Draft Environmental Assessment for Additional Site Assessment Activities on Beacon Wind, LLC's Renewable Energy Lease OCS-A 0520

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Draft Environmental Assessment for Additional Site Assessment Activities on Beacon Wind, LLC's Renewable Energy Lease OCS-A 0520

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Executive Summary

ES.1 Purpose and Need for Action

On March 2, 2023, Beacon Wind submitted, for Bureau of Ocean Energy Management (BOEM) review, a Site Assessment Plan (SAP) Amendment (Tetra Tech 2023) application for additional site assessment activities in Lease Area OCS-A 0520 (Lease Area) not included in the SAP previously approved by BOEM in 2021. This Environmental Assessment (EA) supplements analysis presented in BOEM's 2014 revised EA for *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts* and focuses on new site assessment activities and their potential impacts that have not been previously evaluated. This EA complies with the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) §§ 4321–4370f, the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) §§ 1501.3(b) and 1508.9, U.S. Department of Interior (USDOI) regulations implementing NEPA at 43 CFR Part 46, and USDOI Manual (DM) Chapter 15 (516 DM 15).

The Proposed Action for this EA is approval of Beacon Wind's amended SAP to conduct additional site assessment activities in the Lease Area. The site assessment activities consist of repeated short-term deployment and subsequent removal (i.e., tests) of a single suction bucket at select locations in the Lease Area proposed for eventual installation of wind turbines. The suction bucket deployed during testing would be similar to the suction-bucket jacket foundation type considered for use in supporting wind turbines and offshore substations within the Beacon Wind Construction and Operations Plan (COP). The activities would be conducted to further assess the site conditions and gather information to support the engineering design of suction bucket jacket foundations that may be installed within the Lease Area subject to BOEM's ongoing review and approval of the COP, which BOEM is assessing in an environmental impact statement currently in preparation (88 *Federal Register* 42390).

The purpose of the Proposed Action is to approve the SAP Amendment in support of site assessment activities within the Lease Area on the Outer Continental Shelf (OCS) offshore Massachusetts. The need for BOEM's approval of the SAP Amendment is to enable the lessee to adequately assess whether the geological and geotechnical conditions of select locations within the Lease Area are suitable for, and could support, commercial-scale wind energy production by wind turbine generators and offshore substations that use suction-bucket jacket foundations.

ES.2 Proposed Action and Alternatives

The Proposed Action is to approve additional site assessment activities as described in the SAP Amendment (Tetra Tech 2023). This EA analyzes the reasonably foreseeable effects of activities that are anticipated to occur from the Proposed Action.

The proposed site assessment activities consist of 35 deployments and removals of a single suction bucket foundation at 26 locations within the Lease Area (shown on **Figure 2-1** and listed in **Table 2-2**). Suction bucket foundations are an alternative foundation design to traditional pile-driven foundations. The suction bucket design technology secures a steel bucket-shaped foundation by penetrating the sediment and pumping water from within the bucket to create an area of reduced pressure against the

seafloor, also described as vacuum suctioning the bucket foundation into the seafloor. Due to reduced noise and depth disturbance of these foundation types relative to pile-driven foundations, suction bucket designs can have environmental and technical advantages over pile-driven designs. Results of this testing activity may provide data that informs the significance of these advantages, such as acoustic impact minimization for marine life, which will further the knowledge of this technology and has the potential to facilitate future implementation of the technology for the Beacon Wind Project and the offshore wind industry.

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

Table ES-1. Alternatives analyzed in detail

Alternative	Description
Alternative A—No Action	Under Alternative A, BOEM would not approve the additional site assessment activities proposed in the Beacon Wind SAP Amendment. Alternative A includes other ongoing activities and future planned actions (**Appendix C**) occurring in the same geographic area and timeframe.
Alternative B—Proposed Action: Approval of Beacon Wind's Supplemental Site Assessment Activities (Foundation Testing)	Under Alternative B, BOEM would approve the additional site assessment activities proposed in the Beacon Wind SAP Amendment.

BOEM = Bureau of Ocean Energy Management; SAP = Site Assessment Plan.

ES.3 Foreseeable Activities and Impact-Producing Factors

This EA considers the reasonably foreseeable effects of foundation testing and non-routine activities associated with the proposed site assessment activities within the Lease Area. The scenario of reasonably foreseeable activity and impact-producing factors is informed by Beacon Wind's SAP Amendment; the requirements of the renewable energy regulations at 30 CFR Part 585; applicable BOEM guidance for lessees; and previous EAs prepared for similar activities. Reasonably foreseeable non-routine and low-probability events and hazards that could occur during site assessment activities include (1) severe storms, such as hurricanes and extratropical cyclones; (2) allisions and collisions between the site assessment structure or associated vessels and other marine vessels or marine life; (3) spills from collisions or fuel spills resulting from generator refueling; and (4) recovery of lost survey equipment.

The analysis did not consider construction and operation of any commercial wind power facilities within the Beacon Wind Lease Area, which are being evaluated as part of a separate NEPA process and environmental impact statement evaluating the COP submitted by the lessee on June 5, 2023. Impact-producing factors (IPFs) from the Proposed Action that could affect resources include the following:

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

ES.4 Environmental Consequences

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

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

Resource	Impact Determination: Alternative B (Proposed Action)	
	Foundation Testing Activities	Non-Routine Events
Air Quality and Greenhouse Gas Emissions	Negligible	Negligible
Benthic Resources	Negligible	Negligible
Commercial and Recreational Fishing	Negligible to Minor	Negligible
Cultural, Historical, and Archaeological Resources	Negligible	Negligible
Finfish, Invertebrates, and Essential Fish Habitat	Negligible to Minor	Negligible
Marine Mammals	Negligible	Negligible
Sea Turtles	Negligible	Negligible

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List of Abbreviations and Acronyms

µm	micrometer
ACHP	Advisory Council on Historic Preservation
ADCP	Acoustic Doppler Current Profilers
ADIOS	Automated Data Inquiry for Oil Spills
APE	Area of Potential Effect
ASLFs	Ancient Submerged Landform Features
BA	Biological Assessment
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
Call	Call for Information and Nominations
CD	Consistency Determination
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COP	Construction and Operations Plan
DM	USDOI Manual
DoD	U.S. Department of Defense
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FR	Federal Register
GHG	greenhouse gas emissions
HAPs	Hazardous Air Pollutants
IPaC	Information for Planning and Consultation
IPFs	Impact-producing factors
km	kilometers
NAAQS	National Ambient Air Quality Standards
NARW	North Atlantic right whale
NAVFAC	Naval Facilities Engineering Systems Command
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPS	National Park Service
NRHP	National Register of Historic Places

OCS	Outer Continental Shelf
PA	Programmatic Agreement
PEIS	Programmatic Environmental Impact Statement
ppb	parts per billion
PRDP	Post-Review Discovery Plan
SAP	Site Assessment Plan
SHPO	State Historic Preservation Office
SOCs	Standard Operating Conditions
TSSs	Traffic Separation Schemes
U.S.C.	United States Code
USCG	U.S. Coast Guard
USDOI	U.S. Department of Interior
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOCs	Volatile Organic Compounds

1 Introduction

The U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) has prepared this Environmental Assessment (EA) to determine whether approval of additional site assessment activities as proposed by Beacon Wind LLC (Beacon Wind) within Lease Area OCS-A 0520 (Lease Area) (**Figure 1-1**) offshore Massachusetts would lead to reasonably foreseeable significant impacts on the environment.

On June 3, 2014, BOEM issued a Finding of No Significant Impact (FONSI) based on a Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts (BOEM 2014; referred to herein as the "2014 EA") which covered Lease Area OCS-A 0520. On December 8, 2020, Beacon Wind submitted a Site Assessment Plan (SAP) for the Lease Area in support of site assessment activities consisting of installation and operation of metocean equipment, with updated versions submitted April 27, 2021, and June 28, 2021. The 2014 EA addressed the activities included in the SAP, and the SAP was approved by BOEM on September 24, 2021. The metocean equipment was deployed in the Lease Area on November 10, 2021, and was removed in December 2023.

1.1 Purpose and Need

On March 2, 2023, Beacon Wind submitted, for BOEM review, a SAP Amendment (Tetra Tech 2023) application for additional site assessment activities in the Lease Area not included in the 2020 SAP, which consist of short-term deployment and subsequent removal of representative wind turbine/offshore substation foundation components (Proposed Action). The Proposed Action includes repeated tests of a single suction bucket within the Lease Area, at selected locations planned for eventual installation of wind turbines. The suction bucket would be similar to those considered within the Beacon Wind Construction and Operations Plan (COP) for the suction bucket jacket foundation, which may support wind turbines and/or offshore substations. The Proposed Action will be conducted to further assess the geological and geotechnical conditions and gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area for the proposed Beacon Wind project.

This EA supplements analysis presented in the 2014 EA and focuses on new site assessment activities and their potential impacts that have not been previously evaluated. This EA complies with the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) §§ 4321-4370f, the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) §§ 1501.3(b) and 1508.9, U.S. Department of Interior (USDOI) regulations implementing NEPA at 43 CFR Part 46, and USDOI Manual (DM) Chapter 15 (516 DM 15).

The purpose of the Proposed Action is to approve the SAP Amendment in support of site assessment activities within the Lease Area on the Outer Continental Shelf (OCS) offshore Massachusetts. The need for BOEM's approval of the SAP Amendment is to enable the lessee to adequately assess whether the geological/geotechnical conditions of areas within the Lease Area are suitable for, and could support, commercial-scale wind energy production by wind turbine generators that use suction bucket foundations.

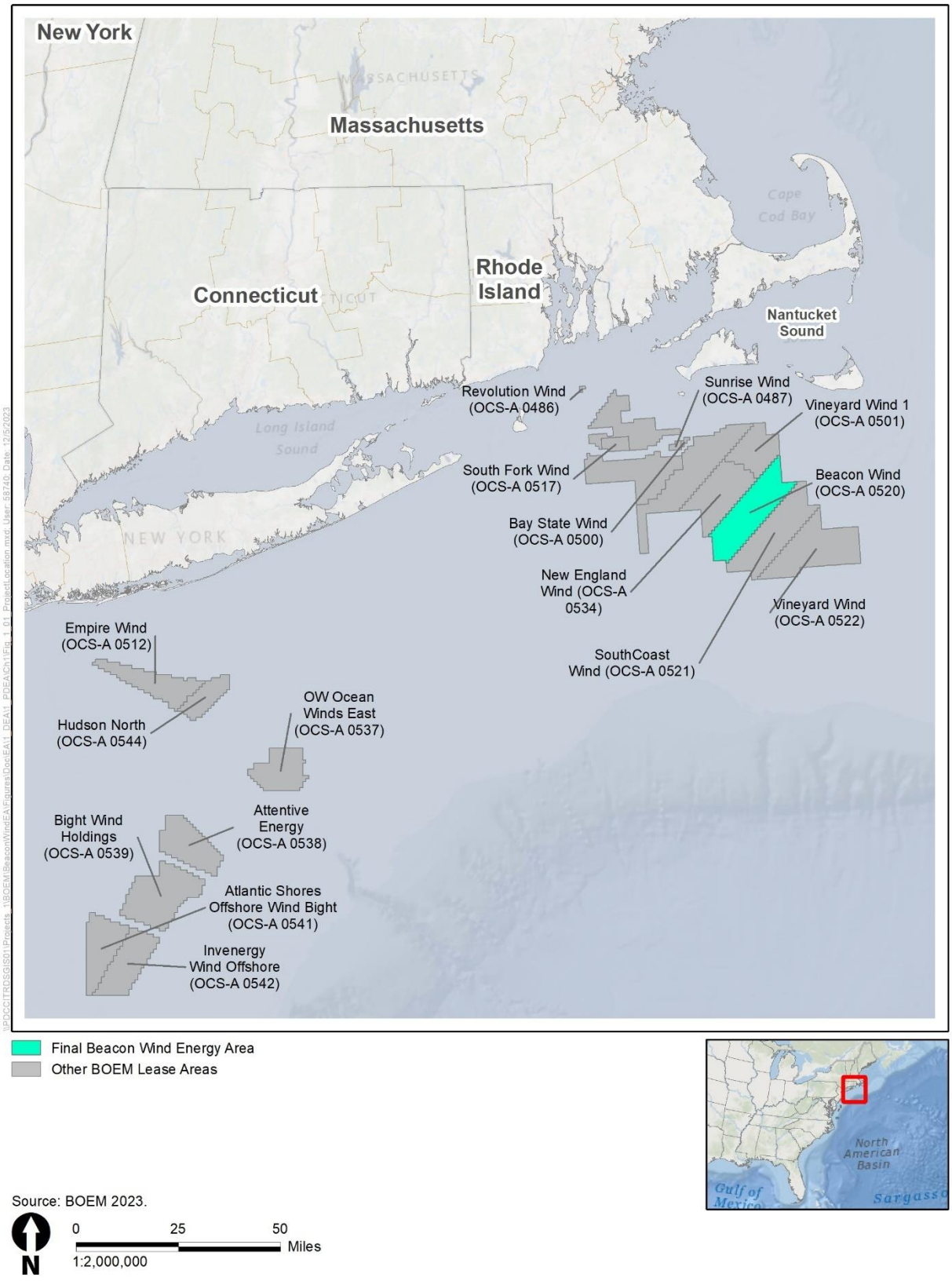

Figure 1-1. Beacon Wind Lease Area

1.2 Information Considered and Supporting National Environmental Policy Act Evaluations

Information considered in scoping this EA includes the following:

- Public response to the November 7, 2023, Notice of Intent (NOI) to prepare this EA.
- Ongoing or completed consultations with other Federal agencies, including the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS).
- Research and review of current relevant NEPA documents that assess similar activities, as well as relevant scientific and socioeconomic literature.

The following NEPA documents were used to inform preparation of this EA and are herein incorporated in their entirety by reference:

- *Final Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf*, OCS Environmental Impact Statement (EIS)/Environmental Assessment (EA) Minerals Management Service (MMS) 2007-046 (MMS 2007).
- *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment*, OCS EIS/EA BOEM 2014-603 (BOEM 2014).

Additional environmental studies performed to support decisions concerning offshore wind energy development are available on BOEM's website at https://www.boem.gov/renewable-energy-research-completed-studies.

2 Alternatives, Including the Proposed Action

This section describes the two alternatives considered in this EA for the Beacon Wind SAP Amendment. See Table 2-1.

Table 2-1. Alternatives Considered

Alternative	Description
Alternative A – No Action	Under Alternative A, BOEM would not approve the additional site assessment activities proposed in the Beacon Wind SAP Amendment. Alternative A includes other ongoing activities and future planned actions (**Appendix C**) occurring in the same geographic area and timeframe.
Alternative B - Proposed Action: Approval of Beacon Wind's Supplemental Site Assessment Activities (Foundation Testing)	Under Alternative B, BOEM would approve the additional site assessment activities proposed in the Beacon Wind SAP Amendment.

2.1 Alternative A (No Action)

Alternative A is the No Action Alternative, which would not include the proposed suction bucket testing, but would include other ongoing activities and future planned actions. Alternative A would result in the continued approved site assessment activities in the Lease Area as described in the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore NY, Revised EA* (BOEM 2016) and as Alternative A Proposed Action in the 2014 EA, but no additional site assessment activities as described in the SAP Amendment would occur. The original site assessment activities included up to 5 meteorological towers, 10 meteorological buoys, or a combination of towers and buoys on the Lease Area. The original site characterization and assessment activities combined were projected to result in between 2,808 and 6,500 vessel round trips as a maximum scenario over a 5-year period (see Section 3.1.3.4 of the 2014 EA). Vessel traffic was divided between 10 major and 21 smaller ports in Massachusetts, Rhode Island, Connecticut, and New York (see Section 3.1.2 of the 2014 EA). These leasing, site characterization, and site assessment scenarios were described in detail in Section 3 of the 2014 EA. The impacts of Alternative A on environmental resources and socioeconomic conditions are described in detail in Section 4.2 of the 2014 EA.

2.2 Alternative B (Proposed Action)

The Proposed Action is to approve additional site assessment activities as described in the SAP Amendment (Tetra Tech 2023). Under the Proposed Action, BOEM would approve the additional site assessment activities for Foundation Testing that will occur within the Lease Area. This EA analyzes the reasonably foreseeable effects of activities that are anticipated to occur from the Proposed Action.

The proposed site assessment activities consist of up to 35 deployments and removals of a single steel suction bucket foundation at up to 26 locations within the Lease Area (shown on **Figure 2-1** and listed in **Table 2-2**) to gather information to support the engineering design of wind turbine and offshore

substation foundations that would potentially be installed within the Lease Area for a future Beacon Wind project. The suction bucket used for the Foundation Tests would be similar to those considered within the COP (AECOM 2023) for the suction bucket jacket foundations, which may be used for some of the wind turbines and/or offshore substations. Suction bucket foundations are an alternative foundation design to traditional pile-driven foundations. The suction bucket design technology secures a steel bucket-shaped foundation by penetrating the sediment and pumping water from within the bucket to create an area of reduced pressure against the seafloor, also described as vacuum suctioning the bucket foundation into the seafloor. Due to reduced noise and depth disturbance of these foundation types relative to pile-driven foundations, suction bucket designs can have environmental and technical advantages over pile-driven designs. Results of this testing activity may provide data that informs the significance of these advantages, such as acoustic impact minimization for marine life, which will further the knowledge of this technology and has the potential to facilitate future implementation of the technology for the Beacon Wind Project and the offshore wind industry.

These two alternatives are analyzed in full in this EA.

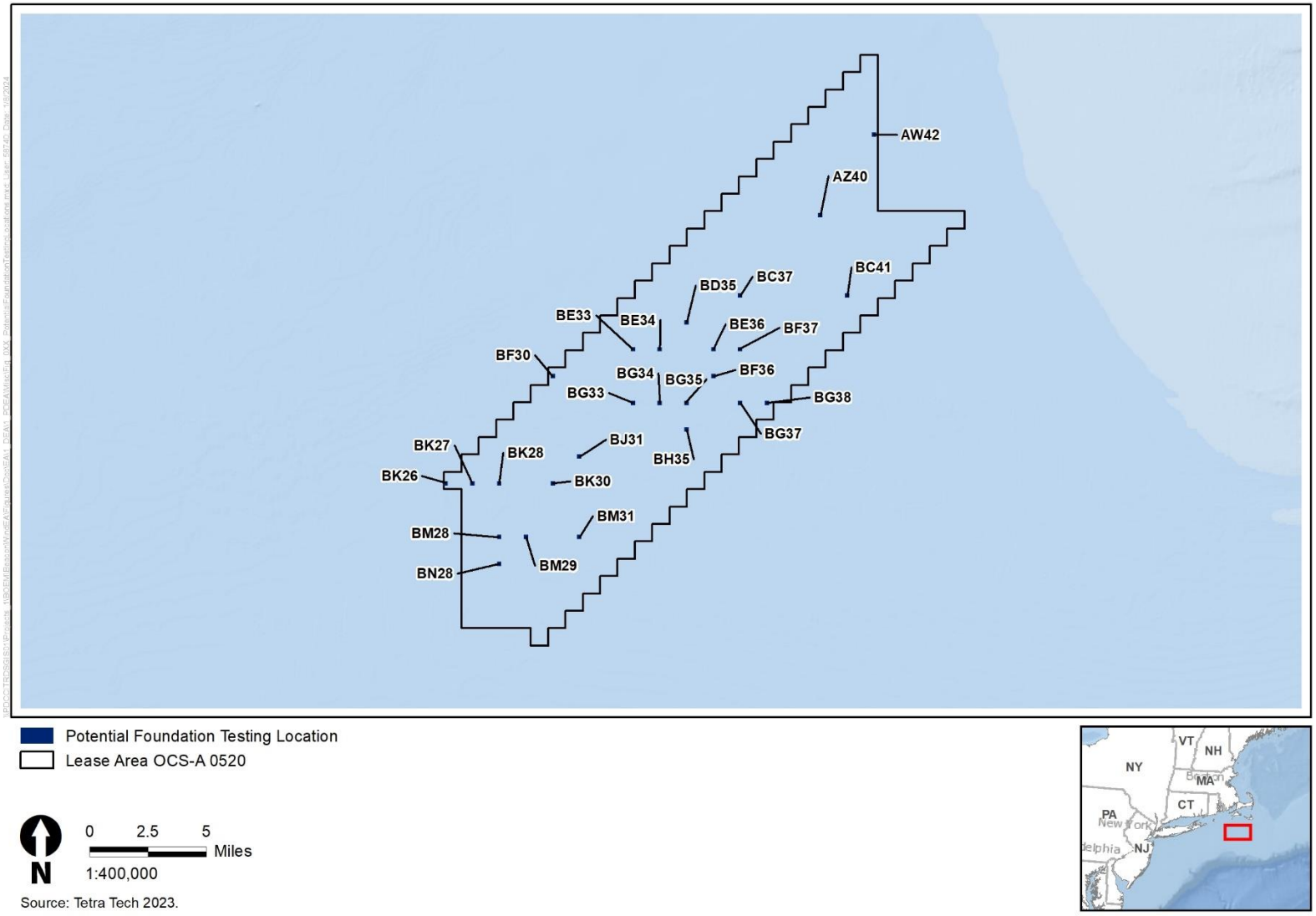

Figure 2-1. Foundation Testing locations

Table 2-2. Location of Foundation Testing *sites*

Wind Turbine Location Name	Latitude (Center of Foundation Testing Area)	Longitude (Center of Foundation Testing Area)	Minimum Water Depth (meters)	Maximum Water Depth (meters)
AW42	40.97132	-70.3722	-42.41	-41.71
AZ40	40.92075	-70.4151	-45.78	-44.94
BC41	40.87099	-70.3921	-48.80	-48.10
BC37	40.86989	-70.48	-52.69	-52.28
BD35	40.85264	-70.5235	-54.48	-53.94
BE33	40.83538	-70.5671	-52.81	-51.75
BE34	40.83567	-70.5451	-54.02	-52.28
BE36	40.83625	-70.5012	-55.21	-54.63
BE37	40.83654	-70.4792	-54.15	-53.62
BF30	40.81778	-70.6325	-55.99	-55.45
BF36	40.81957	-70.5008	-53.78	-52.62
BG33	40.80202	-70.5663	-55.03	-54.38
BG34	40.80232	-70.5443	-53.76	-53.18
BG35	40.80261	-70.5224	-53.44	-52.99
BG37	40.80318	-70.4785	-52.68	-51.95
BG38	40.80346	-70.4565	-52.69	-51.75
BH35	40.78593	-70.522	-53.39	-53.14
BJ31	40.76806	-70.6094	-57.60	-56.98
BK30	40.75108	-70.6309	-58.82	-58.32
BK28	40.75045	-70.6748	-60.40	-60.06
BK27	40.75013	-70.6967	-60.83	-60.12
BM28	40.71709	-70.6739	-60.78	-60.09
BM29	40.71741	-70.652	-60.25	-59.71
BM31	40.71803	-70.6082	-58.73	-58.31
BN28	40.70042	-70.6735	-61.08	-60.59
BK26	40.7498	-70.7186	-61.15	-60.53

3 Scenario of Reasonably Foreseeable Activity and Impact-Producing Factors

3.1 Geographic Analysis Area

BOEM used a localized geographic scope to evaluate impacts from planned actions for resources that are fixed in nature (i.e., their location is stationary—such as benthic and archaeological resources) or for resources where impacts from the Proposed Action would only occur in waters in the Lease Area (e.g., water quality). Although some resources are mobile and, in some cases, migratory (e.g., marine mammals, sea turtles, and fish/fishing), impacts from the Proposed Action are anticipated to remain within the Lease Area, and, as a result, the geographic analysis area will remain the same for these resources.

BOEM has not defined onshore areas from which the Proposed Action would be visible as part of the analysis area because BOEM has concluded that the equipment and vessels performing these activities would be indistinguishable from existing lighted vessel traffic for an observer onshore.

3.2 Routine Activities and Impact-Producing Factors

Routine activities included for the Proposed Action (Alternative B) are summarized in **Table 3-1**. This scenario is based on the requirements of the renewable energy regulations at 30 CFR Part 585, applicable BOEM guidance for lessees, previous plans that have been submitted to BOEM, previous EAs prepared for similar activities (**Section 1.2)**, and the biological assessment (BA) evaluating the effects of survey and data collection activities associated with renewable energy on the Atlantic OCS (Baker and Howson 2021). Unless otherwise noted, assumptions in this section are based on these sources.

Table 3-1. Routine activities for the Proposed Action (Alternative B) scenario

Overall Scenario
BOEM would approve Foundation Testing activities at up to 26 sites within the Beacon Wind Lease Area.
Surveying and Sampling Activities
Foundation Testing will be conducted at sea during a single approximately 10- to 15-day effort in the Lease Area.
Foundation Testing will occur shortly after EA approval and SAP Amendment approval.
Foundation Testing will require a seabed sample at every potential wind turbine location including the possibility of multiple tests at a single location, such that up to 35 total deployment trials would be conducted.
Beacon Wind will be required to comply with Standard Operating Conditions (SOCs) developed to avoid and minimize adverse effects on resources (**Section 5**).
Installation, Decommissioning, and Operations and Maintenance Activities
Because the Foundation Testing is a temporary activity, all testing equipment would be removed and no facilities installed; therefore, no decommissioning is required.
Assumptions for Generation of Noise
Under the Proposed Action, the following activities and equipment would generate noise: Foundation Testing survey equipment and vessel engines during testing.

BOEM = Bureau of Ocean Energy Management; EA = Environmental Assessment; SAP = Site Assessment Plan; SOC = Standard Operating Condition

This EA analyzes the effects of Foundation Testing activities (as shown in **Section 3.2.1**) within the Lease Area. It does not consider construction and operation of any commercial wind power facilities on a lease or grant in the identified Lease Area, which will be evaluated in a separate Environmental Impact Statement (EIS).

Impact-producing factors (IPFs) associated with the proposed testing activities that could affect resources include the following:

- Noise
- Air Emissions
- Lighting
- Vessel Traffic
- Routine Vessel Discharges
- Bottom Disturbance

3.2.1 Foundation Testing Activities

Foundation Testing will consist of trials of up to 35 deployments and removals of a single steel suction bucket. The suction bucket equipment will be similar to that considered within the COP for the suction bucket jacket foundation, which may support wind turbines and/or offshore substations. The Foundation Testing will be conducted to gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area. Suction bucket foundations are an alternative foundation design to traditional pile-driven foundations. This technology secures a steel bucket-shaped foundation by penetrating the sediment and pumping water from within the bucket to create an area of reduced pressure against the seafloor. Potential advantages of suction bucket foundations include reduced noise and depth disturbance compared to pile-driven foundations.

The Foundation Testing will be conducted at sea over approximately 15 days in the Lease Area. No foundation materials or other survey equipment will be detached from the vessel or remain in-water for a period exceeding the suction bucket trial periods at each deployment/removal site. The vessel will utilize dynamic positioning; therefore, no anchors or jack-up legs will be used.

There are 26 proposed deployment/removal sites, all within the Lease Area. Because multiple tests may occur at some of the sites, up to a total of 35 trials may be conducted (**Figure 2-1**). The coordinates for the locations under consideration are provided in **Table 2-2**. At each site, activities will occur within a 984- by 984-foot (300- by 300-meter) square, which is centered on the location for eventual installation of the proposed wind turbines under the COP (AECOM 2023). This area is conservative and would cover all Foundation Testing activities at each location, including the possibility of multiple tests at a single location.

The suction bucket (**Figure 3-1**) used in the test will have a diameter of 30 to 39 feet (9 to 12 meters), a height of 36 to 39 feet (11 to 12 meters), and total weight of approximately 200 tons. The suction bucket will be designed to penetrate the seafloor to a maximum of between 33 and 39 feet (10 and 12 meters). This is significantly less than the maximum seafloor penetration for metocean tower foundations assessed in the 2014 EA, which assumed that such foundations would be pile-driven up to 100 feet (30 meters) below the seafloor.

Figure 3-1. Representative Photograph of a Suction Bucket

A low-flow suction pump (**Figure 3-2**) would be mounted to the top of the suction bucket approximately 19 feet (6 meters) above the seabed. After the bucket has settled into the seafloor, the suction pump would slowly remove water from within the bucket to create an area of reduced pressure, which would assist in completing penetration to the target depth. The suction pump would generate noise during operation, but observations conducted at other offshore wind facilities suggest that noise from suction pumps would attenuate to background noise levels at a relatively short distance from the pump (e.g., within 1,640 feet [500 meters]; Koschinski and Lüdemann 2020).

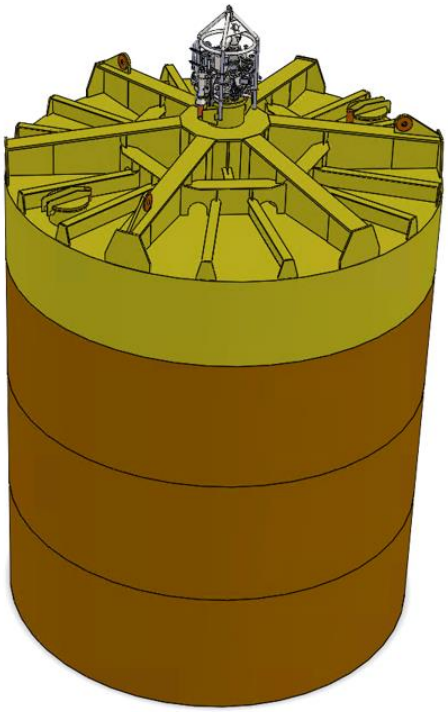

Figure 3-2. Illustrative Drawing of a Suction Pump Mounted atop a Suction Bucket

The suction pump would operate at a nominal rate of 1,320 gallons per minute (5 cubic meters [m^3] per minute), and the removed water would be released immediately outside the bucket. The volume of seawater removed would be limited to the volume inside the bucket, with a maximum of 358,504 gallons (1,357 m^3) removed per test. The suction pump would not be screened to avoid potential pressure losses due to clogging of the screen (e.g., if a small piece of debris became suctioned to the screen), which would cause the pump to malfunction. At the completion of each test, the pump would slowly return water to the interior of the bucket to create positive pressure inside the bucket, allowing it to be removed from the seafloor.

Measurement equipment would be deployed inside the bucket during testing to monitor the soil plug on the inside of the bucket and to gather data to assist with foundation engineering. Imaging equipment (e.g., sonar, echo sounder, sub-bottom profiler) would be mounted inside the lid of the bucket. The imaging equipment would be operated at frequencies at or above 400 kilohertz (kHz), which is inaudible to marine organisms.

Two remotely operated vehicles (ROVs) may be used to assist in precisely locating the bucket during deployment, as well as to observe and gather data on the process of penetration and recovery. The ROVs would be suspended in the water column and would not contact the seafloor. The ROVs would be controlled from on board the vessel and would navigate via hydraulic propellers or thrusters that do not generate significant underwater noise.

Prior to lowering the bucket to the seafloor, a reference frame (**Figure 3-3**) would be lowered to the seafloor to assist the vessel lowering the bucket onto the targeted location and to ensure accurate positioning of the bucket on the seafloor. The reference frame is made of steel with a maximum weight of approximately 1,100 pounds (500 kilograms). The footprint of the reference frame is approximately

11 square feet (ft^2) (1 square meter [m^2]). The reference frame would be directly lowered from the vessel onto the seafloor and would remain stationary on the seafloor for the duration of each foundation installation test. The edge studs of the reference frame may penetrate the top 2 inches (5 centimeters) of the seabed. Upon completion of each trial, the reference frame would be raised vertically back onto the vessel.

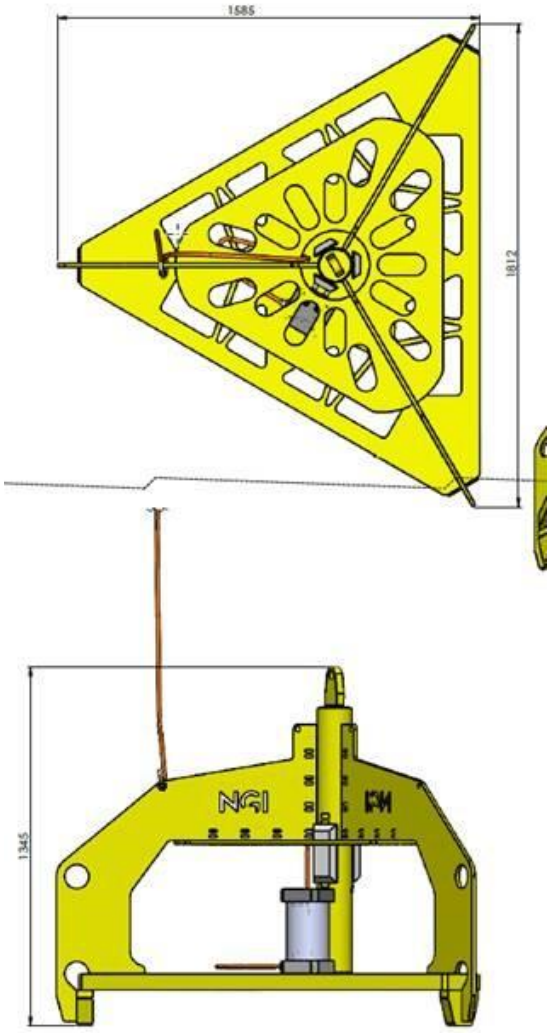

Figure 3-3. Top and Side View of a Representative Reference Frame

Each Foundation Test installation is expected to take 6 to 9 hours, including 3 to 5 hours for deployment (lowering and seabed penetration) and 3 to 4 hours for removal (reverse penetration, lifting, potential cleaning, and lifting onboard). Increased vessel presence and traffic during Foundation Testing could result in several IPFs, including noise, air emissions, routine vessel discharge, and lighting. Vessel Support and Notifications for Foundation Testing Activities

A suction bucket will be fabricated and transported from Europe, and a vessel and crew will be mobilized from Europe, Canada, and/or the United States. Foundation Testing activities are expected to occur over approximately 10–15 days, barring weather delays.

The Foundation Testing will use a single large vessel, equipped with a crane rated to a minimum of 300-ton capacity. Once the construction vessel arrives at each Foundation Testing location, it will be positioned using dynamic positioning technology, without the use of anchors or jack-up legs. Once the suction bucket deployment is complete, retrieval will be initiated. The onboard crane will lift it from the seabed to the surface. If sticky soil is present at the site and becomes attached to the surface of the bucket's walls, it may be cleaned under the water prior to lifting back onboard. The bucket will then be lifted back on the vessel deck, followed by lifting and onboarding of the reference frame. After all equipment is onboard and secure, the vessel will transit to the next trial location and the above process will be repeated. If the sea state conditions are hazardous, the bucket may be left suspended under the vessel and above the seabed as the vessel transits at low speed to the next location to ensure safe operations. Once testing at all sites is complete, crew and materials will transit back to the port of origin and demobilize. Ports being considered for crew mobilization are Halifax (Nova Scotia, Canada), New Bedford, Providence, and Davisville.

Beacon Wind will notify BOEM, United States Fleet Forces N46, the United States Army Corps of Engineers (USACE), and the United States Coast Guard (USCG) prior to mobilization to perform Foundation Testing activities. Written notice via email will be provided to the appropriate contact at Fleet Forces Command prior to mobilization to avoid potential conflicts with military operations. Beacon Wind will update Fleet Forces Command on the testing schedule following BOEM approval of the SAP Amendment and detailed planning.

Additionally, Beacon Wind will notify mariners, fishermen, and other users of the area by submitting a request to the USCG for publication of a Local Notice to Mariners at least 2 weeks prior to the start of the in-water work. This notice will include the contact names for the vessel, local fisheries liaison officer, channels of communication, and the duration of the work. Copies of all USCG communications will be provided to BOEM as required. Additionally, in accordance with standard maritime practices, the vessel captain(s) will broadcast via VHF radio on Marine Channel 16 notification to mariners of their position and limited mobility during Foundation Testing activities. Beacon Wind will also provide a continual live Automatic Identification System (AIS) feed of vessel activity within and around the Lease Area, which can be accessed at https://www.beaconwind.com/environment-sustainability/mariners-fisheries/ along with additional information on Beacon Wind's ongoing coordination with mariners and fisheries for the ongoing Beacon Wind EIS.

Within 30 days of completing Foundation Testing, Beacon Wind will notify BOEM in writing that testing is complete. Per Lease Stipulation 2.2.1, Beacon Wind will continue to submit a semi-annual progress report to BOEM every 6 months for the duration of the site assessment term.

3.2.2 Non-Routine Events

Reasonably foreseeable non-routine and low-probability events and hazards that could occur during Foundation Testing include the following: (1) severe storms, such as hurricanes and extratropical cyclones; (2) collisions between the associated vessel with other marine vessels or marine life; (3) spills from collisions; and (4) loss and recovery of survey equipment. These events and hazards are identical to events addressed in the 2014 EA, and that previous analysis is incorporated here by reference, with the exception that the additional Foundation Testing will not involve the installation of fixed structures and will be conducted over a much shorter timeframe (10–15 days), and therefore the likelihood of non-

routine events occurring during the additional Foundation Testing activity is greatly reduced. Accordingly, the potential impacts from non-routine events as described in the 2014 EA, the SAP, and SAP Amendment are briefly described herein but not analyzed in detail. However, recovery of lost survey equipment is not addressed in the 2014 EA and is carried forward for analysis in this EA.

Storms

Severe weather events have the potential to cause structural damage and injury to personnel. Major storms, winter nor'easters, and hurricanes pass through the area, resulting in elevated water levels (storm surge) and high waves and winds. Storm surge and wave heights from passing storms are worse in shallow water and along the coast but can pose hazards in offshore areas. The Atlantic Ocean hurricane season extends from June 1 to November 30, with a peak in September when hurricanes would be most likely to impact the Lease Area. Storms could contribute to an increased likelihood of allisions and collisions that could result in a spill. However, the storm would cause the spill and its effects to dissipate faster, vessel traffic is likely to be significantly reduced in the event of an impending storm, and the proposed testing activities would be postponed until after the storm had passed. The Foundation Testing will be conducted over a period of 10–15 days; therefore, the likelihood of such a storm event occurring during the activity is extremely low.

Collisions

Collisions between vessels are considered unlikely because vessel traffic will use and stay in the Nantucket to Ambrose Fairway, south of the Lease Area. Vessel traffic is controlled by multiple routing measures, such as safety fairways and Traffic Separation Schemes (TSSs).

Spills

A spill of petroleum product could occur as a result of hull damage from collisions between vessels. From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88 gallons (333 liters) (USCG 2011). Should a spill from a vessel associated with the Proposed Action occur, BOEM anticipates that the volume would be similar.

Diesel fuel is lighter than water and may float on the water's surface or be dispersed into the water column by waves. Diesel fuel would be expected to dissipate very rapidly, evaporate, and biodegrade within a few days (MMS 2007a). The National Oceanic and Atmospheric Administration's (NOAA's) Automated Data Inquiry for Oil Spills (ADIOS; an oil weathering model) was used to predict dissipation of a maximum spill of 2,500 barrels, a spill far greater than what is assumed as a non-routine event during the Proposed Action. Results of the modelling analysis showed that dissipation of spilled diesel fuel is rapid. The amount of time it took to reach diesel fuel concentrations of less than 0.05% varied between 0.5 and 2.5 days, depending on ambient wind (Tetra Tech Inc. 2015), suggesting that 88 gallons (333 liters) would reach similar concentrations much faster and limit the environmental impact of such a spill.

Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills, notification, and best management practices (BMPs) as detailed in the SAP and SAP Amendment. BOEM expects that the Foundation Testing vessel would minimize the potential for a release of oils and/or chemicals in accordance with 33 CFR Part 151, 33 CFR Part 154, and 33 CFR Part 155, which contain guidelines for implementation and enforcement of vessel response plans, facility response plans, and

shipboard oil pollution emergency plans. Based on the size of the spill, it would be expected to dissipate very rapidly and would then evaporate and biodegrade within a day or two (at most), limiting the potential impacts to a localized area for a short duration.

Recovery of Lost Survey Equipment

The Foundation Testing is not expected to result in any trash or bottom debris. However, following the completion of testing, Beacon Wind will ensure that the seafloor has been cleared of all obstructions created by activities on the Lease. This will be accomplished via photo documentation of all deployed and retrieved equipment. Additionally, to confirm that all equipment was retrieved from the site, Beacon Wind will carry out a photographic bottom survey.

3.3 Resources Eliminated from Further Consideration

NEPA requires important resources and areas that may be impacted or affected by the action be the focus of the analysis. Because many of the activities described in this EA have been previously analyzed in the 2014 EA, resource areas of concern for site assessment activities for the proposed Foundation Testing have been well documented. The Foundation Testing as proposed is a short-term, temporary activity conducted offshore, so impacts on many important resources and areas are not expected. Therefore, the resources and areas listed below will not be carried forward for analysis in this EA given that their impacts are anticipated to be negligible or lower.

3.3.1 Bats

The potential impacts on bats associated with the proposed Foundation Testing activities would be negligible. Impacts on bats are analyzed in detail within the 2014 EA, the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore NY, Revised EA* (BOEM 2016), and other recently published offshore wind Environmental Impact Statements (EISs) in the vicinity of the project including Vineyard Wind 1, New England Wind, and SouthCoast. Bat activity in the Atlantic has been found to decline dramatically 11 nautical miles (nm) (20.4 kilometers) from shore (Sjollema et al. 2014), and it is generally considered unlikely that any bats would travel 15 nm (28 kilometers) or more from land over open water to forage in the Lease Area (Peterson 2016; Sjollema et al. 2014).

Although rare in the Lease Area, bats could have avoidance or attraction responses to the survey vessel due to noise, lighting, and the possible presence of insects. Due to the scarcity of bats offshore in the Lease Area and the limited amount of added vessel traffic, collisions between bats and boats are unlikely. Thus, the overall impact of activities associated with the Proposed Action on bats would be negligible.

3.3.2 Birds

The potential impact on birds from the proposed Foundation Testing would be negligible. Potential impacts on birds from site assessment activities are analyzed in detail in the 2014 EA, the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore NY, Revised EA* (BOEM 2016), and other recently published offshore wind Environmental Impact Statements (EISs) in the vicinity of the project including Vineyard Wind 1, Northeast Wind, and SouthCoast. Although birds could

be affected by accidental vessel discharges during the proposed Foundation Testing, any such discharge would be short term and localized.

3.3.3 Coastal Habitats

No direct impacts on wetlands or other coastal habitats would occur from the proposed Foundation Testing activities. Existing ports or industrial areas are expected to be used in support of the proposed activities, and no expansion of existing facilities is expected to occur. Indirect impacts from routine activities may include wake-induced erosion and increased turbidity caused by nearshore vessel traffic but would be negligible or less given the small amount of added vessel traffic caused by one vessel transiting to and from the Lease Area.

3.3.4 Demographics and Employment

Temporary increases in employment from the proposed Foundation Testing activities could occur. However, the small number of workers on the single vessel that would be directly employed for the short-term (10–15 days) testing activities would not have a perceptible impact on local employment and demographic characteristics, such as population. Any impacts on employment, population, and the local economies in and around the ports that would support the Foundation Testing would be short term and imperceptible; therefore, impacts would be negligible.

3.3.5 Environmental Justice

Based on the distance of the nearest shoreline from the proposed Foundation Testing and the negligible impacts of the activities on demographics and employment, the proposed Foundation Testing would not result in disproportionate and adverse environmental or health effects on minority or low-income populations. Only the use of existing coastal facilities has the potential to affect minority or low-income populations. However, existing coastal facilities in the region would support proposed activities without any need for expansion. There would be no impacts on environmental justice because disproportionately high and adverse human health or environmental effects that would disproportionately affect low income and minority persons would not occur as a result of the Proposed Action.

3.3.6 Geology

The potential impacts on sediments from proposed Foundation Testing would have negligible impacts on geology. Seafloor impacts will occur only within the footprint of the reference frame, which will affect 0.028 acre (114 m^2) of seafloor per test, and up to 0.986 acre (3,990 m^2) across the Lease Area, the total area of impact covering a very small portion of the total Lease Area. The Foundation Testing suction bucket would penetrate to a maximum depth of 39 feet (12 meters), which will not impact the underlying geology of the area. Impacts on the geology of the seafloor would be negligible.

3.3.7 Military Use Areas

Potential impact on military use areas from site assessment activities within the Lease Area was fully analyzed in the 2014 EA. Any impact on the Navy's training areas and other U.S. Department of Defense (DOD) activities from the proposed Foundation Testing activities could be mitigated by site-specific

stipulations designed in consultation with DOD. Therefore, any impacts would be negligible and avoidable when coordinated with DOD.

3.3.8 Navigation and Vessel Traffic

Impacts on vessel traffic and navigation as a result of the proposed Foundation Testing will be negligible in the affected area. The additional vessel activity associated with the proposed action will be temporary, limited to a single vessel for 10–15 operational days. Impact on navigation and vessel traffic from all other vessels associated with site assessment activities was fully analyzed in the 2014 EA. The 2014 EA concluded that impacts on vessel traffic and navigation as a result of site characterization surveys would be negligible to minor. Because only one vessel will be associated with the proposed action, the number of vessels passing through the Lease Area is not expected to significantly increase vessel traffic density when compared to existing and projected future vessel traffic in the Lease Area. Based on this information, it is expected that any impacts on navigation and vessel traffic would be short term and negligible.

Additionally, Beacon Wind will notify mariners, fishermen, and other users of the area by submitting a request to the USCG for publication of a Local Notice to Mariners at least 2 weeks prior to the start of the in-water work (**Section 3.2.2**).

3.3.9 Recreation and Visual Resources

The potential impacts on visual resources from Foundation Testing would be negligible. The action includes temporary and short-term vessel activity and does not include placement of permanent infrastructure. Most recreational boating activity occurs within 3 miles (4.8 kilometers) of the shore, and a very limited number of recreational routes have been recorded in the Lease Area. Given the distance of the proposed activities from shore, the fact that no new coastal infrastructure would be necessary, and the small amount of temporary vessel traffic associated with the Proposed Action, impacts on visual resources, onshore cultural resources, and recreation and tourism would be short term and negligible.

3.3.10 Water Quality

Potential impacts on water quality from the proposed Foundation Testing include vessel discharges (including bilge and ballast water, and sanitary waste) and sediment suspension. Non-routine events could include the recovery of lost survey equipment and the potential for spills.

Impacts on coastal and marine waters from vessel discharges would likely be of short duration and remain undetectable or minimal with adherence to regulations governing discharges (BOEM 2015). The Proposed Action is not anticipated to increase runoff or onshore discharge into harbors, waterways, coastal areas, or the ocean environment. The Project vessel would utilize dynamic positioning thrusters to maintain position, and therefore no anchoring impacts would occur. Sediment suspension in the water column resulting from activities associated with the foundation/suction bucket test would be short term, would temporarily impact local turbidity and water clarity, and is not anticipated to result in any significant impact on water quality. Impacts on water quality as a result of potential spills would be minimized by adherence to USCG requirements relating to the prevention and control of oil spills, notification, and BMPs.

Impacts on water quality could occur during Foundation Testing due to vessel discharges, sediment suspension, recovery of lost equipment, and spills. Water quality is expected to return, without mitigation, to its original state after testing is completed. Impacts from vessel discharges and recovery of lost equipment on marine water quality would be short term and negligible, with any changes being small in magnitude, highly localized, and transient. All regulations governing discharges will be adhered to during Foundation Testing. Impacts on water quality as a result of sediment suspension in the water column would also be short term and negligible as sediments will settle to the seafloor within hours to days. Impacts on water quality due to potential spills would be short term and minor as impacts would be minimized by adherence to USCG requirements.

4 Environmental Consequences

4.1 Assessment Methodology

This EA uses a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts predicted if the Proposed Action or the No Action Alternative is implemented. Definitions of impacts are presented in two separate groups: (1) biological and physical resources and (2) socioeconomic resources. Impact level definitions used in this EA are described in **Table 4-1**.

The impact level definitions were originally developed for BOEM's Programmatic Environmental Impact Statement (PEIS) for Alternative Energy Development (MMS 2007b), were used in other previous lease issuance EAs (**Section 1.2**), and are used in this EA to provide consistency in BOEM's discussion of impacts.

Table 4-1. Definitions of impact determinations used in this EA

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

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

In order to comply with the page limits stated in Section 1501.5 of the CEQ implementing regulations, BOEM has focused the main body of this EA on the impacts for resources of most concern and has moved the analysis of other resources to **Appendix A**, including all resources for which implementation of the Proposed Action would result in negligible impacts, including air quality (air emissions estimates are presented in **Appendix B**) and cultural, historical, and archaeological resources.

4.2 Alternative A – No Action Alternative and Affected Environment

Under the No Action Alternative, BOEM would not approve the additional proposed Foundation Testing activities included in the Proposed Action as described in the SAP Amendment. Therefore, additional vessel traffic associated with Foundation Testing activities would not occur.

The No Action Alternative discussions that follow include descriptions of the baseline conditions of each resource, as well as descriptions of how the affected environment or baseline for each resource may change, evolve, or shift (i.e., the trajectory of the resource) absent the Proposed Action (Alternative B). This EA identifies other present (ongoing) and planned actions (formerly referred to as cumulative) that contribute to the No Action baseline that include activities as described in the original SAP described in the 2014 EA, along with impacts on the resources from those actions; this EA focuses on effects that are reasonably foreseeable in the same location and timeframe.

Appendix C includes a list of the ongoing and planned projects and IPFs that BOEM has identified as potentially contributing to reasonably foreseeable impacts when combined with impacts from the Proposed Action over the geography and time scale described in **Section 3**. Reasonably foreseeable planned actions include Foundation Testing activities within the existing Beacon Wind Lease Area. As indicated in **Section 2**, approval of site assessment activities, by itself, does not authorize any construction within the Lease Area. Therefore, the analysis in this EA does not consider development of the Lease Area. However, the No Action Alternative does consider approved, proposed, and contemplated projects across other existing leases.

BOEM has completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development cumulative impacts (now referred to as “planned actions”) scenario (Avanti Corporation

and Industrial Economics Inc. 2019).[1] The study identifies cause-and-effect relationships between renewable energy projects and resources potentially affected by such projects. It further classifies those relationships into a manageable number of IPFs through which renewable energy projects could affect resources. It also identifies the types of actions and activities to be considered in a planned actions impacts scenario. The study identifies actions and activities that may affect the same physical, biological, economic, or cultural resources as renewable energy projects and states that such actions and activities may have the same IPFs as offshore wind projects.

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

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

4.2.1 Benthic Resources

Description of the Affected Environment

The description of benthic resources in this section is supported by studies conducted by Beacon Wind, as well as other studies reviewed in the literature (COP Section 5.5, Appendix G, Appendix S, and Appendix T; AECOM 2023). Site-specific benthic surveys were conducted from July 2021 to September 2021 in the Lease Area at 157 proposed WTG locations, including those proposed for Foundation Testing, utilizing grab sampling, drop and towed camera stills and video, and sediment profile and plan view imaging (SPI/PV) and at 218 locations along interarray cable routes using SPI/PV. From July 2021 to November 2021, site-specific benthic surveys were conducted along the export cable corridor, with SPI/PV imaging collected at 374 stations along the route and benthic grab samples and video collected at 198 of the 374 stations. Benthic video only was collected at an additional 93 stations along the route. Detailed baseline descriptions of the affected environment within the Lease Area are provided in COP Volume II, Appendix S and Section 5.5 (AECOM 2023), and are summarized in this section.

The Beacon Wind Lease Area is located approximately 20 miles (32 kilometers) south of Nantucket, Massachusetts, and 60 miles (97 kilometers) east of Montauk, New York. The Lease Area covers approximately 28,811 acres (52,128 hectares) and the sediments are predominately muddy sands (138 out of 157 stations) throughout the Lease Area (COP Appendix S, Table 20; AECOM 2023). No

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

hardbottom or rocky habitats were observed in the Lease Area during site-specific sampling conducted in 2021. Polychaete worms (*Levinsenia gracilis*, *Polygordius* spp., *Ninoe nigripes*, and *Terrebellides stroemi*), amphipods (*Ampleisca vadorum*, *Unciola irrorata*, and *Ericthonius brasiliensis*), bivalves (*Nucula proxima* and *Periploma papyratium*), and cumaceans (*Eudorella pusilla*) were the most numerically abundant infaunal organisms in the Lease Area. Faunal assemblages in the Lease Area had generally low percent coverage and included sea stars (Asterias sp. and Astropecten sp.), which were more abundant in the southern portion of the Lease Area, and sand dollars (likely *Echinarachnius parma*), which were observed in the northwest portion of the Lease Area. No nonnative species, seagrass, macroalgae, sensitive habitats, or NOAA species of concern were observed in the Lease Area.

Impact Analysis of Alternative A

Benthic resources are subject to pressure from ongoing activities and conditions, especially climate change, commercial fishing using bottom-tending gear (e.g., dredges, bottom trawls, traps/pots), vessel anchoring, cable and pipeline emplacement and maintenance activities, electromagnetic fields (EMF), underwater noise from construction activities, and sediment dredging for navigation. These routine activities are expected to continue for the foreseeable future and would affect benthic habitats and their community compositions. Construction of ongoing and planned offshore wind projects would affect benthic resources through the primary IPFs of accidental releases, cable emplacement and maintenance, noise, and land disturbance.

Conclusion

Under the No Action Alternative, benthic resources would continue to be affected by existing environmental trends and ongoing activities. BOEM expects ongoing activities to have continuing short-term, long-term, and permanent impacts (e.g., disturbance, injury, mortality, habitat degradation, habitat conversion) on benthic resources primarily through regular maritime activity, offshore construction impacts, cable emplacement, and climate change. Offshore wind activities are expected to involve several IPFs, primarily new cable emplacement and the presence of structures (i.e., foundations and scour/cable protection). However, habitat disturbance from offshore construction is expected to be minimal, and recovery of benthic communities is expected over time. BOEM anticipates the No Action Alternative to result in **negligible** to **moderate** impacts on benthic resources.

4.2.2 Commercial and Recreational Fishing

Description of the Affected Environment

Most fisheries resources in Federal waters of the New England region are managed under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §1801 et seq.) through two Regional Fishery Management Councils, the New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC). The Regional Fishery Management Councils develop species-specific Fisheries Management Plans (FMPs), which establish fishing quotas, seasons, and closure areas, as well as protections for Essential Fish Habitat (EFH). Fishery resources managed under NEFMC include the Atlantic Herring FMP; Monkfish FMP; Northeast Multispecies (Large-Mesh and Small-Mesh) FMPs; Red Crab FMP; Sea Scallop FMP; and Skate FMP (NEFMC 2023). Fishery resources managed under MAFMC include the Bluefish FMP; Golden and Blueline Tilefish FMP; Mackerel, Squid,

Butterfish FMP; Spiny Dogfish FMP; Summer Flounder, Scup, Black Sea Bass FMP; and Surfclam, Ocean Quahog FMP (MAFMC 2023). Additional fishery resources include the Highly Migratory Species FMP managed under NMFS (NMFS 2006), as well as the American Lobster FMP, Jonah Crab FMP, and Shad and River Herring FMP managed under the Atlantic States Marine Fisheries Commission (ASMFC 2023). These FMP fisheries are referred to throughout this section; therefore, the author-date citations are provided only here.

Commercial fisheries in Federal waters of the New England region harvest a variety of finfish and shellfish species, including American lobster (*Homarus americanus*), Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), bluefish (*Pomatomus saltatrix*), clams (Atlantic surfclam [*Spisula solidissima*] and ocean quahog (*Arctica islandica)*), Atlantic sea scallop (*Placopecten magellanicus*), groundfish such as Atlantic cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*), Jonah crab (*Cancer borealis*), monkfish (*Lophius americanus*), longfin squid (*Doryteuthis pealeii)* and shortfin squid (*Illex illecebrosus*), and summer flounder (*Paralichthys dentatus*). These fishery resources are harvested with a variety of fishing gear, including mobile gear (e.g., bottom trawl, dredge, midwater trawl) and fixed gear (e.g., gillnet, pot, bottom longline, seine, hand line).

The primary source of data used to describe the commercial fisheries in the Lease Area was NMFS's Socioeconomics Impacts of Atlantic Offshore Wind Development reports (NMFS 2023f). These reports combine data from Vessel Trip Reports (VTRs) and dealer reports submitted by those issued a permit for managed species in Federal waters. Annual average commercial fishing landings and revenue in the Lease Area from 2008–2021 are summarized by species for the top 10 species by revenue in **Table 4-2**. Commercial fishing activity in the Lease Area landed an annual average weight of 596,389 pounds and generated an annual average revenue of $590,863. The species that generated the highest revenue in the Lease Area was longfin squid, which accounted for 22% of the revenue generated there. Other species that were among the highest in revenue generated in the Lease Area were the silver hake (*Merluccius bilinearis*), Jonah crab, monkfish, summer flounder, and scup (*Stenotomus chrysops*).

Table 4-2. Annual commercial fishing landings and revenue in the Lease Area by species, 2008–2021

Species[1]	Average Landings (pounds)	Maximum Landings (pounds)	Average Revenue (2021 dollars)	Maximum Revenue (2021 dollars)
Longfin Squid	95,730	317,923	$131,716	$445,964
Silver Hake	119,018	237,572	$84,779	$192,556
Jonah Crab	71,457	145,726	$65,183	$144,828
Monkfish	31,769	68,395	$50,337	$153,141
Summer Flounder	16,026	41,317	$49,938	$132,827
Scup	58,136	150,621	$47,625	$126,272
American Lobster	6,246	14,314	$32,515	$63,928
Skates spp.	60,683	130,055	$32,218	$59,565
Golden Tilefish	4,774	29,767	$20,359	$129,237
Atlantic Sea Scallop	1,789	3,772	$19,625	$39,165
All Species[2]	**596,389**	**1,134,824**	**$590,863**	**$964,613**

Source: NMFS 2023f.
Note: Data are for vessels issued Federal fishing permits by the Greater Atlantic Regional Fisheries Office.
[1] Species are sorted by average revenue in descending order.
[2] Includes 59 species that were harvested in the Lease Area.

Annual average commercial fishing landings and revenue in the Lease Area from 2008–2021 are summarized by fishing port for the top 10 ports by revenue in **Table 4-3**. The fishing ports with the highest landed weight and revenue in the Lease Area were Point Judith, Rhode Island, and New Bedford, Massachusetts, which collectively accounted for approximately 60% of the landed weight and 57% of revenue from the Lease Area. Other fishing ports that accounted for substantial landings and revenue in the Lease Area included Montauk, New York; Chatham, Massachusetts; and Little Compton, Rhode Island.

Table 4-3. Annual commercial fishing landings and revenue in the Lease Area by fishing port, 2008–2021

Fishing Port[1]	Average Landings (pounds)	Maximum Landings (pounds)	Average Revenue (2019 dollars)	Maximum Revenue (2019 dollars)
Point Judith, RI	201,941	433,007	$202,173	$389,229
New Bedford, MA	158,955	595,253	$135,002	$342,808
Montauk, NY	53,271	171,831	$64,428	$153,878
Chatham, MA	18,701	50,733	$20,114	$77,402
Little Compton, RI	19,813	64,533	$19,416	$63,077
Newport, RI	16,863	40,271	$18,198	$29,684
Westport, MA	8,289	18,764	$11,042	$27,178
Fairhaven, MA	11,129	66,639	$10,240	$60,893
Beaufort, NC	3,229	16,263	$9,380	$43,115
Hampton, VA	2,589	8,998	$6,155	$22,414
All ports[2]	**596,388**	**1,134,823**	**$590,863**	**$964,613**

Source: NMFS 2023f.
Note: Data are for vessels issued Federal fishing permits by the Greater Atlantic Regional Fisheries Office.
MA = Massachusetts, NC = North Carolina, NY = New York, RI = Rhode Island, VA = Virginia
[1] Fishing ports are sorted by average revenue in descending order.
[2] Includes 31 ports for which there were reported landings in the Lease Area.

As with the commercial fishing industry, the for-hire recreational fishing fleets contribute to the economy through direct employment, income, and gross revenues of the for-hire businesses, as well as through spending on products and services to maintain and operate their vessels, triggering further indirect multiplier effects that are dependent upon the initial demands of the for-hire fleet (Steinback and Brinson 2013). For-hire recreational fishing boats are operated by licensed captains for businesses that sell recreational fishing trips to anglers. These boats include both party boats, defined as boats on which fishing space and privileges are provided for a fee, and charter boats, defined as boats operating under charter for a price wherein the participants are part of a preformed group of anglers.

Recreational fishing in the Lease Area is accessed by boats from various ports and inlets located in Massachusetts, New York, and Rhode Island. There are several documented recreational fishing locations within or near the Lease Area, including “The Star,” located in the northeastern portion of the Lease Area; “The Dump,” a former offshore disposal area located west of the Lease Area; and “Gordon’s Gully,” located northwest of the Lease Area (**Figure 4-1**). Recreational saltwater fishing in the region occurs year-round with the most intensity during warmer months when the seasons for many recreational finfish are open (April/May through September/October) (MA DMF 2023).

Recreational fishing for highly migratory species occurs in the Lease Area (**Figure 4-2**). Several Atlantic Highly Migratory Species tournaments are based out of ports near the Lease Area, including ports in Block Island, Nantucket, and Cape Cod. Species targeted in these tournaments have included blue marlin, white marlin, sailfish, swordfish, and various tuna species. Based on the NMFS Large Pelagics Survey, an intercept survey that includes both for-hire and private fishing, the level of recreational fishing effort for Highly Migratory Species from 2002–2019 was moderate in the Lease Area.

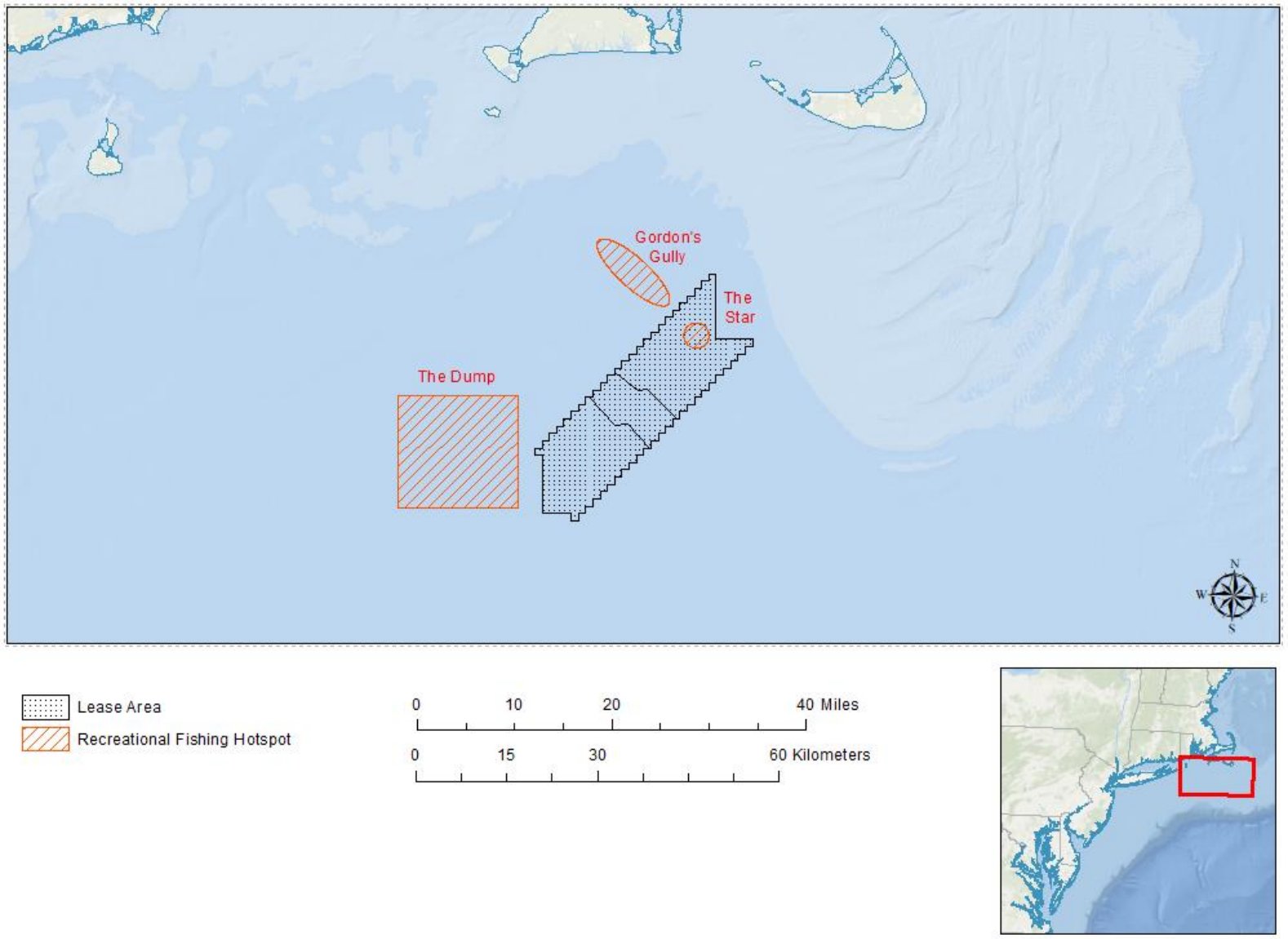

Figure 4-1. Recreational fishing hotspots within or near the Lease Area

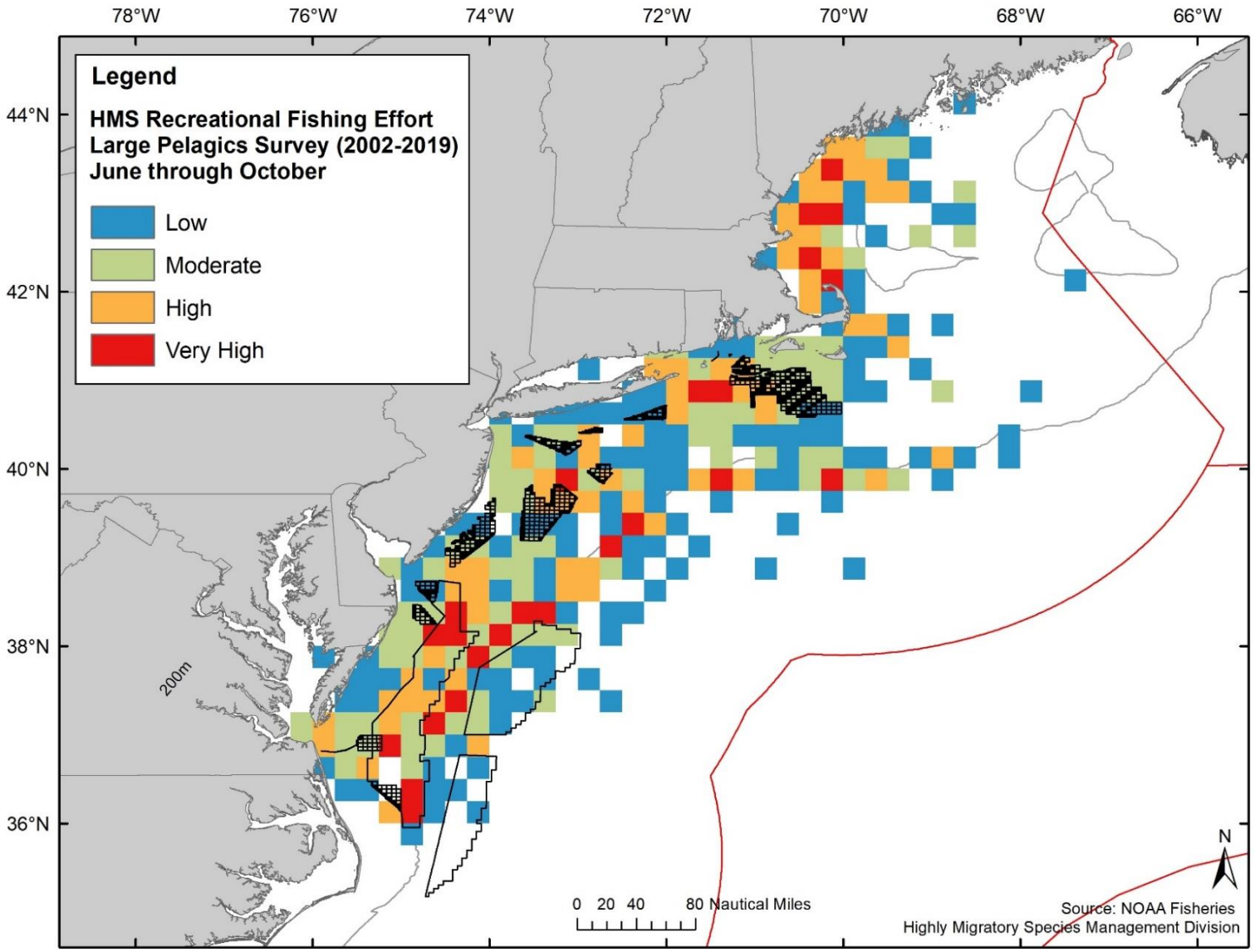

Figure 4-2. Fishing effort for highly migratory species in the Greater Atlantic

Note: Data is based on intercept surveys and include both for-hire and private fishing for highly migratory species

The primary source of data used to describe the for-hire recreational fisheries in the Lease Area was NMFS's Socioeconomics Impacts of Atlantic Offshore Wind Development reports (NMFS 2023a). Annual average for-hire recreational fishing effort from 2008–2021 is summarized by state for the Lease Area in **Table 4-4**. For-hire recreational fishing vessels originating from Massachusetts accounted for the highest level of fishing effort in the Lease Area with an annual average of six angler trips and one vessel trip. Rhode Island and New York also reported trips to the Lease Area, but the for-hire recreational fishing effort from those states was low, as there was less than one vessel trip from each of those states to the Lease Area per year.

Table 4-4. Annual for-hire recreational fishing effort in the Lease Area by state, 2008–2021

State	Average Angler Trips[1]	Maximum Angler Trips	Average Vessel Trips	Maximum Vessel Trips
Massachusetts	6	42	1	7
Rhode Island	1	6	< 1	1
New York	4	55	< 1	1
All Ports	**10**	**68**	**2**	**7**

Source: NMFS 2023f.
[1] Angler trips is the number of passengers reported on Vessel Trip Reports for party and charter vessels.

Impact Analysis of Alternative A

Under the No Action Alternative, baseline conditions for commercial fisheries and for-hire recreational fishing would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities. Ongoing activities within the Greater Atlantic region that have impacts on commercial and for-hire recreational fisheries include undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications), tidal energy projects, marine minerals use and ocean-dredged material disposal, military use, marine transportation, onshore development activities, fisheries use and management, and climate change. Some of these activities may also result in bottom disturbance or habitat conversion and may alter the distribution of fishery-targeted species and increase individual mortality. Risks to fisheries associated with these events include the ability to safely conduct fishing operations (e.g., because of storms) and climate-related habitat or distribution shifts in targeted species. If these risks result in a decrease in catch or increase in fishing costs, the profitability of businesses engaged in commercial fisheries and for-hire recreational fishing would be adversely affected.

Conclusion

Under the No Action Alternative, ongoing activities would have continuing impacts on commercial and for-hire recreational fishing, primarily through port use, vessel activity, other offshore development, climate change, and fisheries use and management. BOEM anticipates that the commercial fisheries and for-hire recreational fishing impacts from ongoing activities associated with the No Action Alternative would be permanent and **moderate** to **major**. The major impact rating for some fisheries and fishing operations is primarily driven by regulated fishing effort and climate change associated with ongoing activities.

4.2.3 Finfish, Invertebrates, and Essential Fish Habitat

Description of the Affected Environment

The affected environment includes benthic, demersal, and pelagic habitats within the Beacon Wind geographic analysis area described in **Section 3.1** (i.e., the Lease Area). Approximate depths in the Lease Area range from 118 to 203 feet (36 to 62 meters). Affected benthic habitats and benthic organisms are more comprehensively discussed in **Section 4.2.1** and are summarized in this section to include discussions on impacts on finfish species that utilize benthic habitats (e.g., sand lances). Demersal habitats are characterized as near sea bottom habitats including the lower layer of the water column and the interface between the seafloor and water column. There is overlap between benthic and demersal habitats, but demersal habitat is not inclusive of subsurface sediment layers. The pelagic habitat is anywhere in the open water column.

Benthic habitats include the seafloor surface and subsurface seabed sediments. Beacon Wind conducted surveys to characterize benthic habitats at 157 planned WTG locations, which include each of the 26 potential suction bucket Foundation Test sites. Bottom substrates at these sites are predominantly silt and sand soft bottom (COP Volume II, Section 4.5.5.1.1.2; AECOM 2023). Biogenic materials (e.g., shell fragments) are common at these sites and are mixed with silt, mud, and mixed sediments.

Demersal finfish that commonly occur in the Lease Area include red hake (*Urophycis chuss*), silver hake (*Merluccius bilinearis*), white hake (*Urophycis tenuis*), scup, goosefish and monkfish (Lophiidae), Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), pollock (*Pollachius pollachius*), ocean pout (*Macrozoarces americanus*), the flatfishes Atlantic halibut (*Hippoglossus hippoglossus*), yellowtail flounder (*Scophthalmus aquosus*), windowpane flounder (*Scophthalmus aquosus*), winter flounder (*Pseudopleuronectes americanus*), yellowtail flounder (*Limanda ferruginea*), summer flounder (*Paralichthys dentatus*), and plaice (*Hippoglossoides platessoides*), winter skate (*Leucoraja ocellata*), little skate (*Raja erinacea*), and clearnose skate (*Raja eglanteria*), sea raven (*Hemitripterus americanus*), and longhorn sculpin (*Myoxocephalus octodecemspinosus*) (Shackell et al. 2022; MAFMC 2017; NEFMC 2017; NOAA Office of National Marine Sanctuaries 2017; Bonzek et al. 2017; Guida et al. 2017). Some demersal finfish in the Lease Area are important forage species for upper trophic levels including Atlantic butterfish (*Peprilus triacanthus*) and sand lances (*Ammodytes* spp.) (Staudinger et al. 2020; Cross et al. 1999). Several of these species utilize benthic habitats. Finfish that predominantly stage or spend considerable time in contact with seafloor sediments include Lophiidae, flatfishes, and skates. Sand lances in the affected environment likely include American sand lance (*A. americanus*) and northern sand lance (*A. dubius*), which spend part of the day partially buried in seafloor sediments (Jones et al. 2023; Auster and Stewart 1986). Some species such as scup, butterfish, and summer flounder are more abundant during warm months in the Lease Area (Guida et al. 2017).

Pelagic finfish in the Lease Area include the forage species Atlantic menhaden (*Brevoortia tyrannus*), Atlantic herring (*Clupea harengus*), and Atlantic saury (*Scomberesox saurus*) (MAFMC 2017). Species such as Atlantic herring and Atlantic menhaden form large schools that are targeted by feeding predators (Reid et al. 1999; Rogers and Van Den Avyle 1989). Pelagic predators include Atlantic bluefin tuna (*Thunnus thynnus*), yellowfin tuna (*Thunnus albacares*), bluefish (*Pomatomus saltatrix*), Atlantic mackerel (*Scomber scombrus*), king mackerel (*Scomberomorus maculates*), and whiting (*Merluccius bilinearis*).

Early life stages (ELS) of finfish and invertebrates (i.e., eggs and larvae) in the affected environment may occupy benthic/demersal or pelagic habitats, irrespective of which habitats are utilized during adult stages. For example, the demersal Atlantic cod produces buoyant eggs and pelagic larvae (Fahay et al. 1999). Conversely, the eggs of the pelagic Atlantic herring are benthic/demersal (Reid et al. 1999). Eggs of finfish species potentially present in the Lease Area include margined snake eel (*Ophichthus cruentifer*), Atlantic menhaden, striped anchovy, bay anchovy, silvery anchovy (*Engraulis urystole*), Mueller's pearlside (*Maurolicus muelleri*), lizardfishes (Synodontidae), cusk (*Brosme brosme*), fourbeard rockling (*Enchelyopus cimbrius*), Atlantic cod, and 31 other taxa (Berrien and Sibunka 1999). Presence and abundance levels of ELS vary spatially and temporally at seasonal and interannual scales (Berrien and Sibunka 1999). For example, the eggs of some species such as weakfish (*Cynoscion regalis*) are absent in the Southern New England OCS most years, but they do occur in some years (Berrien and Sibunka 1999). Furthermore, the ranges of species in the Atlantic OCS are experiencing northward shifts in distributions (Walsh et al. 2015). See **Section 4.2.1** for a more comprehensive list and discussion on benthic invertebrates.

Like finfish, invertebrate species may be benthic, demersal, or pelagic. Benthic and demersal invertebrates in the Lease Area include infaunal (i.e., burrowing) organisms such as annelid worms (Oligochaeta and Polychaeta), flatworms (Platyhelminthes), and nematodes (Nematoda) (Beacon Wind 2023). Common demersal species associated with soft-bottom habitats include amphipods (Amphipoda), mysids (Mysida), copepods (Copepoda), and crabs (Brachyura) (Beacon Wind 2023). Echinoderms are another abundant soft-bottom group found in the geographic analysis area that includes sand dollars (Clypeasteroida), starfishes (Asteroidea), and sea urchins (Echinoidea). Other soft-bottom invertebrates include commercially important shellfishes such as Atlantic surfclam (*Spisula solidissima*), ocean quahog (*Arctica islandica*), bay scallop (*Argopecten irradians*), and horseshoe crab (*Limulus polyphemus*) (Beacon Wind 2023; Cargnelli et al. 1999).

Pelagic macroinvertebrates in the Lease Area include the longfin squid (*Doryteuthis pealeii)* and shortfin squid (*Illex illecebrosus*) (Beacon Wind 2023). Pelagic mesozooplankton are abundant and include pelagic forms of copepods, amphipods, and water fleas (Cladocera) and pelagic early life stages of other invertebrates. Mesozooplankton are a major part of the marine forage base as they are preyed upon by pelagic jellyfishes including comb jellies (Ctenophora) and medusae (Medusozoa) (Slater et al. 2020; Condon et al. 2013). Longfin squid are a common pelagic invertebrate species in the Lease Area (Guida et al. 2017).

There is EFH for 40 species within the Lease Area. Species with EFH include those managed by the NEFMC (18 species), the MAFMC (11 species), and NOAA's Atlantic Highly Migratory Species Division (11 species). These species are fully analyzed in the EFH Assessment for this EA, which was submitted to NMFS in December 2023.

Based on current and historical distributions, Endangered Species Act (ESA)-listed species that potentially occur in the Lease Area include Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and giant manta ray (*Mobula birostris*). The endangered Atlantic salmon (*Salmo salar*) historically ranged into the waters off Southeast New England and its tributaries, but the existing population does not occur south of Central New England based on current assessments and therefore is not expected to occur in the Lease Area (Rikardsen 2021; USASAC 2020; Moore et al. 2014; Spidle et al. 2001). Atlantic sturgeon have been documented to occur near the Lease Area (Kazyak et al. 2021). Giant manta ray potentially occur

seasonally in the Lease Area from June to October based on recent models that used sighting data (Farmer et al. 2022). Atlantic sturgeon and giant manta ray are each susceptible to vessel interactions (Pate and Marshall 2020; McGregor et al. 2019; Balazik et al. 2012).

Impact Analysis of Alternative A

Under the No Action Alternative, baseline conditions for finfish, invertebrates, and EFH would continue to follow regional trends responding to impacts from ongoing activities in the Lease Area and climate change. Ongoing activities that impact finfish, invertebrates, and EFH in the region include undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications), tidal energy projects, marine minerals use and ocean-dredge material disposal, military use, marine transportation, onshore development activities, fisheries use and management, and climate change, as well as ongoing and planned offshore wind development. Within the geographic analysis area, impacts include marine transportation, fisheries use and management, and climate change.

Conclusion

Finfish, invertebrates, and EFH would continue to be impacted by ongoing activities in the geographic analysis area and the greater region, considering that the populations of most species in the geographic analysis area exist and move freely throughout the greater region. The impact factors from ongoing activities and climate change described in the previous section are expected to result in **negligible** to **moderate** adverse impacts on finfish, invertebrates, and EFH, depending on the impact factor. Considering planned actions in the foreseeable future, impacts are expected to range from **negligible** to **moderate** adverse with some **minor beneficial** impacts.

4.2.4 Marine Mammals

Description of the Affected Environment

Thirty-nine species of marine mammals are known to occur or could occur in U.S. waters of the northwest Atlantic Ocean, which is where all Project activities would occur: 6 mysticete species (i.e., baleen whales), 28 odontocete species (i.e., toothed whales, dolphins, and porpoises), 4 pinniped species (i.e., seals and sea lions), and 1 sirenian species (i.e., manatees and dugongs) (BOEM 2014; CSA Ocean Sciences 2021). All 39 marine mammal species that occur in the northwest Atlantic OCS are protected under the Marine Mammal Protection Act (MMPA), and 6 are listed under the ESA. The blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), North Atlantic right whale (NARW) (*Eubalaena glacialis*), sei whale (*B. borealis*), and sperm whale (*Physeter macrocephalus*) are listed as endangered. The West Indian manatee (*Trichechus manatus*) is listed as threatened. Critical habitat has been designated for NARW and West Indian manatee. However, critical habitat for these species is not within the area that would be affected by suction bucket testing (i.e., the Lease Area). NARW critical foraging habitat (Unit 1 of the designated critical habitat) is located approximately 38 miles (61 kilometers) northeast of the Lease Area; NARW critical calving habitat (Unit 2 of the designated critical habitat) is located off the coast of the southeastern United States, stretching from central Florida to the southernmost portion of the North Carolina coast. Manatee critical habitat is located within inland tributaries and along nearshore habitats of the coast of Florida.

Of the 39 species that are known to occur or could occur in the northwest Atlantic OCS, 38 have documented ranges that include the Lease Area (**Table 4-5**). For the purposes of the description of the affected environment in this EA, the focus is on the 11 species of marine mammals that would be likely to commonly occur in the Lease Area. Population information for these common species is provided in **Table 4-6**. Additional information for these species is provided below.

Table 4-5. Marine mammals occurring in the Lease Area

Common Name	Scientific Name	ESA/ MMPA Status[1]	Relative Occurrence in the Lease Area[2]	Seasonal Occurrence in the Lease Area
Mysticetes				
Blue whale	*Balaenoptera musculus*	E/D	Rare	N/A
Fin whale	*Balaenoptera physalus*	E/D	Common	Year-round
Humpback whale	*Megaptera novaeangliae*	None/N	Common	Year-round
Minke whale	*Balaenoptera acutorostrata*	None/N	Common	Spring, summer, and fall
North Atlantic right whale	*Eubalaena glacialis*	E/D	Common	Winter and spring
Sei whale	*Balaenoptera borealis*	E/D	Common	Spring and summer
Odontocetes				
Atlantic spotted dolphin	*Stenella frontalis*	None/N	Uncommon	Year-round
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	None/N	Common	Year-round
Blainville's beaked whale	*Mesoplodon densirostris*	None/N	Rare	N/A
Bottlenose dolphin	*Tursiops truncatus*	None/D, N	Common	Year-round
Common dolphin	*Delphinus delphis*	None/N	Common	Year-round
Clymene dolphin	*Stenella clymene*	None/N	Rare	N/A
Cuvier's beaked whale	*Ziphius cavirostris*	None/N	Rare	N/A
Dwarf sperm whale	*Kogia sima*	None/N	Rare	N/A
False killer whale	*Pseudorca crassidens*	None/N	Rare	N/A
Fraser's dolphin	*Lagenodelphis hosei*	None/N	Rare	N/A
Gervais' beaked whale	*Mesoplodon europaeus*	None/N	Rare	N/A
Harbor porpoise	*Phocoena phocoena*	None/N	Common	Year-round
Killer whale	*Orcinus orca*	None/N	Rare	N/A
Long-finned pilot whale	*Globicephala melas*	None/N	Uncommon	Year-round
Melon-headed whale	*Peponocephala electra*	None/N	Rare	N/A
Northern bottlenose whale	*Hyperoodon ampullatus*	None/N	Rare	N/A
Pantropical spotted dolphin	*Stenella attenuata*	None/N	Rare	N/A
Pygmy killer whale	*Feresa attenuate*	None/N	Rare	N/A
Pygmy sperm whale	*Kogia breviceps*	None/N	Rare	N/A
Risso's dolphin	*Grampus griseus*	None/N	Uncommon	Year-round
Rough-toothed dolphin	*Steno bredanensis*	None/N	Rare	N/A
Short-finned pilot whale	*Globicephala macrorhynchus*	None/N	Rare	N/A
Sowerby's beaked whale	*Mesoplodon bidens*	None/N	Rare	N/A
Sperm whale	*Physeter macrocephalus*	E/D	Uncommon	Summer and fall
Spinner dolphin	*Stenella longirostris*	None/N	Rare	N/A

Common Name	Scientific Name	ESA/ MMPA Status[1]	Relative Occurrence in the Lease Area[2]	Seasonal Occurrence in the Lease Area
Striped dolphin	*Stenella coeruleoalba*	None/N	Rare	N/A
True's beaked whale	*Mesoplodon mirus*	None/N	Rare	N/A
White-beaked dolphin	*Lagenorhynchus albirostris*	None/N	Rare	N/A
Pinnipeds				
Gray seal	*Halichoerus grypus*	None/N	Common	Year-round
Harbor seal	*Phoca vitulina*	None/N	Common	Year-round
Harp seal	*Cystophora cristata*	None/N	Uncommon	Winter and spring
Hooded seal	*Phoca groenlandica*	None/N	Rare	N/A

[1] E = endangered; T = threatened; D = depleted; N = non-strategic.
[2] Rare – records for some years but limited; Uncommon – occurring in low numbers or on an irregular basis; Common – occurring consistently in moderate to large numbers.

Table 4-6. Population information for marine mammals with common occurrence in the Lease Area

Common name	Stock	Population Estimate	Population Trend	Annual Human-Caused Mortality[1]	Reference
Fin whale	Western North Atlantic	6,802	Unavailable	1.8	Hayes et al. 2022
Humpback whale	Gulf of Maine	1,396	Increasing	12.15	Hayes et al. 2020
Minke whale	Canadian East Coast	21,968	Unavailable	10.6	Hayes et al. 2022
North Atlantic right whale	Western North Atlantic	338	Decreasing	31.2	Hayes et al. 2023
Sei whale	Nova Scotia	3,292	Unavailable	0.8	Hayes et al. 2022
Atlantic white-sided dolphin	Western North Atlantic	93,233	Unavailable	27	Hayes et al. 2022
Bottlenose dolphin	Western North Atlantic – Offshore	62,851	None	28	Hayes et al. 2020
	Western North Atlantic – Northern Coastal Migratory	6,639	None	12.2–21.5	Hayes et al. 2018
Common dolphin	Western North Atlantic	172,974	Unavailable	390	Hayes et al. 2022
Harbor porpoise	Gulf of Maine/Bay of Fundy	95,543	Unavailable	164	Hayes et al. 2022
Gray seal	Western North Atlantic	27,300 (U.S. waters)	Unavailable	4,453	Hayes et al. 2022
Harbor seal	Western North Atlantic	61,336 (U.S. waters)	None	339	Hayes et al. 2022

[1] Annual human-caused mortality is mean annual figure for the period 2016–2020, with the exception of NARW.

The best available information on marine mammal occurrence and distribution in the Lease Area is provided by a combination of visual sighting data from aerial and vessel surveys, which are routinely conducted near the Lease Area. Aerial surveys of the Lease Area were conducted monthly from October 2019 to October 2020 (Normandeau and APEM 2020), documenting marine mammal presence throughout the year. Protected Species Observers aboard site characterization survey vessels documented sightings of marine mammals in the Lease Area in 2020 and 2021 (COP Volume 2, Section 5.6, Table 5.6-2; AECOM 2023). Aerial surveys of the Massachusetts Wind Energy Area (WEA) and Massachusetts/Rhode Island WEA documented marine mammal presence in the region from 2011 through 2022 (Kraus et al. 2013, 2014, 2016; Leiter et al. 2017; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019; Stone et al. 2017). The Atlantic Marine Assessment Program for Protected Species has conducted shipboard and aerial surveys over a broad area off the U.S. East Coast, including the Lease Area, since 2011 to assess the abundance, distribution, ecology, and behavior of marine mammals in the U.S. Atlantic (NEFSC and SEFSC 2013, 2014, 2015, 2016, 2018, 2019, 2020, 2021, 2022; Palka et al. 2017). The North Atlantic Right Whale Survey conducts annual aerial line track surveys to document seasonal distribution of NARWs off the coast of the northeastern United States from Long Island, New York, to Eastport, Maine (Cole et al. 2007; Gatzke et al. 2017; Khan et al. 2018).

Additional sources of information to characterize marine mammal occurrence and distribution within the Lease Area include habitat-based modeling efforts that utilize multiple years of visual survey data and technical reports. A habitat-based cetacean density model for the U.S. Exclusive Economic Zone of the East Coast (eastern United States) and Gulf of Mexico was developed by the Duke University Marine Geospatial Ecology Lab in 2016 (Roberts et al. 2016). These models have been subsequently updated to include more recently available data (Roberts et al. 2017, 2018, 2020, 2022, 2023) and represent the best information currently available for marine mammal densities in the U.S. Atlantic. NMFS prepares marine mammal stock assessment reports each year presenting the most current description of the geographic range, minimum population estimate, population trend, net productivity rates, potential biological removals, status, estimate of human-caused mortality and serious injury by source, and descriptions of other factors contributing to population decline or inhibiting population recovery for each stock assessed in a given year (Hayes et al. 2017, 2018, 2019, 2020, 2021, 2022, 2023). Passive acoustic monitoring data, academic publications, and other technical reports were also used to characterize marine mammal occurrence in the Lease Area.

ESA-Listed Threatened and Endangered Marine Mammals

The ESA (16 U.S.C. §1531 et seq.) classifies certain species as threatened or endangered based on their overall population status and health. Three marine mammals that are likely to occur in the Lease Area are classified as endangered: fin whale, NARW, and sei whale. Of these marine mammal species listed under the ESA, critical habitat has only been designated for the NARW (NMFS 2016b). Biologically Important Areas (BIAs) for fin whale, NARW, and sei whale have been identified within or in the vicinity of the Lease Area or north of the Lease Area, as described below.

Fin whales may occur in the Lease Area year-round; these individuals belong to the Western North Atlantic stock (**Table 4-6**). A BIA for fin whale feeding has been identified approximately 18 miles (29 kilometers) to the northwest of the Lease Area (Van Parjis et al. 2015).

NARW may occur in the Lease Area year-round, though densities are expected to be highest in the winter and spring. Individuals in the Lease Area belong to the Western North Atlantic stock (**Table 4-6**). NARW has been experiencing an unusual mortality event (UME) since 2017 attributed to vessel strikes and entanglement in fisheries gear (NMFS 2023c). In 2017, a total of 31 mortalities, serious injuries, and morbidities were documented. Between 2017 and October 2023, a total of 121 mortalities, serious injuries, and morbidities (sublethal injury and illness) of NARW were documented (NMFS 2023c). As noted above, the closest designated NARW critical habitat area (Unit 1) is approximately 38 miles (61 kilometers) northeast of the Lease Area. A BIA for NARW migration overlaps with the Lease Area and surrounding waters for the months of March through April and November through December (Van Parjis et al. 2015). A BIA for NARW feeding has been identified approximately 59 miles (95 kilometers) northeast of the Lease Area. The Lease Area is adjacent to the Block Island Sound seasonal management area for NARW, which is in effect from November through April.

Sei whale may occur in the Lease Area year-round, and the highest densities of this species occur in the spring. Individuals occurring in the Lease Area belong to the Nova Scotia stock (**Table 4-6**). A BIA for sei whale feeding has been identified approximately 55 miles (89 kilometers) northeast of the Lease Area (Van Parjis et al. 2015).

Non-ESA-Listed Marine Mammals

As noted above, all marine mammals are protected pursuant to the MMPA (16 U.S.C. §1361 et seq.), and their populations are monitored by NMFS and USFWS.[2] Mysticetes that are not listed as endangered or threatened under the ESA and commonly occur in the Lease Area include the humpback whale (*Megaptera novaeangliae*) and minke whale (*B. acutorostrata*). Odontocetes that are not listed under the ESA and commonly occur in the Lease Area include Atlantic white-sided dolphin (*Lagenorhynchus acutus*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), and harbor porpoise (*Phocoena phocoena*). Pinnipeds that are not listed as endangered or threatened under the ESA and commonly or regularly occur in the Lease Area include gray seal (*Halichoerus grypus*) and harbor seal (*Phoca vitulina*). BIAs for harbor porpoise, humpback whale, and minke whale have been identified north of the Lease Area, as described below.

Humpback whales could be found in the Lease Area year-round, and individuals that occur in the Lease Area belong to the Gulf of Maine stock, as identified in **Table 4-6**. Humpback whales in the Atlantic have been experiencing a UME since 2016. From 2016 through October 2023, 209 humpback whales have stranded coastwide (NMFS 2023a). The suspected cause of this event is vessel strikes. However, more research is necessary to be definitive. A BIA for humpback whale feeding has been identified approximately 60 miles (97 kilometers) north of the Lease Area (Van Parjis et al. 2015).

Minke whales could be found in the Lease Area in spring, summer, and fall, and minke whales that occur in the Lease Area belong to the Canadian East Coast stock, as identified in **Table 4-6**. This species is also experiencing a UME, declared in 2017. A total of 160 individuals have stranded from Maine to South Carolina from 2017 through October 2023. The suspected cause of this event is entanglement and disease based on preliminary necropsy results. However, these results are not conclusive (NMFS 2023b). A BIA for minke whale feeding has been identified approximately 35 miles (56 kilometers) north of the Lease Area (Van Parjis et al. 2015).

[2] Marine mammals under USFWS jurisdiction are not expected to occur in the Lease Area.

Atlantic white-sided dolphins, bottlenose dolphins, common dolphins, and harbor porpoise could be found in the Lease Area throughout the year. Stocks to which these species belong are identified in **Table 4-6**.

Gray seal and harbor seal have the potential to occur in the Lease Area year-round. Gray seals found in the Lease Area belong to the Western North Atlantic stock, and harbor seals occurring in the Lease Area belong to the Western North Atlantic stock (**Table 4-6**). There is an active UME for these species off the southern and central coast of Maine dating back to June 2022. Sixty-five gray seal strandings and 379 harbor seal strandings have been documented between June 1, 2022, and July 16, 2023 (NMFS 2023d). Preliminary testing has found some of the harbor and gray seals affected by the UME to be positive for highly pathogenic avian influenza (H5N1).

Impact Analysis of Alternative A

NMFS lists the long-term changes in climate as a threat for almost all marine mammal species (Hayes et al. 2020, 2021). Climate change is known to increase temperatures, alter ocean acidity, raise sea levels, and increase numbers and intensity of storms. Increased temperatures can alter habitat, modify species' use of existing habitats, change precipitation patterns, and increase storm intensity (Barton et al. 2016; Love et al. 2013; NASA 2023; USEPA 2022). Increase of the ocean's acidity has numerous effects on ecosystems, including reducing available carbon that organisms use to build shells and causing a shift in food webs offshore (Love et al. 2013; NASA 2023; USEPA 2022). This has the potential to affect the distribution and abundance of marine mammal prey. For example, between 1982 and 2018 the average center of biomass for 140 marine fish and invertebrate species along U.S. coasts shifted approximately 20 miles (32 kilometers) north. These species also migrated an average of 21 feet (6 meters) deeper (USEPA 2022). Shifts in abundance of their zooplankton prey will affect mysticetes who travel over large distances to feed (Hayes et al. 2020). The extent of these impacts is unknown; however, it is likely that marine mammal populations already stressed by other factors (e.g., NARWs) will likely be the most affected by the repercussions of climate change.

All marine mammal species in the geographic analysis area are also subject to ongoing anthropogenic threats. The primary threats to mysticetes include entanglement, vessel strike, and underwater noise. Habitat loss and degradation, pollution, and bycatch can also affect these species. Vessel strike, habitat loss and degradation, pollution, and fisheries interactions, including bycatch, are the primary threats to odontocetes. Entanglement and underwater noise are also threats to odontocetes. Primary threats for pinnipeds include entanglement and fisheries interactions.

Conclusion

Under the No Action Alternative, marine mammals would continue to be affected by existing environmental trends and ongoing activities. Ongoing activities and climate change described in the previous section are expected to result in **negligible** to **moderate** adverse impacts on mysticetes other than NARW, odontocetes, and pinnipeds. Because of the low population size for the NARW and continuing stressors, population-level effects on NARWs are occurring. Vessel activity (i.e., vessel collisions) and gear utilization associated with ongoing non-offshore wind activities would continue to result in long-term population-level impacts if serious injury and mortality continue from these activities. The effects of climate change would further exacerbate impacts on this species. For NARW,

the No Action Alternative, considering baseline conditions, would result in **negligible** to **major** long-term impacts.

4.2.5 Sea Turtles

Description of the Affected Environment

Five species of sea turtles have been documented in U.S. waters of the northwest Atlantic Ocean, where the Lease Area occurs: green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta caretta*). All five species are listed under the ESA; hawksbill, Kemp's ridley, and leatherback sea turtles are listed as endangered, and green (North Atlantic distinct population segment [DPS]) and loggerhead sea turtles are listed as threatened. Critical habitat has been designated for green, hawksbill, leatherback, and loggerhead sea turtles; however, critical habitat for these species is not within or in the vicinity of the Lease Area.

Although hawksbill sea turtles have been documented in OCS waters of the northwest Atlantic Ocean as far north as Massachusetts, they are rare in this region. This species occurs primarily in warmer waters to the south (Kenney and Vigness-Raposa 2010; NMFS and USFWS 1993). The individual hawksbill sea turtles that have occasionally been documented in and near the southern New England area have been stunned by exposure to unusual cold water events and subsequently transported northward into the region by the Gulf Stream (Lutz and Musick 1997; NMFS and USFWS 1993). These occurrences are not representative of normal behaviors or distribution. Therefore, hawksbill sea turtle will not be evaluated further in this EA.

The best available information on the occurrence and distribution of sea turtles in the Lease Area is provided by a combination of visual sighting data from aerial and vessel surveys. Aerial surveys of the Lease Area were conducted monthly from October 2019 to October 2020 (Normandeau and APEM 2020), documenting sea turtle occurrence throughout the year. Protected Species Observers aboard site characterization survey vessels documented sightings of sea turtles in the Lease Area in 2020 and 2021 (COP Volume 2, Section 5.6, Table 5.6-2; AECOM 2023). Aerial surveys of the Massachusetts WEA and Massachusetts/Rhode Island WEA documented sea turtle presence in the region from 2011 through 2022 (Kraus et al. 2013, 2014, 2016; Leiter et al. 2017; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019; Stone et al. 2017). The Atlantic Marine Assessment Program for Protected Species has conducted shipboard and aerial surveys over a broad area off the U.S. East Coast, including the Lease Area, since 2011 to assess the abundance, distribution, ecology, and behavior of marine megafauna in the U.S. Atlantic, including sea turtles (NEFSC and SEFSC 2013, 2014, 2015, 2016, 2018, 2019, 2020, 2021, 2022; Palka et al. 2017). Additional sources of information to characterize sea turtle occurrence and distribution within the Lease Area include stranding data from the Sea Turtle Stranding and Salvage Network (NMFS STSSN 2023); geospatial sighting data obtained from the Ocean Biodiversity Information System (OBIS SEAMAP 2023); occurrence information compiled for the Rhode Island Ocean Special Area Management Plan (Kenney and Vigness-Raposa 2010); density estimates from the U.S. Navy Northeast Operating Areas (DoN 2012, 2017); and other technical reports and academic publications.

Sea turtles generally migrate into or through the Lease Area as they travel between their northern-latitude feeding grounds and their nesting grounds in the southern United States, the Gulf of Mexico,

and the Caribbean. As ocean waters warm in the spring, sea turtles migrate northward to feeding grounds in the mid-Atlantic and in embayments and estuaries in the northeastern United States, including Cape Cod Bay. Sea turtles typically arrive in waters off New England in the spring or summer and remain through the fall, when sea surface temperatures range from 61 to 79 degrees Fahrenheit (°F) (16 to 26 degrees Celsius [°C]) (CETAP 1982). As water temperatures cool, most sea turtles begin their return migration to the south. Historically, this southward migration begins in October, and most turtles have left by the end of November. Based on this seasonal migration pattern, sea turtles are generally expected to occur in the Lease Area between May and November (NMFS 2021b). Some individuals may remain into the winter when they could experience cold stunning as temperatures drop below 50°F (10°C) (NMFS 2021a). Individuals occurring in the Lease Area are either migrating or foraging. Species occurrence in the Lease Area is summarized in **Table 4-7** and described in the following paragraphs.

Table 4-7. Sea turtles likely to occur in the Lease Area

Common Name	Scientific Name	Distinct Population Segment (DPS)/ Population	ESA Status	Relative Occurrence in the Lease Area[1]
Green sea turtle	*Chelonia mydas*	North Atlantic DPS	Threatened	Regular
Kemp's ridley sea turtle	*Lepidochelys kempii*	--	Endangered	Regular
Leatherback sea turtle	*Dermochelys coriacea*	Northwest Atlantic	Endangered	Regular
Loggerhead sea turtle	*Caretta caretta*	Northwest Atlantic DPS	Threatened	Regular

Source: COP Volume II, Section 5.7.1, Table 5.7-3; AECOM 2023.
[1] Regular = occurring regularly, inhabits at least seasonally, and has been documented within the Lease Area and export cable routes.

Sea turtles are likely to be found in the Lease Area seasonally (BOEM 2014). Green sea turtles that occur in the Lease Area belong to the North Atlantic DPS (**Table 4-7**) and are likely juveniles. Kemp's ridley sea turtles that occur in the Lease Area are also likely juveniles. Leatherback sea turtles that occur in the Lease Area belong to the Northwest Atlantic population of leatherbacks (**Table 4-7**) and could be juveniles or adults. Loggerhead sea turtles that occur in the Lease Area belong to the Northwest Atlantic DPS (**Table 4-7**) and could be juveniles or adults, though juveniles are much more abundant in the region. All four species may transit through the region; Kemp's ridley and leatherback sea turtles may also potentially forage in the Lease Area.

Impact Analysis of Alternative A

Sea turtles are subject to regional, pre-existing threats. These threats include fisheries bycatch, loss or degradation of nesting and foraging habitat, entanglement in fishing gear, vessel strikes, dredging, anthropogenic noise, accidental releases, predation and harvest, disease, and climate change. Green, Kemp's ridley, and loggerhead sea turtles are also susceptible to cold stunning. Climate change has the potential to affect the distribution and abundance of prey due to changing water temperatures and ocean currents and increased acidity. As sea turtle migrations can cover long distances, these threats can have impacts on individuals over broad geographical scales.

Conclusion

Under the No Action Alternative, sea turtles would continue to be affected by existing environmental trends and ongoing activities. Ongoing activities and climate change described in the previous section are expected to result in **negligible** to **minor** adverse impacts on sea turtles as some impacts would be detectable and measurable but of low intensity, localized, and temporary or short term in duration.

4.3 Alternative B – Proposed Action

The Proposed Action alternative is analyzed alone and in combination with the changing baseline conditions as described for Alternative A (**Section 4.2**).

4.3.1 Benthic Resources

Up to 35 suction bucket foundation trials would occur over 10 to 15 days at 26 identified locations within the Lease Area. Activities related to suction bucket testing would cause localized, short-term (e.g., habitat alteration, injury) to permanent (e.g., mortality) impacts on benthic resources through direct contact and suction penetration of the suction bucket into the seafloor and the direct contact of the triangular reference frame with the seafloor, the establishment of a negative pressure within the confines of the suction bucket foundation, and sediment deposition. Each trial would result in a maximum temporary seabed disturbance (from the suction bucket and reference frame combined) of approximately 0.028 acre (114 square meters), for a total temporary seabed disturbance of 0.99 acre (3,990 square meters). Because 9 of the trials would occur at a location previously disturbed by a prior trial, 0.25 acre (1,026 square meters) of the total disturbance would occur in previously disturbed trial locations. Sessile epifauna and infauna would be crushed by contact of the suction bucket and reference frame with the seafloor. Because the suction bucket and reference frame would approach the seafloor at a slow, controlled rate of less than 13 inches (30 centimeters) per second, mobile epifauna may be able to move out of the trial footprint to avoid being crushed. Any organisms trapped inside the suction bucket footprint would experience direct mortality from crushing or the negative pressure conditions experienced during the trial.

The level of Impacts caused by benthic disturbance could depend on the time of year that they occur, especially if these alterations overlap with times and places of high benthic organism abundance or reproductive activity. Invertebrate densities are generally lowest in the winter in the Mid-Atlantic Bight and reach maximum levels during the late spring and summer before declining in the fall; however, some species may experience secondary peaks in abundance during the winter (e.g., Schaffner and Boesch 1982; Slacum et al. 2010; Ramey 2008). For example, the amphipod *Erichthonius rubicornis* was most abundant off the coast of New Jersey during spring and summer months, and the amphipod *Unciola irrorate* was most abundant during spring months with a secondary peak during winter months, with both species' abundances being lowest during the fall (Schaffner and Boesch 1982). Slacum et al. (2010) found that fish and invertebrate species diversity, richness, and catch per unit effort in flat-bottom and shoal habitats offshore Maryland and Delaware were greatest during the spring, summer, and fall, and least during the winter months. Ramey (2008) found that the reproductive cycle of the polychaete *Polygordius jouinae* off the coast of New Jersey spans from May to August, with most individuals reaching sexual maturity in late May and recruitment beginning by July. Recolonization rates of benthic habitats are driven by the types of benthic communities inhabiting the area surrounding the

affected region. Benthic communities that are well-adapted to disturbance within their habitats (e.g., mobile soft sediments) are likely to quickly recolonize a disturbed area. Currents, storms, and other oceanographic processes frequently disturb soft-bottom habitats, and native invertebrates are adapted to respond to such disturbances (Guida et al. 2017).

Suction bucket installation and removal may result in minor local sediment disturbance, which could slightly increase turbidity in the immediate area surrounding the trial location. The height of the suspended sediment above the bottom would be influenced by particle size and bottom currents. Adult and juvenile individuals, demersal eggs, and larvae could be buried by deposited sediments; however, measurable sediment deposition would be limited to areas immediately adjacent to each trial.

The suction pump used to evacuate water from and return water to within the foundation will operate at a typical rate of approximately 392 cubic yards per hour (300 cubic meters per hour), with a maximum displaced volume of 1,775 cubic yards (1,357 cubic meters) evacuated per trial. An equivalent volume would be returned during suction bucket removal. While in use, the suction pump can entrain planktonic larvae of benthic fauna (e.g., larval polychaetes, mollusks, crustaceans) with assumed 100% mortality of entrained individuals. Due to the location of the intake at approximately 19 feet (6 meters) off the seafloor, water withdrawal could entrain pelagic eggs and larvae, but would not affect resources on the seafloor. During suction bucket removal, water would be withdrawn from the water column and pumped to the interior of the suction bucket, resulting in a hydraulic zone of influence (HZI) with a radial distance of 2.5 feet (0.76 meter), depth (linear distance) of 1 foot (0.30 meter), and an area of 20 square feet (1.9 square meters) under prevailing ambient current conditions in the fall, and a radial distance of 2 feet (0.61 meter), depth of 1 foot (0.30 meter), and an area of 13 square feet (1.2 square meters) under prevailing ambient current conditions in the winter, spring, and summer.[3] During suction bucket installation, water would only be withdrawn from within the suction bucket, and thus the HZI would be limited to the confines of the suction bucket. Because only a limited number of trials would be conducted, population-level impacts on any given benthic species are not anticipated.

The vessel, ROVs, suction pump, and imaging equipment inside the suction bucket used during Foundation Testing would generate underwater noise in the Lease Area. However, the imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kHz, which is inaudible to marine organisms. Therefore, imaging equipment noise is not expected to affect benthic resources. Vessel noise includes non-impulsive sounds that arise from a vessel's engines, propellers, and thrusters. Sound levels emitted from vessels depend on the vessel's operational state (e.g., idling, in-transit) and are strongly weather dependent. Source levels for large vessels reported by McKenna et al. (2017) range from 177 to 188 decibels referenced to 1 micropascal (dB re 1 µPa) at 3 feet (1 meter) with most of the energy below 1 kHz and peaks in the 20 to 100 hertz (Hz) range. Zykov et al. (2013) and McPherson et al. (2019) report a maximum broadband source level of 192 dB re 1 µPa for numerous vessels with varying propulsion power. While there does seem to be some evidence that certain behaviors and stress biomarkers in invertebrates could be negatively affected by vessel noise (see Wale et al. 2013; Filiciotto et al. 2014; Hudson et al. 2022), it is difficult to draw conclusions from this work as

[3] Stream function theory was used to model the zone of influence based on the pump flow rate and ambient ocean current data collected from the Lease Area by Beacon Wind during site assessment activities. Modeling results indicated that the zone of influence would have a radial distance of 2.5 feet (0.8 meter) and a depth of 1 foot (0.3 meter) in the fall, resulting in a total area of 20 square feet (1.9 square meters). In the other seasons, the radial distance of the zone of influence would be reduced to 2 feet (0.6 meter), resulting in a total area of 13 square feet (1.2 square meters).

it has been limited to the laboratory and, in most cases, did not measure particle motion as the relevant cue. Several studies have shown that planktonic larvae of fish and invertebrates are sensitive to acoustic cues (Montgomery et al. 2006; Simpson et al. 2005; Stanley et al. 2012; Staaterman et al. 2014) and thus may experience acoustic masking from continuous sound sources like vessels. However, given the short range of such biologically relevant signals for particle motion-sensitive animals (Kaplan and Mooney 2016), the spatial scale at which these cues are relevant is rather small. If vessel transit areas overlap with settlement habitat, it is possible that vessel noise could mask some biologically relevant sounds (e.g., Holles et al. 2013), but these effects are expected to be short term and would occur over a small spatial area. ROVs used to assist in positioning of the suction bucket foundations and reference frames as well as for data collection are not anticipated to generate significant levels of underwater noise and are not expected to disturb marine life (Equinor 2020; NMFS 2020a). Sound levels generated by the suction pump used to evacuate water from and return water to within the foundation are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters]) (Koschinski and Lüdemann 2020). Given the rapid attenuation of underwater vibrations with increasing distance from a sound source (Morley et al. 2014), it is unlikely that noise generated by Foundation Testing activities would cause more than short-term behavioral effects (e.g., flight or retraction), masking, or physiological (e.g., stress) responses. Overall, effects on benthic invertebrates from noise associated with suction bucket trials are expected to be short term and localized and are not anticipated to pose a risk to benthic invertebrates. Only a few individuals would be affected at any given time, and they are likely to return to normal behaviors after the noise is over.

Non-Routine Events

Accidental releases of trash and debris may occur from the vessel during suction bucket Foundation Testing. However, the Project vessel would comply with laws and regulations to properly dispose of marine debris and to minimize releases and BMPs detailed in the SAP and SAP Amendment. In the event of a release, it would be an accidental, localized event in the vicinity of the vessel, and therefore project-related marine debris would only have an indirect, short-term effect on benthic resources. Foundation Testing would comply with all laws regulating at-sea discharges of vessel-generated waste, and the Project vessel will comply with USCG requirements relating to prevention and control of oil spills.

Only one vessel would be used to conduct the suction bucket testing, and no permanent structures would be left in place after the completion of each of the trials; therefore, collisions and allisions are considered unlikely. In the event that a vessel collision or allision does occur, most of the materials that would potentially spill tend to float in seawater and are unlikely to contact benthic resources. The chemicals with potential to sink or dissolve rapidly are predicted to dilute to non-toxic levels before they reach benthic resources.

Conclusion

Impacts of Foundation Testing would be short term and negligible. Because Foundation Testing is not anticipated to generate significant levels of underwater noise, the majority of impacts on benthic resources would occur through direct contact and suction penetration of the suction bucket into the seafloor and the direct contact of the triangular reference frame with the seafloor, the establishment of a negative pressure within the confines of the suction bucket foundation, and sediment deposition. These impacts would be localized to the 26 Foundation Testing footprint locations and the areas

immediately surrounding them. Soft-bottom sediment communities recover fairly quickly from disturbance, generally within a few months to a year (Wilbur and Clarke 2007), and although estimates of recovery time following disturbance vary by region, species, and type of disturbance, disturbance associated with Foundation Testing would not prevent natural recovery of benthic communities. The duration of activity affecting benthic communities would be short term, and, given the limited area of disturbance associated with Foundation Testing, impacts on benthic resources from Foundation Testing are expected to be **negligible**.

4.3.2 Commercial and Recreational Fishing

The Proposed Action would involve suction bucket testing within the Lease Area. Deployment and removal of the suction bucket is expected to result in mortality of fish and invertebrates, including species that are harvested in fisheries. Sessile infaunal and epifaunal organisms (e.g., eggs, larvae, bivalves) within the suction bucket footprint are expected to experience lethal, localized impacts as contact with the suction bucket or pressure from embedding would cause crushing or other fatal injuries. Benthic and demersal fish and invertebrates inhabiting the 26 suction bucket testing locations could also potentially become crushed under the suction bucket or reference frame or become trapped inside the bucket once it reaches the seafloor, which is expected to result in mortality. Because the suction bucket and reference frame would approach the seafloor at a slow, controlled rate of less than 13 inches (30 centimeters) per second (i.e., approximately 0.7 mile [1.1 kilometer] per hour), mobile epifauna may be able to move out of the trial footprint to avoid being crushed. Benthic eggs and larvae of fish and invertebrate species inhabiting the immediate area of the suction pump when it is fully embedded in the seafloor may become entrained in the intake flow of the suction pump with conservatively assumed 100% entrainment mortality. However, mortality associated with suction bucket testing is not expected to result in fishery-level impacts because the relatively small amount of benthic habitat that would be impacted by suction bucket testing (0.996 acre [3,990 square meters]) and the relatively small volume of water that would be withdrawn over the course of 35 tests (up to 25.1 million gallons [94,900 cubic meters]) are not likely to result in a measurable increase in mortality relative to natural mortality levels for any species.

The installation and removal of the suction bucket at each test site would generate temporary increases in suspended sediment concentrations. As described above, the reference frame and suction bucket would be lowered at a rate of 0.7 mile per hour (1.1 kilometers per hour), potentially limiting the size of sediment plumes and suspended sediment concentrations within the plume. Mobile finfish and invertebrates, including species that are targeted in fisheries, are expected to avoid sediment plumes if such plumes are severe enough to induce behavioral responses. The avoidance of sediment plumes could temporarily reduce the catchability of some species in the immediate area of the test.

The Proposed Action would involve the generation of underwater noise, which could influence the behavior and catchability of finfish and invertebrates that are targeted in fisheries. A single vessel would be used during each Foundation Test, exposing organisms to vessel-related noise generated by the main thrusters and dynamic positioning thrusters. Fish and invertebrate responses to vessel noise include avoidance, diving, and dispersal, especially in schooling fish species (De Robertis and Handegard 2013; Handegard 2003; Vabø et al. 2002). Operation of ROVs and the suction pump would also generate underwater noise during Foundation Testing. However, ROVs are not anticipated to generate levels of underwater noise that would disturb marine life (Equinor 2020; NMFS 2020a), and sound levels

generated by the suction pump are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters]) (Koschinski and Lüdemann 2020). Behavioral responses to underwater noise could temporarily reduce the catchability of some species in the immediate area of the test, particularly in hook and line fisheries (Løkkeborg et al. 2012; Skalski et al. 1992).

Suction bucket testing would be conducted by a single vessel. This activity would result in the temporary exclusion of other vessels at testing locations during deployment and removal of the suction bucket to prevent conflicts and collisions with the vessel and equipment. The Proposed Action includes a series of 35 deployments and removals of a single suction bucket foundation at 26 locations in the Lease Area. At each testing location, activities would occur within a 984- by 984-foot (300- by 300-meter) square, which is centered on the location for the eventual proposed installation of wind turbines. Each suction bucket test is expected to take 6 to 9 hours. Exclusion of other vessels during each test is expected to be on a scale of hours and confined to the immediate area around the vessel. Commercial and recreational fishing vessels that are transiting or fishing within the Lease Area could use local notices to mariners to avoid the areas where suction bucket testing is occurring. Suction bucket testing activities are not expected to interfere with access to active fishing grounds beyond the Lease Area outside of the need to change transit routes slightly to avoid testing locations. Impacts on commercial fisheries and recreational fishing from suction bucket testing are expected to vary depending on the fishing gear type used. For instance, anglers using fixed gear such as lobster pots or gillnets may need to retrieve their gear if it is located in the area where suction bucket testing is about to occur.

Non-Routine Events

Non-routine events that could potentially have impacts on commercial fisheries and for-hire recreational fishing through temporary space-use conflicts include the recovery of lost equipment, allisions and collisions, and oil spills. The size of the lost equipment and/or the replacement cost would dictate the type of equipment deployed and the number of attempts made at recovery. The number of recovery attempts could affect the size of the resultant impact area and time spent searching. Additionally, the location of the lost equipment could affect the impact on other resources. Regardless, the potential for recovery operations to interact with vessel traffic is low, given that recovery operations would likely involve one vessel for a short period of time; therefore, impacts are not expected to disrupt the activity of other vessels. The potential for allisions and collisions would be minimized through adherence to USCG Navigation Rules and Regulations; therefore, risk of damage to vessels and equipment and other conflicts is considered unlikely. The size of a potential oil spill would be limited to the amount of oil held on the single vessel that would be utilized for Foundation Testing. The potential for and size of an oil spill, should one occur, would be minimized through compliance with USCG requirements relating to prevention and control of oil spills.

Conclusion

Overall, impacts on commercial fisheries and recreational fishing from the Proposed Action are expected to be **minor** based on multiple factors, including the relatively small spatial extent of impacts on fish and invertebrates from crushing, entrainment, turbidity, and noise associated with routine suction bucket testing activities, the small increase in vessel traffic (one vessel would be used to conduct testing) relative to existing traffic, and the relatively small spatial area and limited duration over which vessel

exclusion would occur during a test. Impacts are expected to range from **negligible** to **minor** depending on the fishery, as effects would be noticeable for some fisheries, but the resource would be expected to recover completely without remedial or mitigating action. Communication and coordination between Beacon Wind and the fishing community would reduce the potential for conflict during vessel movement and suction bucket testing activities.

4.3.3 Finfish, Invertebrates, and Essential Fish Habitat

The Proposed Action is expected to generate a range of impacts on finfish, invertebrates, and EFH within the Beacon Wind Lease Area. Impacts of the Proposed Action are expected to primarily affect the immediate area of proposed activities (i.e., within the footprint of each planned Foundation Test). Impact-producing factors include physical interactions, benthic habitat disturbance, turbidity, entrainment, underwater noise, and vessel traffic. The Proposed Action includes measures to avoid or minimize impacts on marine mammals associated with these factors, which also may benefit finfish species including ESA-listed species.

Under the Proposed Action, tests of suction bucket foundation installations would be done at 26 locations of the 157 positions proposed by Beacon Wind. A maximum of 35 suction bucket Foundation Tests could include repeat testing at some of the 26 WTG positions.

The swimming capabilities of most finfish, including benthic-associated species (e.g., flatfishes and sand lances), are sufficient to avoid being crushed by the reference frame or being trapped within the foundation bucket. Some invertebrate species, especially infaunal invertebrates, are not mobile enough to avoid being trapped within the bucket. Those organisms would be injured or killed during the installation process. Other potential organisms that would not be able to avoid the installation of buckets during testing include demersal eggs of finfish and invertebrates. Examples of finfish and invertebrates that produce demersal eggs include winter flounder and longfin squid (Griswold and Prezioso 1981; Saila 1961; Perlmutter 1947).

The maximum seafloor disturbance area per Foundation Test would be approximately 0.028 acre (114 square meters). The approximate total area disturbed for a maximum number of 35 tests would be 0.99 acre (3,990 square meters). The installation process is expected to impact benthic finfish and invertebrates while disturbing specific soft-bottom EFH habitat within the suction bucket footprint to a sub-sediment depth of 33 to 39 feet (10 to 12 meters). After the completion of the Proposed Action, benthic communities are expected to recover relatively quickly, within a few months following disturbances to soft-bottom habitats (Wilbur and Clarke 2007).

The installation and removal of the suction bucket at each test site would generate temporary increases in suspended sediment concentrations. As suction bucket foundations require less benthic disturbance compared to other offshore wind foundation types (Horwath et al. 2021), for the purposes of this evaluation, it was assumed that suspended sediment plumes from each test would be similar to or lesser than those associated with site preparation activities for other foundation types (e.g., dredging for sand bedform clearing). Modeling results of cutterhead dredging indicate that suspended sediment concentrations above background levels would be present throughout the bottom 6 feet (1.8 meters) of the water column for a distance of approximately 1,000 feet (305 meters) (NMFS 2020b citing USACE 1983). Elevated suspended sediment levels are expected to be present only within a 984- to 1,640-foot (300- to 500-meter) radius of the cutterhead dredge (NMFS 2020b citing USACE 1983; NMFS 2020b

citing Hayes et al. 2000; NMFS 2020b citing LaSalle 1990). Suspended sediment concentrations associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 milligrams per liter with the highest levels (550.0 milligrams per liter) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (NMFS 2020b citing USACE 2005, 2010, 2015; NMFS 2020b citing Nightingale and Simenstad 2001). Based on this information, the localized sediment plume generated by the Proposed Action may extend 984 to 1,640 feet (300 to 500 meters) along the seabed, with suspended sediment concentrations of 282 milligrams per liter or less, and higher concentrations possible immediately adjacent to the suction bucket upon removal. The plume is expected to dissipate rapidly. The reference frame and suction bucket would be lowered at a rate of 0.7 mile per hour (1.1 kilometers per hour), potentially limiting the size of sediment plumes and suspended sediment concentrations within the plume.

Mobile finfish and invertebrate species, including Atlantic sturgeon (Wilkens et al. 2015), are expected to avoid sediment plumes if such plumes are severe enough to induce behavioral responses. Less mobile organisms (e.g., filter feeding bivalves) are more vulnerable to suspended sediment plume impacts. Physiological stress in these organisms may occur at high suspended sediment concentrations, but impacts from lower concentrations are mediated by filter feeding organisms by evacuation or decreases in filtration rates (Bergstrom et al. 2013; NYSERDA 2017).

Entrainment of eggs and larvae of finfish and invertebrates would occur during installation and removal of the suction bucket. The suction pump used for this process would be rated as a low-flow pump with a flow rate of 1,320 gallons per minute (5 cubic meters per minute) and a pump velocity of 5.2 feet per second (1.6 meters per second). Entrainment survival rates have not been studied for suction pumps associated with suction bucket foundations. Therefore, entrainment mortality was conservatively assumed to be 100% for the purposes of this evaluation.

During suction bucket installation, organisms trapped under the bucket would be entrained through the pump. During removal of the suction bucket, water would be pumped into the bucket from the water column. Entrainment of organisms from the water column would occur during this process. The total volume of water removed from within the bucket for each test would be 1,775 cubic yards (1,357 cubic meters). An equivalent amount of water would be pumped into the bucket during removal. Based on these volumes, potential entrainment numbers were estimated using ichthyoplankton densities collected during the Ecosystem Monitoring (EcoMon) survey program between 1977 and 2019 (**Table 4-8**). Estimated larval fish entrainment per test ranged from 459 in May to 9,289 in August (**Table 4-9**) with no discernable patterns other than that the lowest entrainment numbers would occur in April and May. Estimates of total entrainment for the 35 proposed tests are provided in **Table 4-10**. These entrainment numbers are very low compared to the high egg and larval fish production and subsequent adult recruitments that are documented for these fish taxa, and population-level impacts are not expected.

Table 4-8. Mean monthly larval density estimates in Lease Area OCS-A 0520[1,2]

Species	Mean Monthly Density Estimates Larvae/3,531 Cubic Feet (100 Cubic Meters)						
	Feb	Mar	Apr	May	Jun	Jul	Aug
American plaice	0	0.2	0	0.4	0.5	0	0
Atlantic cod	1.5	2.3	2	0.2	0	0	0
Atlantic croaker	0	0	0	0.3	0	0	0
Atlantic herring	4.7	3.6	0	0	0	0	0
Atlantic mackerel	0	0	0	0.6	1.2	0.3	0
Atlantic menhaden	0	0	0	0	0	0	0
Bluefish	0	0	0	0	0.1	0	0.7
Bristlemouths	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	1.1	17.2
Cunner	0	0	0	0	0	0.7	0.5
Fourbeard rockling	0	0	0	0.2	2.8	1.4	0
Fourspot flounder	0	0	0	0	0	1.4	34.6
Frigate tunas	0	0	0	0	0	0	4.7
Grubby	0	<0.1	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	0.3	145.8
Haddock	<0.1	0.4	0	0.9	0.8	0	0
Hakes	0	0	0	0	0.3	14.4	114
Lanternfishes	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0
Lefteye flounders	0	0	0	0	0	0	0
Longhorn sculpin	0.4	1.1	0.2	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0
Monkfish	0	0	0	0	0.1	0	0.1
Offshore hake	0	0	0	0	0	0	0
Pollock	0.7	1.2	0	0	0	0	0
Rock gunnel	0.1	<0.1	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0
Sand lances	236.9	90.1	29.6	0.1	0.1	0	0
Sea robins	0	<0.1	0	0	0	0	0.8
Silver hake	0	0	0	0	0.3	5.3	21.2
Summer flounder	<0.1	<0.1	0	0	0	0	0
Windowpane flounder	0	0	0	0.8	2.6	0	1.9
Winter flounder	<0.1	1.6	0	9.2	2.5	0	0
Witch flounder	0	0	0	0.9	0.4	0.4	0.1
Wolffishes	0	0	0	0	0	0	0
Yellowtail flounder	0	<0.1	0	3.1	25.9	1.1	0.1
Total	**244.6**	**100.8**	**31.7**	**16.7**	**37.6**	**26.3**	**342**

Source: NCEI 2023.

[1] For abundant fish taxa collected in the EcoMon survey program from 1977 to 2019 for months in which Foundation Testing could occur.

[2] Based on survey stations located within a 10-nautical mile (18.5-kilometer) radius of the center point of the Lease Area.

Table 4-9. Estimates of larval entrainment for each suction bucket test by month

Species	Estimated Entrainment (Number of Larvae)[1]						
	Feb	Mar	Apr	May	Jun	Jul	Aug
American plaice	0	5	0	11	13	0	0
Atlantic cod	41	64	54	7	0	0	0
Atlantic croaker	0	0	0	8	0	0	0
Atlantic herring	128	98	0	0	0	0	0
Atlantic mackerel	0	0	0	18	34	10	0
Atlantic menhaden	0	0	0	0	0	0	0
Bluefish	0	0	0	0	4	0	20
Bristlemouths	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	29	467
Cunner	0	0	0	0	0	19	15
Fourbeard rockling	0	0	0	6	75	39	0
Fourspot flounder	0	0	0	0	0	39	941
Frigate tunas	0	0	0	0	0	0	129
Grubby	0	2	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	9	3,957
Haddock	2	11	0	25	23	0	0
Hakes	0	0	0	0	8	390	3,096
Lanternfishes	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0
Lefteye flounders	0	0	0	0	0	0	0
Longhorn sculpin	12	29	5	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0
Monkfish	0	0	0	0	4	0	4
Offshore hake	0	0	0	0	0	0	0
Pollock	19	32	0	0	0	0	0
Rock gunnel	4	2	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0
Sand lances	6,430	2,447	804	3	4	0	0
Sea robins	0	3	0	0	0	0	23
Silver hake	0	0	0	0	8	144	576
Summer flounder	3	2	0	0	0	0	0
Windowpane flounder	0	0	0	23	72	0	53
Winter flounder	2	44	0	249	68	0	0
Witch flounder	0	0	0	25	12	10	4
Wolffishes	0	0	0	0	0	0	0
Yellowtail flounder	0	2	0	84	704	29	4
Total	**6,641**	**2,741**	**863**	**459**	**1,029**	**718**	**9,289**

[1] Based on larval densities provided in **Table 4-8** and a maximum volume of displaced seawater of 716,963 gallons (2,714 cubic meters).

Table 4-10. Estimates of total larval entrainment for all suction bucket tests by month

Species	Estimated Entrainment (Number of Larvae)[1]						
	Feb	Mar	Apr	May	Jun	Jul	Aug
American plaice	0	175	0	385	455	0	0
Atlantic cod	1,435	2,240	1,890	245	0	0	0
Atlantic croaker	0	0	0	280	0	0	0
Atlantic herring	4,480	3,430	0	0	0	0	0
Atlantic mackerel	0	0	0	630	1,190	350	0
Atlantic menhaden	0	0	0	0	0	0	0
Bluefish	0	0	0	0	140	0	700
Bristlemouths	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	1,015	16,345
Cunner	0	0	0	0	0	665	525
Fourbeard rockling	0	0	0	210	2,625	1,365	0
Fourspot flounder	0	0	0	0	0	1,365	32,935
Frigate tunas	0	0	0	0	0	0	4,515
Grubby	0	70	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	315	138,495
Haddock	70	385	0	875	805	0	0
Hakes	0	0	0	0	280	13,650	108,360
Lanternfishes	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0
Lefteye flounders	0	0	0	0	0	0	0
Longhorn sculpin	420	1,015	175	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0
Monkfish	0	0	0	0	140	0	140
Offshore hake	0	0	0	0	0	0	0
Pollock	665	1,120	0	0	0	0	0
Rock gunnel	140	70	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0
Sand lances	225,050	85,645	28,140	105	140	0	0
Sea robins	0	105	0	0	0	0	805
Silver hake	0	0	0	0	280	5,040	20,160
Summer flounder	105	70	0	0	0	0	0
Windowpane flounder	0	0	0	805	2,520	0	1,855
Winter flounder	70	1,540	0	8,715	2,380	0	0
Witch flounder	0	0	0	875	420	350	140
Wolffishes	0	0	0	0	0	0	0
Yellowtail flounder	0	70	0	2,940	24,640	1,015	140
Total	**232,435**	**95,935**	**30,205**	**16,065**	**36,015**	**25,130**	**325,115**

[1] Based on entrainment estimates per test provided in **Table 4-9** and a maximum of 35 tests conducted during Foundation Testing (i.e., a maximum volume of 25.1 million gallons [94,900 cubic meters]).

During suction bucket removal, there is the potential to impinge larger fish on the suction pump, which would have an opening with a maximum diameter of 7 inches (18 centimeters). As noted above, the pump velocity for the suction pump is estimated at 5.2 feet per second (1.6 meters per second), which is likely to exceed sustained swimming speeds of many species. However, adults of some larger species have burst speeds in excess of the pump velocity (e.g., sturgeon [Kelly and Klimley 2012]). Based on the anticipated location of the pump (i.e., 19 feet [6 meters] above the seabed), demersal species would not be at risk of impingement. Pelagic species may be vulnerable to impingement, but given the small HZI (i.e., 20 square feet [1.8 square meters] or less), an individual fish would have to be in close proximity to the pump to potentially experience impingement. Therefore, impingement on the suction pump is unlikely to occur.

A single vessel would be used during each Foundation Test exposing organisms to vessel-related noise. All fishes sense the particle motion component of a sound wave (Fay and Popper 2000). Finfishes with swim bladders, particularly those with complex swim bladders involved in hearing, are more vulnerable to noise than others (Wiernicki et al. 2020; Halverson et al. 2011). Invertebrates also have organs that detect particle motion (Mooney et al. 2010; Budelmann 1992). Noise sources from vessels include sounds from main thrusters and dynamic positioning thrusters. Noise levels and frequencies from main thrusters vary considerably depending on vessel size (McKenna et al. 2013).

Source levels for large vessels reported by McKenna et al. (2017) range from 177 to 188 dB re µPa at 3 feet (1 meter) with most of the energy below 1 kHz and peaks in the 20 to 100 Hz range. Zykov et al. (2013) and McPherson et al. (2019) report a maximum broadband source level of 192 dB re 1 µPa for numerous vessels with varying propulsion power.

Fish and invertebrate responses to vessel noise include avoidance, diving, and dispersal, especially in schooling fish species (De Robertis and Handegard 2013; Handegard 2003; Vabø et al. 2002). Physiological stress in response to vessel noise has been reported in some species (Celi et al. 2016; Nichols et al. 2015; Wysocki et al. 2006); however, it is thought that handling of test subjects during these studies may have confounded results (Harding et al. 2020; Staaterman et al. 2020). Subtle impacts such as masking of behavioral responses to other stimuli are also possible (Haver et al. 2021; Ferrari et al. 2018; Holmes et al. 2017; Nedelec et al. 2017; Simpson et al. 2016). Habituation (i.e., eventual lack of response) to vessel sound has also been documented after prolonged exposure to vessel sound (Nedelec et al. 2016).

Jimenez-Arranz et al. (2019) measured dynamic positioning noise generated by a Mobile Offshore Drilling Unit and, based on these measurements, estimated source levels produced by dynamic positioning would peak at approximately 188 dB re 1 µPa in the 31.5 Hz one-third octave band. Warner and McCrodan (2011) measured vessel self-noise during dynamic positioning of a geophysical and geotechnical survey vessel at less than 145 dB re 1 µPa approximately 361 feet (110 meters) from the vessel and observed that frequencies generated by the dynamic positioning thrusters varied between 110 and 140 Hz; based on measured root mean square sound levels, Warner and McCrodan (2011) estimated that sound levels generated by the vessel during dynamic positioning would fall below the 150 dB re 1 µPa behavioral disturbance threshold for fish at approximately 60 feet (18 meters) from the vessel. Impacts of noise from dynamic positioning systems on marine organisms have been poorly studied. Dynamic positioning thrusters may run up to 9 hours per test during the Proposed Action, inclusive of installation and removal procedures.

Operation of ROVs and the suction pump would also generate underwater noise during Foundation Testing. ROVs are not anticipated to generate significant levels of underwater noise and are not expected to disturb marine life (Equinor 2020; NMFS 2020a). Sound levels generated by the suction pump are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters]) (Koschinski and Lüdemann 2020).

Acoustic imaging will be conducted within the confines of the suction bucket frame. However, the imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kHz, which is inaudible to marine organisms. Therefore, imaging equipment noise is not expected to affect finfish or invertebrates.

A single vessel would be used during Foundation Testing activities under the Proposed Action. Furthermore, all Foundation Tests would be conducted during a single mobilization, limiting the number of trips to ports when vessel collisions with large fish (e.g., Atlantic sturgeon) are more likely due to the shallower water depth. Vessel collisions are possible during vessel transits between test sites but less likely. The increased risk of vessel collisions due to the single Foundation Testing vessel would be very minimal compared to risks associated with existing vessel traffic.

In the unlikely event that weather conditions make onboarding the suction bucket at the end of the test hazardous, the suction bucket may be suspended under the vessel as it transits to the next testing site, posing an opportunity for potential physical interactions with large fish in the water column during transit. However, the transit would be conducted at low speed (i.e., 1 to 2 knots [2 to 4 kilometers per hour]) and a fish would have to be in the water column directly in front of the suction bucket. Therefore, physical interactions with the suspended suction bucket during transit are unlikely to occur.

Non-Routine Events

The risk of non-routine events is expected to be very low. Potential non-routine events include lost equipment, severe weather events, and accidental spills. Lost equipment could potentially require retrieval efforts such as video surveillance and/or grappling. Severe weather events could prevent testing and change the activities schedule, possibly extending the testing period. Although the risks of accidental spills are low, especially for a single vessel, extreme weather events would increase those risks.

Conclusion

The impacts of the Proposed Action on finfish, invertebrates, and EFH would be short term and range from **negligible** to **minor** adverse across individual impact-producing factors. Factors with **negligible** adverse impacts include physical interactions, turbidity, underwater noise, and vessel traffic. Impacts due to benthic habitat disturbance and entrainment would be **minor** adverse. These **minor** adverse impacts would affect individuals and would not have population-level impacts. The affected environment and impacted communities are expected to recover relatively quickly following the completion of activities from the Proposed Action.

4.3.4 Marine Mammals

Factors that could have an impact on marine mammals from the Proposed Action include benthic habitat disturbance, turbidity, entrainment and impingement, underwater noise, vessel traffic, and physical interactions. The Proposed Action includes measures to avoid or minimize potential impacts on marine mammals associated with these factors, which are discussed with the relevant factor in this impact assessment.

The installation and removal of the suction bucket and the placement and removal of the reference frame would result in temporary benthic disturbance of up to approximately 0.7 acre (2,873 square meters) in the Lease Area. The Project vessel would utilize dynamic positioning thrusters to maintain position, and therefore no anchoring impacts would occur. However, benthic disturbance associated with suction bucket testing under the Proposed Action would result in a temporary reduction in prey availability for benthic foragers. This reduction would be localized and short term. Recolonization and recovery of prey species is expected to occur within a few months to a year (Wilbur and Clarke 2007). As mysticete species expected to occur in the Lease Area are pelagic foragers, effects of a reduction in prey availability associated with benthic habitat disturbance are expected to be negligible for mysticetes. Though some odontocetes and pinnipeds may consume benthic prey, the area of habitat disturbance would be very small relative to soft-bottom foraging habitats available in the Lease Area, and effects on foraging would be non-measurable.

The installation and removal of the suction bucket and the placement and removal of the reference frame will result in temporary increases in suspended sediment concentrations at the testing sites. As the design and installation of suction bucket foundations require relatively few bottom-disturbing activities compared to other offshore wind foundation types (Horwath et al. 2021), suspended sediment concentrations associated with installation and removal of the suction bucket and reference frame would be expected to be similar to or lesser than suspended sediment concentrations associated with site preparation activities for other foundation types (e.g., dredging for sand bedform clearing). Modeling results of cutterhead dredging indicate that suspended sediment concentrations above background levels would be present throughout the bottom 6 feet (1.8 meters) of the water column for a distance of approximately 1,000 feet (305 meters) (NMFS 2020b citing USACE 1983). Elevated suspended sediment levels are expected to be present only within a 984- to 1,640-foot (300- to 500-meter) radius of the cutterhead dredge (NMFS 2020b citing USACE 1983; NMFS 2020b citing Hayes et al. 2000; NMFS 2020b citing LaSalle 1990). Suspended sediment concentrations associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 milligrams per liter with the highest levels (550.0 milligrams per liter) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (NMFS 2020b citing USACE 2005, 2010, 2015; NMFS 2020b citing Nightingale and Simenstad 2001). Based on this information, the localized sediment plume generated by the proposed Foundation Testing may extend 984 to 1,640 feet (300 to 500 meters) along the seabed, with suspended sediment concentrations of 282 milligrams per liter or less, and higher concentrations possible immediately adjacent to the suction bucket upon removal. The plume is expected to dissipate rapidly.

As described in Johnson (2018), NMFS has determined that elevated turbidity could result in effects on marine mammal species under specific circumstances (e.g., high turbidity levels over long periods during dredging operations). In general, marine mammals are not subject to impact mechanisms that injure fish

(e.g., gill clogging, smothering of eggs and larvae), so physiological effects are unlikely. Behavioral impacts, including avoidance or changes in behavior, increased stress, and temporary loss of foraging opportunity, could occur but only at high suspended sediment concentrations (Johnson 2018). The small increase in suspended sediment concentrations due to installation and removal of the suction bucket and placement and removal of the reference frame are not expected to be sufficient to result in behavioral impacts on marine mammals. Therefore, effects of turbidity associated with Foundation Testing are unlikely to occur. If marine mammals were to avoid the small sediment plumes generated by the Proposed Action, effects of the behavioral reaction would be temporary and non-measurable.

Operation of the suction pump would pull ambient water through the pump, potentially resulting in entrainment or impingement of marine organisms. Marine mammals could potentially be affected by entrainment of their prey as a result of the Foundation Testing. Entrainment during suction pump operation is not expected to result in measurable impacts on plankton or fish populations and is therefore not expected to measurably reduce prey availability for marine mammals. Marine mammals are too large to be vulnerable to impingement on the suction pump.

The Foundation Testing vessel, the ROVs, the suction pump, and the imaging equipment inside the suction bucket would produce noise during Foundation Testing activities. Vessels generate low frequency, non-impulsive noise that could affect marine mammals. Source levels for large vessels range from 177 to 188 dB re 1 µPa at 3 feet (1 meter) with most of the energy below 1 kHz and peaks in the 20–100 Hz range (McKenna et al. 2017). Jimenez-Arranz et al. (2019) measured dynamic positioning noise generated by a Mobile Offshore Drilling Unit and, based on these measurements, estimated source levels produced by dynamic positioning would peak at approximately 188 dB re 1 µPa in the 31.5 Hz one-third octave band. Warner and McCrodan (2011) measured vessel self-noise during dynamic positioning of a geophysical and geotechnical survey vessel at less than 145 dB re 1 µPa approximately 361 feet (110 meters) from the vessel and observed that frequencies generated by the dynamic positioning thrusters varied between 110 and 140 Hz approximately; based on measured root mean square sound levels, Warner and McCrodan (2011) estimated that sound levels generated by the vessel during dynamic positioning would fall below the 120 dB re 1 µPa behavioral disturbance threshold for marine mammals at approximately 1 mile (1,600 meters) from the vessel. Vessel noise overlaps with the hearing range of marine mammals and may cause behavioral responses (e.g., startle responses, behavioral changes, and avoidance), stress responses, and masking (Erbe et al. 2018, 2019; Nowacek et al. 2007; Southall et al. 2007). In NARW, vessel noise is known to increase stress hormone levels, which may contribute to suppressed immunity and reduced reproductive rates and fecundity (Hatch et al. 2012; Rolland et al. 2012). Masking may interfere with detection of prey and predators and reduce communication distances (e.g., Hatch et al. 2012).

Noise associated with survey ROVs equipped with acoustic imaging equipment was previously evaluated for site characterization surveys in the Lease Area (Equinor 2020), and NMFS (2020) determined that the likelihood of marine mammal take resulting from operation of the survey ROV was so low as to be discountable. Therefore, operation of the ROVs under the Proposed Action, which would not utilize acoustic imaging equipment, is not expected to result in behavioral disturbance of marine mammals. Suction pump noise is not anticipated to exceed injury thresholds for marine mammals, but source levels may exceed the 120 dB re 1 µPa behavioral disturbance threshold for non-impulsive noise (Koschinski and Lüdemann 2020). Sound levels produced by the suction pump are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters]

(Koschinski and Lüdemann 2020). Therefore, if source levels exceed the behavioral disturbance threshold, they would be expected to attenuate to non-disturbing levels within a relatively short distance. The imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kHz, which would be above the hearing range of marine mammals. Therefore, imaging equipment noise does not have the potential to affect marine mammals.

Noise produced during Foundation Testing is not expected to exceed injury thresholds for marine mammals but could exceed the behavioral disturbance threshold. Short-term, localized behavioral responses may occur to animals near the testing sites, but behavior would be expected to return to normal once the test is complete and/or when a marine mammal leaves the area. Given the temporary nature of the effects, the short duration of individual tests (i.e., up to 9 hours), and the short overall duration of Foundation Testing (i.e., up to 15 days), any effects of behavioral disturbance on marine mammals would be non-measurable.

A single vessel would be utilized to carry out Foundation Testing under the Proposed Action. As the vessel is expected to exceed 65 feet (20 meters) in length, the Foundation Testing vessel would be subject to a 10-knot (18.5-kilometer per hour) speed restriction from November 1 through July 31. If the proposed Foundation Testing were to take place in August, the Foundation Testing vessel would comply with any Dynamic Management Area or Slow Zone in effect during Foundation Testing activities and would utilize a trained lookout anytime the vessel would be operating at speeds of 10 knots (18.5 kilometers per hour) or greater. Additionally, the vessel would comply with measures to minimize vessel interactions with protected species, as described in *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* (BOEM 2021), including the following:

- The vessel captain and crew will maintain a vigilant watch for all protected species and reduce speed, stop the vessel, or alter course, as appropriate, to avoid striking any listed species.
- Anytime the vessel is underway, the vessel will maintain a 1,640-foot (500-meter) separation distance from ESA-listed species, including unidentified large whales, and a trained lookout will monitor a Vessel Strike Avoidance Zone of at least 1,640 feet (500 meters).
- If the trained lookout is a vessel crew member, this will be their designated role and primary responsibility, and they will receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements.
- All vessel crew members will be briefed in the identification of protected species that may occur in the action area and in regulations and best practices for avoiding vessel collisions. Reference materials for identification of ESA-listed species will be available on board the vessel, and Beacon Wind will clearly communicate, and post in highly visible locations, the expectation and process for reporting of protected species sightings.
- If an ESA-listed whale or unidentified large whale is observed within 1,640 feet (500 meters) of the forward path of the vessel, the operator will steer a course away from the whale at 10 knots (18.5 kilometers per hour) or less until the 1,640-foot (500-meter) minimum separation distance has been established. The vessel operator may also shift to idle if feasible.

- If a large whale is sighted within 656 feet (200 meters) of the forward path of a vessel, the vessel operator will reduce speed and shift the engine to neutral. Engines will not be engaged until the whale has moved outside of the vessel's path and beyond 1,640 feet (500 meters). If stationary, the vessel will not engage engines until the large whale has moved beyond 1,640 feet (500 meters).
- If a sea turtle or manta ray is sighted at any distance within the operating vessel's forward path, the vessel operator will slow down to 4 knots (7.4 kilometers per hour) and steer away (unless unsafe to do so). The vessel may resume normal vessel operations once the vessel has passed the individual.
- During times of year when sea turtles are known to occur in the action area, the vessel will avoid transiting through areas of visible jellyfish aggregations or floating vegetation (e.g., sargassum lines or mats). In the event that operational safety prevents avoidance of such areas, the vessel will slow to 4 knots (7.4 kilometers per hour) while transiting through such areas.
- A trained lookout will be posted at all times to avoid interactions with ESA-listed species when a vessel is underway (transiting or surveying) by monitoring in all directions; during any nighttime transits, the lookout will be equipped with night vision and/or infrared equipment to aid in detection of ESA-listed species.
- All crew members responsible for navigation duties will receive site-specific training on ESA-listed species sighting/reporting and vessel strike avoidance measures.
- The vessel will not divert course to approach any ESA-listed species or other marine mammal species.
- The vessel will reduce speed to 10 knots (18.5 kilometers per hour) or less while operating in any Slow Zone triggered by visual detections of NARWs, except in areas within a portion of a visually designated Dynamic Management Area or Slow Zone where it is not reasonable to expect the presence of NARWs (e.g., Long Island Sound, shallow harbors).
- The vessel operator will check for information regarding mandatory or voluntary ship strike avoidance (Seasonal Management Areas and Dynamic Management Areas [or Slow Zones that are also designated as Dynamic Management Areas]) and daily information regarding NARW sighting locations. These media may include, but are not limited to: NOAA weather radio, USCG NAVTEX and channel 16 broadcasts, Notices to Mariners, the Whale Alert app, or WhaleMap website.

Vessel strikes are a major source of mortality and injury for many marine mammal species (Hayes et al. 2021; Laist et al. 2001; Moore and Clarke 2002), including NARW (Kite-Powell et al. 2007). Almost all sizes and classes of vessels have been involved in collisions with marine mammals around the world (Dolman et al. 2006). Marine mammals are expected to be most vulnerable to vessel strikes when within the vessel's draft and not detectable by visual observers (e.g., animal below the surface or poor visibility conditions such as bad weather or low light), and probability of vessel strike increases with increasing vessel speed (Pace and Silber 2005; Vanderlaan and Taggart 2007). NARWs are at highest risk for vessel strike when vessels travel in excess of 10 knots (Vanderlaan and Taggart 2007); serious injury to cetaceans due to vessel collision rarely occurs when vessels travel below 10 knots (Laist et al. 2001). Given that a single vessel will be used for the Proposed Action and the mitigation measures to avoid vessel strike described above, including vessel speed restrictions, use of trained lookouts, minimum separation distances, and vessel strike avoidance procedures, a collision between the vessel and a marine mammal is extremely unlikely to occur.

There is the potential for the frame or suction bucket to come into contact with a marine mammal while being lowered to the seabed. However, the structures would be lowered at a low speed (0.7 mile per hour [1.1 kilometers per hour]) and in a controlled manner. A marine mammal would have to be directly below the suction bucket or reference frame as it is being lowered to experience a physical interaction. Additionally, the slow rate of lowering the bucket and frame at each testing site should allow marine mammals to avoid interaction. To minimize the risk of a physical interaction between the frame or suction bucket and a marine mammal, a trained lookout would monitor for marine mammals in the area prior to and during deployment, and lowering of the equipment would be stopped if a marine mammal is sighted within 1,640 feet (500 meters) of the vessel.

In the unlikely event that weather conditions make onboarding the suction bucket at the end of the test hazardous, the suction bucket may be suspended under the vessel as it transits to the next testing site, posing an opportunity for potential physical interactions with marine mammals during transit. However, the transit would be conducted at low speed (i.e., 1 to 2 knots [2 to 4 kilometers per hour]). A marine mammal would have to be in the water column immediately in front of the suction bucket during vessel transit to experience a physical interaction. Additionally, the slow transit speed during suspended transit of the suction bucket should allow marine mammals to avoid interaction. Given the low probability of a marine mammal occurring directly in the path of lowering or transiting equipment and the slow lowering and suspended transit speeds under the Proposed Action, physical interactions are not expected to occur.

Non-Routine Events

Non-routine events that could potentially have impacts on marine mammals include accidental releases or discharges and recovery of lost equipment. Accidental releases of trash and debris may occur from the vessel during suction bucket Foundation Testing. About half of all marine mammal species worldwide have been documented to ingest trash and debris (Werner et al. 2016), which can result in death. Based on stranding data, mortality rates associated with debris ingestion range from 0 to 22%. Ingestion may also result in sublethal effects, including digestive track blockage, disease, injury, and malnutrition (Baulch and Perry 2014). Linkages between impacts on individual marine mammals associated with debris ingestion and population-level effects are difficult to establish (Browne et al. 2015). BOEM assumes the Project vessel would comply with laws and regulations to properly dispose of marine debris and to minimize releases. In the event of a release, it would be an accidental, localized event in the vicinity of the vessel.

An accidental discharge from the vessel could also occur during Foundation Testing. Marine mammal exposure to releases through aquatic contact or inhalation of fumes can result in death or sublethal effects, including but not limited to adrenal effects, hematological effects, hepatological effects, poor body condition, and dermal effects (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). BOEM assumes the Project vessel would comply with all laws regulating at-sea discharges of vessel-generated waste and USCG requirements relating to prevention and control of oil spills. Any spill associated with the Proposed Action would be an isolated event with rapid dissipation and low risk of exposure to marine mammals.

The recovery of lost equipment could affect marine mammals through the potential impact from entanglement stemming from the dragging of grapnel lines. Entanglement is a threat to all taxa of

marine mammals (Hayes et al. 2020, 2021). The extent of impacts from the grapnel lines would be dependent upon the type of lost equipment, which would dictate the number of attempts made at recovery. Regardless, the potential for marine mammals to interact with the grapnel line and to become entangled is extremely unlikely given the low probability of a marine mammal encountering the line in the Lease Area. Impacts from additional vessel traffic and noise associated with recovery of lost equipment likely would be from a single vessel and are therefore not expected to disrupt the normal or routine functions of marine mammals.

Conclusion

Overall, impacts from Foundation Testing activities on marine mammals are expected to be **negligible,** because based on the scale and nature of activities proposed, any impacts would have little to no effect or no measurable impacts on individuals. If a vessel strike were to occur, effects on individual mysticetes other than the NARW, odontocetes, and pinnipeds would be detectible and measurable, but the viability of the species would not be threatened, whereas severe population-level effects that compromise the viability of NARW would be possible. However, the likelihood of a vessel strike as a result of the Proposed Action is considered very low given the use of a single vessel and the expected limited total extent and duration of activities considered. Furthermore, implementation of the proposed mitigation measures would minimize potential impacts on marine mammals.

4.3.5 Sea Turtles

Factors that could have an impact on sea turtles from the Proposed Action include benthic habitat disturbance, turbidity, entrainment and impingement, underwater noise, vessel traffic, and physical interactions. The Proposed Action includes measures to avoid or minimize potential impacts on sea turtles associated with these factors, which are discussed in this impact assessment.

The installation and removal of the suction bucket and the placement and removal of the reference frame would result in temporary benthic disturbance of up to approximately 0.7 acre (2,873 square meters) in the Lease Area. The Project vessel would utilize dynamic positioning thrusters to avoid anchoring disturbance of additional area within the Lease Area. Benthic disturbance associated with the Proposed Action would result in a temporary reduction in prey availability for benthic foragers. This reduction would be localized and short term. Recolonization and recovery of prey species is expected to occur within a few months to a year (Wilbur and Clarke 2007).

As green sea turtles, leatherback sea turtles, and loggerhead sea turtles do not forage in the soft-bottom habitats present in the Lease Area, benthic habitat disturbance would not reduce prey availability or foraging opportunities for these species. Juvenile Kemp's ridley sea turtles that may occur in the Lease Area do forage in this type of habitat and may therefore experience a reduction in prey availability or foraging opportunities due to benthic habitat disturbance associated with Foundation Testing. However, this reduction would be temporary and would be localized to a very small portion of the Lease Area. Given the temporary, short-term nature of the prey reduction and the large area of soft-bottom habitat that would remain available for foraging, any effect of a reduction in prey availability or foraging opportunities for Kemp's ridley sea turtle due to benthic habitat disturbance as a result of Foundation Testing would be non-measurable.

The installation and removal of the suction bucket and the placement and removal of the reference frame will result in temporary increases in suspended sediment concentrations at the testing sites. As suction bucket foundations require relatively few bottom-disturbing activities compared to other offshore wind foundation types (Horwath et al. 2021), suspended sediment concentrations associated with installation and removal of the suction bucket and reference frame would be expected to be similar to or lesser than suspended sediment concentrations associated with site preparation activities for other foundation types (e.g., dredging for sand bedform clearing). Modeling results of cutterhead dredging indicate that suspended sediment concentrations above background levels would be present throughout the bottom 6 feet (1.8 meters) of the water column for a distance of approximately 1,000 feet (305 meters) (NMFS 2020b citing USACE 1983). Elevated suspended sediment levels are expected to be present only within a 984- to 1,640-foot (300- to 500-meter) radius of the cutterhead dredge (NMFS 2020b citing USACE 1983; NMFS 2020b citing Hayes et al. 2000; NMFS 2020b citing LaSalle 1990). Suspended sediment concentrations associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 milligrams per liter with the highest levels (550.0 milligrams per liter) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (NMFS 2020b citing USACE 2005, 2010, 2015; NMFS 2020b citing Nightingale and Simenstad 2001). Based on this information, the localized sediment plume generated by the proposed Foundation Testing may extend 984 to 1,640 feet (300 to 500 meters) along the seabed, with suspended sediment concentrations of 282 milligrams per liter or less, and higher concentrations possible immediately adjacent to suction bucket upon removal. The plume is expected to dissipate rapidly.

There are no data to indicate that suspended sediment has physiological effects on sea turtles. However, elevated suspended sediment may cause alterations to normal movements or behavioral disruption as sea turtles would be expected to avoid the area of elevated suspended sediment. Given the localized nature of the sediment plume and the rapid dissipation of the plume, any effects of behavioral reactions in sea turtles due to turbidity associated with Foundation Testing would be non-measurable.

Elevated suspended sediment concentrations can affect benthic communities, which could impact Kemp's ridley sea turtle as this species forages in soft-bottom habitats. Suspended sediment concentrations high enough to result in adverse impacts on the benthic community (i.e., above 390 milligrams per liter [USEPA 1986]) are not expected throughout most of the plume. Based on plumes generated by hydraulic dredging, it may be possible that suspended sediment concentrations would exceed this threshold immediately adjacent to the suction bucket upon removal. If this threshold were exceeded, prey availability or foraging opportunities for Kemp's ridley sea turtles may be temporarily reduced in the area immediately outside the footprint of the suction bucket. Given the temporary, short-term nature of the prey reduction, the small scale of the reduction, and the large area of soft-bottom habitat that would remain available for foraging, any effect of a reduction in prey availability or foraging opportunities for Kemp's ridley sea turtle due to increased turbidity as a result of Foundation Testing would be non-measurable.

Operation of the suction pump would pull ambient water through the pump, potentially resulting in entrainment or impingement of marine organisms. However, entrainment during suction pump operation is not expected to result in measurable impacts on plankton or fish populations and is therefore not expected to measurably reduce prey availability for sea turtles.

The pump velocity for the suction pump is estimated at 5.2 feet per second (1.6 meters per second). Sea turtles are capable of cruising (i.e., sustained swimming) at speeds of 3.3 to 4.4 feet per second (1 to 1.3 meters per second), and juveniles are known to forage in areas with currents of up to 3.4 feet per second (1 meter per second) (NMFS 2023e). However, sea turtles may be capable of burst speeds of up to 6.6 feet per second (2 meters per second) for a few seconds (Prange 1976), indicating that sea turtles would be able to escape the pump. Additionally, the HZI of the pump would be 20 square feet (1.9 square meters) or less. A sea turtle is unlikely to occur within the radius (up to 2.5 feet [0.8 meter]) of the hydraulic zone of influence while the suction pump is in operation. Therefore, effects of impingement on the suction pump on sea turtles are unlikely to occur.

The Foundation Testing vessel, the ROVs, the suction pump, and the imaging equipment inside the suction bucket would produce noise during Foundation Testing activities. Vessels generate low frequency, non-impulsive noise that could affect sea turtles. Source levels for large vessels range from 177 to 188 dB re 1 µPa at 3 feet (1 meter) with most of the energy below 1 kHz and peaks in the 20–100 Hz range (McKenna et al. 2017). Jimenez-Arranz et al. (2019) measured dynamic positioning noise generated by a Mobile Offshore Drilling Unit and, based on these measurements, estimated source levels produced by dynamic positioning would peak at approximately 188 dB re 1 µPa in the 31.5 Hz one-third octave band. Warner and McCrodan (2011) measured vessel self-noise during dynamic positioning of a geophysical and geotechnical survey vessel at less than 145 dB re 1 µPa approximately 361 feet (110 meters) from the vessel and observed that frequencies generated by the dynamic positioning thrusters varied between 110 and 140 Hz; based on measured root mean square sound levels, Warner and McCrodan (2011) estimated that sound levels generated by the vessel during dynamic positioning would fall below 170 dB re 1 µPa at 3 feet (1 meter) from the vessel, indicating that source levels generated during dynamic positioning were likely below the recommended behavioral disturbance threshold for sea turtles of 175 dB re 1 µPa. Based on anticipated sound levels for vessels, noise from the Foundation Testing vessel may elicit behavioral responses in sea turtles, including startle responses and changes in diving patterns, or a temporary stress response (NSF and USGS 2011; Samuel et al. 2005).

Noise associated with survey ROVs equipped with acoustic imaging equipment was previously evaluated for site characterization surveys in the Lease Area (Equinor 2020), and NMFS (2020) determined that the likelihood of behavioral disturbance resulting from operation of the survey ROV was so low as to be discountable. Therefore, operation of the ROVs under the Proposed Action, which would not utilize acoustic imaging equipment, is not expected to result in behavioral disturbance of sea turtles.

Suction pump noise is not anticipated to exceed the injury threshold or the 175 dB re 1 µPa behavioral disturbance threshold for sea turtles (Koschinski and Lüdemann 2020). The imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kHz, which is above the hearing range of sea turtles. Therefore, imaging equipment noise does not have the potential to affect sea turtles.

Any behavioral responses to Foundation Testing noise would be short term and localized to the area around the testing site or the transiting Foundation Testing vessel; effects of any elicited behavioral response would dissipate once the test is complete and the vessel or sea turtle leaves the area. Given the temporary nature of the effects, the short duration of individual tests, and the short overall duration

of Foundation Testing, any effects of behavioral disturbance on sea turtles due to noise associated with Foundation Testing would be non-measurable.

A single vessel would be utilized to carry out Foundation Testing under the Proposed Action. As the vessel is expected to exceed 65 feet (20 meters) in length, the Foundation Testing vessel would be subject to a 10-knot (18.5-kilometer per hour) speed restriction from November 1 through July 31. If the proposed Foundation Testing were to take place in August, the Foundation Testing vessel would comply with any Dynamic Management Area or Slow Zone in effect during Foundation Testing activities and would utilize a trained lookout anytime the vessel would be operating at speeds of 10 knots or greater. Additionally, the vessel would comply with measures to minimize vessel interactions with protected species form *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* (BOEM 2021), as described in **Section 4.3.4.**

Vessel strikes are a known source of injury and mortality for sea turtles (Chaloupka et al. 2008). Though sea turtles spend a majority of their time (greater than 90%) submerged (Lutcavage and Lutz 1997), most of their submerged time (60 to 75%) occurs within 32 feet (10 meters) of the surface for hard-shelled species (i.e., green, Kemp's ridley, and loggerhead sea turtles) (Borcuk et al. 2017; Watwood and Buonantony 2012), indicating that these species may be vulnerable to vessel strike, particularly by deep draft vessels, approximately 66 to 81% of the time. Leatherback sea turtles spend less time within 32 feet (10 meters) of the surface (approximately 20%) (Borcuk et al. 2017; Watwood and Buonantony 2012), indicating that this species may be less vulnerable to vessel strike than the other sea turtle species in the Lease Area. Sea turtles are expected to be most vulnerable to vessel strikes in coastal foraging areas and may not be able to avoid collisions when vessel speeds exceed 2 knots (4 kilometers per hour) (Hazel et al. 2007). Given that a single vessel would be used for the Proposed Action and the mitigation measures to avoid vessel strike described above, including use of trained lookouts, minimum separation distances, and vessel strike avoidance procedures, a collision between the vessel and a sea turtle is unlikely to occur.

There is the potential for the frame or suction bucket to come into contact with a sea turtle while being lowered to the seabed. However, the structures would be lowered at a low speed (0.7 mile per hour [1.1 kilometers per hour]) and in a controlled manner. A sea turtle would have to be directly below the suction bucket or reference frame as it is being lowered to experience a physical interaction. Additionally, the slow rate of lowering the bucket and frame at each testing site should allow sea turtles to avoid interaction. To minimize the risk of a physical interaction between the frame or suction bucket and a sea turtle, a trained lookout would monitor for sea turtles in the area prior to and during deployment, and lowering of the equipment would be stopped if a sea turtle is sighted within 1,640 feet (500 meters) of the vessel.

In the unlikely event that weather conditions make onboarding the suction bucket at the end of the test hazardous, the suction bucket may be suspended under the vessel as it transits to the next testing site, posing an opportunity for potential physical interactions with sea turtles during transit. However, the transit would be conducted at low speed (i.e., 1 to 2 knots [2 to 4 kilometers per hour]). A sea turtle would have to be in the water column immediately in front of the suction bucket during vessel transit to experience a physical interaction. Additionally, the slow transit speed during suspended transit of the suction bucket should allow sea turtles to avoid interaction. Given the low probability of a sea turtle

occurring directly in the path of lowering or transiting equipment and the slow lowering and suspended transit speeds under the Proposed Action, physical interactions are not expected to occur.

Non-Routine Events

Non-routine events that could potentially have impacts on sea turtles include accidental releases or discharges and recovery of lost equipment. Accidental releases of trash and debris may occur from the vessel during suction bucket Foundation Testing. All sea turtle species are known to ingest trash and debris, including plastic fragments, tar, paper, polystyrene foam, hooks, lines, and net fragments (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014; Thomás et al. 2002). Such ingestion can occur accidentally or intentionally when individuals mistake the debris for potential prey items (Gregory 2009; Hoarau et al. 2014; Thomás et al. 2002). Ingestion of trash and debris can result in death or sublethal effects, including but not limited to dietary dilution, chemical contamination, depressed immune system, poor body condition, reduced growth rates, reduced fecundity, and reduced reproductive success (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). BOEM assumes the Project vessel would comply with laws and regulations to properly dispose of marine debris and to minimize releases. In the event of a release, it would be an accidental, localized event in the vicinity of the vessel.

An accidental discharge from the vessel could also occur during Foundation Testing. Sea turtle exposure to oil spills through aquatic contact or inhalation of fumes can result in death (Shigenaka et al. 2010, 2021) or sublethal physical or chemical effects. Physical effects limit basic functionality for most turtles exposed as oil interferes with surface breathing, movement, and vision, which limits their ability to forage or evade predators (Shigenaka et al. 2021). Chemical effects are less apparent and, therefore, less understood. Documented chemical effects include but are not limited to adrenal effects, dehydration, hematological effects, increased disease incidence, hepatological effects, poor body condition, dermal effects, skeletomuscular effects, and oxidative stress (Bembenek-Bailey et al. 2019; Camacho et al. 2013; Mitchelmore et al. 2017; Shigenaka et al. 2010, 2021; Vargo et al. 1986). BOEM assumes the Project vessel would comply with all laws regulating at-sea discharges of vessel-generated waste and USCG requirements relating to prevention and control of oil spills. Any spill associated with the Proposed Action would be an isolated event with rapid dissipation and low risk of exposure to sea turtles.

The recovery of lost equipment could affect sea turtles through the potential impact from entanglement stemming from the dragging of grapnel lines. The extent of impacts from the grapnel lines would be dependent upon the type of lost equipment, which would dictate the number of attempts made at recovery. Regardless, the potential for sea turtles to interact with the grapnel line and to become entangled is extremely unlikely given the low probability of a sea turtle encountering the line in the Lease Area. Impacts from additional vessel traffic and noise associated with recovery of lost equipment likely would be from a single vessel and are therefore not expected to disrupt the normal or routine functions of sea turtles.

Conclusion

Overall, impacts from Foundation Testing activities on sea turtles are expected to be **negligible** because potential impacts on individuals from the scale and nature of activities proposed would have little to no

effect or no measurable impacts. Implementation of the mitigation measures provided in **Section 4.3.4** would minimize potential impacts on sea turtles.

5 Standard Operating Conditions

The Proposed Action includes SOCs to reduce or eliminate potential risks to or conflicts with specific environmental resources. BOEM will require the lessee to comply with the SOCs throughout Foundation Testing activities. The lessee's SAP and SAP Amendment contain a description of environmental protection features or measures that the lessee will use.

For offshore cultural resources and biologically sensitive habitats, BOEM's primary mitigation strategy has been and will continue to be avoidance. For example, the exact locations of Foundation Tests have been and would be adjusted to avoid adverse effects on offshore cultural resources or biologically sensitive habitats, if present.

The Beacon Wind Lease contains specific stipulations to minimize risk to marine species that must be followed. Foundation Testing will not require pile driving; accordingly, mitigations to reduce adverse impacts on protected species from pile driving do not apply to the proposed Foundation Testing. All activities associated with the Foundation Testing will comply with the applicable Lease stipulations.

During Foundation Testing, Beacon Wind will use many of the BMPs identified in the *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan* (BOEM 2019) and *Establishment of an OCS Alternative Energy and Alternate Use Program, Record of Decision, December 2007* (BOEM 2007). Additionally, Beacon Wind will adhere to the BOEM programmatic consultation with NOAA Fisheries, most recently revised as of November 22, 2021, detailing Project Design Criteria (PDCs) and BMPs for Protected Species Associated with Offshore Wind Data Collection (NMFS 2021), as applicable. **Appendix A** provides an overview of the PDCs and BMPs within the programmatic consultation that are applicable to the proposed Foundation Testing.

In addition, all vessels, regardless of length, will observe a 10-knot (18.5-kilometer per hour) speed restriction in specific areas designated by NOAA Fisheries for the protection of NARW, the Block Island Sound Seasonal Management Area (in effect from November 1 through April 30), and any Dynamic Management Areas when in effect. A trained lookout would monitor for marine mammals in the area prior to and during deployment, and lowering of the equipment would be stopped if a marine mammal or sea turtle is sighted within 1,640 feet (500 meters) of the vessel.

More specific information on the SOCs is available in **Appendix F**.

6 Consultation and Coordination

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

6.1 Public Involvement

6.1.1 Notice of Intent to Prepare an Environmental Assessment

BOEM initiated an environmental assessment process by publishing a NOI in the *Federal Register* on November 7, 2023 (https://www.federalregister.gov/documents/2023/11/07/2023-24610/notice-of-intent-to-prepare-an-environmental-assessment-for-additional-site-assessment-activities-on). The NOI signaled the commencement of a 30-day public comment period, providing an opportunity for interested parties to contribute their perspectives and insights. During the 30-day comment period, BOEM received 9 comments from a variety of stakeholders, including renewable and other businesses and associations; environmental and other public-interest groups; Federal, state, and local governmental entities; and the general public. Some commenters expressed general support or opposition, but most raised specific areas of concern on the Proposed Action, Alternatives, the NEPA process and timeline to complete, access to testing data, public involvement and engagement, cumulative impacts, mitigation and monitoring including implementing protected species observers clearance and shutdown zones, vessel speed restrictions, and the need for more detail on benthic resources and habitat and noise impacts for finfish, invertebrates, essential fish habitat, marine mammals, and recreational and commercial fishing. These are summarized and responded to in Appendix E of the EA. The comments can be viewed at www.regulations.gov by searching for docket ID **BOEM-2023-0062**.

6.2 Consultations

6.2.1 ESA

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

For the activities addressed in this EA that could potentially affect protected species, BOEM has engaged in informal consultation with both USFWS and NMFS, as per their respective jurisdictions. The current status of consultations with each of these services is described in the following sections.

USFWS

BOEM prepared a BA using the USFWS Information for Planning and Consultation (IPaC) Consultation Package Builder to address the species and critical habitat that may be affected by activities associated with the approval of the proposed Foundation Testing activities within the Beacon Wind Lease Area. BOEM submitted the BA (Project Code: 2024-0013543) to USFWS on December 21, 2023, with BOEM's determination that the impacts of the proposed activities will have no effect on ESA-listed species.

NMFS

BOEM prepared a BA evaluating species and critical habitat under jurisdiction of NMFS that could be affected by the Proposed Action. BOEM submitted the BA to NMFS on December 21, 2023, and requested concurrence with BOEM's determination that the impacts of the Proposed Action may affect, but is not likely to adversely affect any listed species under NOAA Fisheries' jurisdiction.

6.2.2 Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act of 1976, Federal agencies are required to consult with NMFS on any action that may result in adverse effects on Essential Fish Habitat (EFH). NMFS regulations implementing the EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act can be found at 50 CFR Part 600. BOEM submitted the EFH assessment to NMFS on December 20, 2023, and requested concurrence with BOEM's determination that the impacts of the Proposed Action would not significantly affect the quality and quantity of EFH.

6.2.3 Coastal Zone Management Act

The Coastal Zone Management Act requires that Federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of the state's federally approved coastal management program (15 CFR Part 930 Subpart C). Beacon Wind prepared a Consistency Determination (CD) under 15 CFR § 930.36(a) to determine whether Foundation Testing activities in the Beacon Wind Lease Area are fully consistent with the provisions identified as enforceable by the Coastal Zone Management Programs of New York, Massachusetts, and Rhode Island. BOEM submitted the CD to the States on January 17, 2024 for review and the States will concur or object to the determination.

This EA provides the comprehensive data and information required under 15 CFR Part 930 Subpart C to support the CD.

6.2.4 National Historic Preservation Act (Section 106)

Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C. §306108; NHPA Section 106) and its implementing regulations (36 CFR Part 800) require Federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. BOEM determined the lease issuance and approval of the original SAP both constituted undertakings with the potential to affect historic properties and were subject to the NHPA Section 106 review and consultation process pursuant to a programmatic agreement (PA) (*Programmatic Agreement among the U.S. Department of the Interior, Bureau of Ocean Energy*

Management; the State Historic Preservation Officers of Massachusetts and Rhode Island; the Mashpee Wampanoag Tribe; the Narragansett Indian Tribe; the Wampanoag Tribe of Gay Head [Aquinnah]; and the Advisory Council on Historic Preservation Regarding the "Smart from the Start" Atlantic Wind Energy Initiative: Leasing and Site Assessment Activities Offshore Massachusetts and Rhode Island) (BOEM 2012). BOEM executed the Massachusetts and Rhode Island PA on May 23, 2012, with the State Historic Preservation Officers (SHPOs) of Massachusetts and Rhode Island, the ACHP, the Mashpee Wampanoag Tribe, The Narragansett Indian Tribe, and the Wampanoag Tribe of Gay Head (Aquinnah).

BOEM implemented this PA pursuant to 36 CFR 800.14(b) to fulfill its obligations under NHPA Section 106 for the undertakings of lease issuance and approval of site assessment activities on the OCS offshore Rhode Island and Massachusetts. The PA expired on May 12, 2022. BOEM concluded the NHPA Section 106 process with Findings of No Historic Properties Affected for commercial wind lease issuance and site assessment activities offshore Massachusetts in June 2014, and for the SAP for Lease OCS-A 0520 on July 26, 2021.

BOEM has determined that approval of the additional site assessment activities within Lease Area OCS-A 0520, proposed as an amendment to the SAP by Beacon Wind, also constitutes an NHPA Section 106 undertaking (the present undertaking) subject to review and consultation as the activities proposed in the original SAP did not encompass those that are proposed in the SAP Amendment.

On November 14, 2023, BOEM initiated consultations via letters sent to 10 federally recognized Tribes (i.e., Delaware Tribe of Indians, Eastern Shawnee Tribe of Oklahoma, Mashantucket [Western] Pequot Tribe, Mashpee Wampanoag Tribe, Mohegan Tribe of Indians of Connecticut, Stockbridge-Munsee Community Band of Mohican Indians, The Delaware Nation, The Narragansett Indian Tribe, The Shinnecock Indian Nation, and Wampanoag Tribe of Gay Head [Aquinnah]) and six Federal agencies (i.e., ACHP; USACE, New York District; Bureau of Safety and Environmental Enforcement [BSEE]; National Park Service [NPS]; Naval Facilities Engineering Systems Command [NAVFAC] HQ; and Naval History and Heritage Command [Underwater Archaeology Branch]). These Tribes and Federal agencies were determined to be existing consulting parties to the NHPA Section 106 review of the Beacon Wind Construction and Operations Plan (COP) for Lease Area OCS-A 0520, which is being evaluated by BOEM as a separate but related NHPA Section 106 undertaking currently undergoing review and consultations. As such, BOEM assumed the continued participation of the aforementioned Tribes and Federal agencies as consulting parties to the NHPA Section 106 review of the present undertaking.

On November 15, 2023, the SHPOs of Delaware, Massachusetts, New York, and Rhode Island were notified of the present undertaking due to BOEM's concurrent NHPA Section 106 consultations with these SHPOs on separate activities proposed to occur within Lease Area OCS-A 0520. Though the area of potential effects (APE) is limited to the OCS (i.e., not within any state lands or waters), SHPOs were extended an invitation to consult on the undertaking. The New York SHPO accepted BOEM's invitation to consult on November 29, 2023. The Delaware, Massachusetts, and Rhode Island SHPOs did not respond to BOEM's invitation.

BOEM prepared a Finding of No Historic Properties Affected (Finding), consistent with 36 CFR §800.4(d)(1), which was provided to the consulting parties on January 30, 2024, as a notification of its Finding. The Finding is available on BOEM's website at: https://www.boem.gov/renewable-energy/state-activities/beacon-wind.

7 Preparers

Table 7-1. BOEM contributors

Name	Role/Resource Area
NEPA Coordinators	
Wolfson, Laura Lee	NEPA Compliance
Resource Scientists and Contributors	
Ajilore, Ololade	Navigation and Vessel Traffic
Baker, Kyle	Marine Mammals, Sea Turtles and NMFS BA
Bigger, David	Birds; Bats; USFWS BA
Bucatari, Jennifer	Marine Minerals Use and Ocean Dredged Material Disposal
Chaky, Sindey	Coastal Zone Management Act Compliance
Christianson, Justine	Cultural Resources; Tribal Nation Coordination
Gange, Joshua	Project Coordinator
Hooker, Brian	Marine Mammals, Sea Turtles NMFS BA, Benthic Resources, Finfish, Invertebrates, and EFH
Jensen, Brandon	Benthic Resources, Finfish, Invertebrates, and EFH
Jensen, Mark	Socioeconomics; Recreation and Tourism
Monroe, Lori	Solicitor
Slayton, Ian	Air Quality, Climate Change, Cumulative Scenarios/Planned Action Scenario
Hogan, Charissa	Air Quality
Stromberg, Jessica	Chief, Environment Branch for Renewable Energy; NEPA Compliance
Lewis, Joanne	Navigation and Vessel Traffic
Draher, Jennifer	Water Quality; Navigation and Vessel Traffic, Sediment

Table 7-2. Consultants

Name	Role/Resource Area
ICF	
Cwalinski, Emma	Project Coordinator
Ernst, David	Air Quality Lead
Gleaton, Soniya	Comment Processing
Ha, Anthony	Publications Specialist
Hallman, Ryan	Air Quality Support
Hartfelder, Kelsey	Air Quality Support
Hatfield, Teresa	Navigation and Vessel Traffic Lead
Healy, Erin	Project Director
Hoelzer, Tara	Geographic Information Systems
Lin, Clay	Recreation and Tourism Lead
Lundstrom, Kristen	Technical Editor
Muntz, Alice	Section 106 and Cultural Resources Lead

Name	Role/Resource Area
Nally, Dan	QA/QC; NEPA
O'Donnell, Megan	Project Manager
Read, Brent	Geographic Information Systems
Slankard, Scott	Water Quality
Williams, Drew	Administrative Record
Zedaker, Dylan	Section 106 and Cultural Resources Support
AKRF	
Baggett, Lesley	Benthic Resources
Krebs, Justin	QA/QC; NMFS BA; EFH Assessment
Lozano, Carlos	Finfish, Invertebrates, and Essential Fish Habitat
Manhard, Chris	Commercial Fisheries and For-Hire Recreational Fishing; EFH Assessment
Manhard, Rachael	Biological Resources Lead; Marine Mammals; Sea Turtles; NMFS BA

APPENDIX A: Assessment of Resources with Negligible Impacts

A.1 Introduction

On June 3, 2014, Bureau of Ocean Energy Management (BOEM) issued a Finding of No Significant Impact (FONSI) based on a Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts (BOEM 2014; referred to herein as the "2014 EA"). The 2014 EA concluded that the Proposed Action would have negligible impact on the following resources: Air Quality, Birds, Bats, Coastal Habitat, Cultural Resources, Demographics and Employment, Environmental Justice, Recreation and Visual, Military Use, and Commercial Fisheries (Section 4.2, BOEM 2014). Because these resources have been described in the 2014 EA (BOEM 2014), **Section 3.3** of the Environmental Assessment (EA) describes the resources eliminated from further consideration.

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

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

A.2.1 Air Quality and Greenhouse Gas Emissions

Air quality is characterized by comparing the ambient air concentrations of criteria pollutants to the National Ambient Air Quality Standards (NAAQS), which have been established by the U.S. Environmental Protection Agency (USEPA) to be protective of human health and welfare. The NAAQS have been established in 40 Code of Federal Regulations (CFR) Part 50 for each of the six criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$: particulate matter with a diameter less than or equal to 10 and 2.5 micrometers [µm], respectively), and lead (Pb). Ozone forms in the atmosphere from precursor pollutants such as nitrogen oxides (NO_X) and volatile organic compounds (VOCs). The USEPA has also established emission standards for Hazardous Air Pollutants (HAPs).

When the monitored pollutant levels in an area exceed the NAAQS for any pollutant, USEPA designates the area as being in "nonattainment" for that pollutant, requiring the development of a State Implementation Plan (SIP) to improve air quality in the area. USEPA will redesignate a nonattainment area as a "maintenance area," once it meets the standards and additional redesignation requirements in the Clean Air Act (CAA). The designated onshore areas nearest the Lease Area include parts of Connecticut, Massachusetts, New York, and New Jersey. The following onshore designated areas occur near the Lease Area (listed with their respective nonattainment or maintenance designations) (USEPA 2023a):

- New York-Northern New Jersey-Long Island Area, NY-NJ-CT Severe/Moderate Ozone Nonattainment Area (2008/2015 NAAQS)

- New York-Northern New Jersey-Long Island Area, NY-NJ-CT Carbon Monoxide Maintenance Area (1971 NAAQS)
- New York County, NY PM_{10} Moderate Nonattainment Area (1987 Annual NAAQS)
- New York-Northern New Jersey-Long Island Area, NY-NJ-CT $PM_{2.5}$ Maintenance Area (1997 Annual NAAQS)
- New York-Northern New Jersey-Long Island Area, NY-NJ-CT $PM_{2.5}$ Maintenance Area (2006 24-Hour NAAQS)

All of southeastern Massachusetts is currently designated as unclassifiable or attainment for all criteria pollutants, except for Dukes County (primarily Martha's Vineyard), which is designated as marginal nonattainment for the 2008 ozone NAAQS of 75 parts per billion (ppb). In August 2018, USEPA designated Dukes County as attainment for the more stringent 2015 ozone standard of 70 ppb. Though monitored ozone levels in Dukes County have remained below the NAAQS of 70 ppb since 2018, the nonattainment designation for the 2008 ozone standard remains in effect. The entirety of Rhode Island is classified attainment for all criteria pollutants.

Conclusion

Under Alternative A, BOEM would not approve the proposed Foundation Testing activities, including trials of a suction bucket within the Lease Area, and there would be no effects on air quality. However, BOEM expects ongoing and reasonably foreseeable planned actions, such as other wind energy development activities and global climate change, to have continuing regional air quality impacts over the timeframe considered in the EA (**Appendix B**). Over the timeframe considered in this EA, local impacts on air quality from climate change are likely to be small, incremental, and difficult to discern from effects of other ongoing actions. The largest ongoing contributors to impacts on air quality stem from vessel traffic.

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

A.2.2 Cultural, Historical, and Archaeological Resources

The geographic analysis area for cultural, historical, and archaeological resources comprises the depth and breadth of the seabed potentially impacted by any bottom-disturbing activities defined as the area of potential effects (APE) pursuant to 36 CFR § 800.16(d) and Section 106 of the National Historic Preservation Act (NHPA Section 106; BOEM 2020). Moreover, the visual APE consists of the viewshed where aboveground historic properties would be visually adversely affected as a result of the testing activities. Due to the distance and temporary nature of the proposed activities from shore, no visual

effects on aboveground historic properties are anticipated and they are therefore not considered in the delineation of the visual APE.

Based on information from Beacon Wind's Archaeological Site Characterization Report completed for the SAP Amendment application (Appendix D, Tetra Tech 2023), no cultural, historical, or archaeological resources that are historic properties listed or potentially eligible for listing in the National Register of Historic Places (NRHP) are located in the APE.

Conclusion

There are no ongoing and reasonably foreseeable planned wind energy development actions occurring within the geographic analysis area for cultural, historical, and archaeological resources. Bottom-disturbing activities generally have the potential to affect cultural, historical, and archaeological resources, including historic properties. However, impacts of Alternative A (No Action) on cultural, historical, and archaeological resources would be **negligible** as none of the resources that are historic properties are located within the geographic analysis area.

A.3 Alternative B – Proposed Action

A.3.1 Air Quality and Greenhouse Gas Emissions

Sources of air emissions associated with the Proposed Action are Foundation Testing activities, which will consist of trials of a suction bucket within the Lease Area, and associated vessel transit. It is anticipated that Foundation Testing activities would be completed over a single vessel trip spanning approximately 10 to 15 days. Vessel traffic due to Foundation Testing activities would add to current vessel traffic levels within the geographic analysis area and the existing port in eastern Canada used by the vessel. The additional vessel activity associated with the Proposed Action over a 10- to 15-day span would be temporary and negligible as compared with existing vessel traffic levels in the region and at the existing ports.

Impacts from criteria pollutant, HAP, and greenhouse gas (GHG) emissions associated with Foundation Testing activities would be localized within the geographic analysis area and in the vicinity of the existing port used to support vessel activity. The SAP Amendment prepared by Beacon Wind (Tetra Tech 2023) provided estimates of criteria pollutant, HAP, and GHG emissions associated with the Proposed Action, and the results are provided in **Appendix B** of this EA. Parameters for the Foundation Testing and vessel activities associated with the Proposed Action, upon which the air emissions calculations are based, are also provided in **Appendix B**. Air pollutant emissions from onshore activities associated with the Proposed Action are expected to be negligible in comparison with the existing onshore activities because an existing port would be utilized, and no expansion would be needed of these facilities to accommodate the Proposed Action.

Major source thresholds are defined in the CAA for purposes of permitting stationary emission sources on land. The major source thresholds do not apply to the Proposed Action, which would not site stationary sources of emissions on land. Still, they are used here as screening levels for assessing

potential air quality impacts. Major source thresholds for the onshore areas closest to the Lease Area are as follows (USEPA 2023b):

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

As indicated in **Appendix B**, estimated annual air emissions from the Proposed Action are expected to be less than major source thresholds and are not expected to lead to any violation of the NAAQS and, therefore, are expected to be negligible.

Non-Routine Events

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

Federal Class I Areas

Section 162(a) of the CAA establishes air quality protections for designated Federal Class I areas such as national parks, national wilderness areas, and national monuments. The Class I area closest to the Lease Area is Brigantine Wilderness Area in New Jersey, which is approximately 204 miles (328 kilometers) from the Lease Area. Federal Land Managers must be notified of facilities that will be located within 62 miles (100 kilometers) of a Class I area. It is not anticipated that Proposed Action activities in the Lease Area and in the vicinity of existing ports will impact visibility or acidic deposition in the Brigantine Wilderness Area.

Climate Change

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

Conclusion

As shown in **Appendix B**, air emissions from the Proposed Action are not expected to lead to any violation of the NAAQS. Foundation Testing activities constitute the main impact driver for the Proposed Action. Although the estimated air pollutant and GHG emissions from the Proposed Action are measurable, they would be minor relative to other air emissions onshore or offshore. Criteria pollutant, HAP, and GHG emissions associated with the Proposed Action are thus expected to be **negligible**, though the GHG emissions would contribute incrementally to global climate change.

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

A.3.2 Cultural, Historical, and Archaeological Resources

As described in **Section A.2.2** for Alternative A, no cultural, historical, or archaeological resources that are historic properties are located in the geographic analysis area. Based on information from Beacon Wind's *Archaeological Site Characterization Report* completed for the SAP Amendment application (Tetra Tech 2023, Appendix D), no cultural, historical, or archaeological resources that are historic properties listed or potentially eligible for listing in the NRHP are located in the APE. Unanticipated or post-review discoveries of marine archaeological resources could occur during the proposed additional site assessment activities and result in impacts on a discovered resource; however, such discoveries and impacts are considered unlikely based on the extent of known information generated from Beacon Wind's site characterization efforts and implementation of a post-review discovery plan (PRDP) developed for the undertaking. As such, the proposed additional site assessment activities would have similar negligible impacts on cultural, historical, or archaeological resources as Alternative A. Please refer to **Section 6.2.4** in the EA and BOEM's Finding of No Historic Properties Affected for additional information on BOEM's review and consultations pursuant to NHPA Section 106. The Finding is available on BOEM's website at: https://www.boem.gov/renewable-energy/state-activities/beacon-wind.

Non-Routine Events

Due to existing regulatory measures, information generated from Beacon Wind's initial site characterization activities, and implementation of a PRDP, reasonably foreseeable non-routine and low-probability events and hazards are unlikely to have impacts on cultural, historical, or archaeological resources.

Conclusion

Bottom-disturbing activities associated with the proposed Foundation Testing are the types of activities to affect cultural, historical, and archaeological resources, including historic properties. However, impacts of the Proposed Action on cultural, historical, and archaeological resources would be **negligible** as none of these resources that are historic properties are located within the geographic analysis area, and proposed bottom-disturbing activities avoid known locations of these resources.

A.4 References

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APPENDIX B: Beacon Wind Site Assessment Plan Amendment Air Emissions Calculations

Emission summary - suction bucket trials

Activity	VOC (tpy)	NO_X (tpy)	CO (tpy)	PM/PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	HAPs (tpy)	GHG (tpy CO_2e)
Vessel Transit	0.18	0.24	0.46	0.02	0.02	0.04	0.02	61.46
Vessel Non-Transit Activities	12.51	16.25	31.28	1.17	1.07	2.51	1.03	4,167.67
Suction Pump Engine	8.21E-03	0.30	0.22	1.30E-02	1.26E-02	2.70E-04	9.30E-04	29.80
Total Emissions (tons)	12.71	16.79	31.96	1.20	1.10	2.54	1.05	4,258.92

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

CO_2e = carbon dioxide equivalent; tpy = tons per year

Transit fuel consumption

Vessels/ Equipment	No. of Engines per Vessel	1. DP 2. Anchored 3. Spuds	Dimensions (ft) length x width x depth (draft)	Emission Factor Used (see EFs worksheet)	Engine Rating (hp)	Fuel Type	Transit Round Trips[1]	Transit Duration (hours/ round trip)[2]	Offshore Operating Days	Transit Average load (%)	Transit Fuel Usage Gallons (per vessel)
Work Boat		**1**	**515 x 89 x 39 (28)**								
Main Generators	4			3	4,424	Diesel	1	6	25	1	3,237
Main Generators	2			3	5,898	Diesel	1	6	25	1	2,158
Emergency Dive Generator	1			1	1,193	Diesel	0	0	0	0	0
Emergency Vessel Generator	1			1	493	Diesel	0	0	0	0	0
Suction Pump		**N/A**	**N/A**								
Main Engine	1			2	150	Diesel	0	0	25	0	0
Totals											**5,396**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

[1] A single round trip from an overseas port to the lease area is assumed.

[2] Trip time constitutes the roundtrip transit time to and from the project site, when located within 25 nm of the lease area boundary. The number of hours per trip were estimated based on an assumed transit speed of 10 knots. Round trip distance is estimated to be 60 nm.

Non-transit fuel consumption

Vessels/ Equipment	No. of Engines per Vessel	1. DP 2. Anchored 3. Spuds	Dimensions (feet) length x width x depth (draft)	Emission Factor Used[1]	Engine Rating (hp)	Fuel Type	Non-Transit Operating Hours (per day)[2]	Non-Transit Total Operating Hours	Non-Transit Average load (%)	Non-Transit Fuel Usage Gallons (per vessel)
Work boat[3]		**1**	**515 x 89 x 39 (28)**							
Main Generators	4			3	4,424	Diesel	24	600	0	219,543
Main Generators	2			3	5,898	Diesel	24	600	0	146,362
Emergency Dive Generator	1			1	1,193	Diesel	0	0	0	0
Emergency Vessel Generator	1			1	493	Diesel	0	0	0	0
Suction Pump		**N/A**	**N/A**							
Main Engine	1			2	150	Diesel	14	350	1	2,626
TOTALS										**368,531**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

[1] See Emission Factors worksheet.

[2] Operating hours/day assumes that the vessel will operate continuously in the lease area during the suction bucket trials.

[3] Work boat main engine load during transit is based on Equation 3.6 in the USEPA 2022, with an assumed vessel speed equal to 82% of the maximum speed. Work boat main engine load during non-transit activities is based on the default auxiliary engine load factor in Table 4.4 of USEPA 2022. The suction pump engine is assumed to operate at 100% load when in use.

Non-transit emissions

Vessels/ Equipment	Total Non-Transit Emissions (tons)										
	VOC	NO_X	CO	PM_{10}	$PM_{2.5}$	SO_2	HAPs	CO_2	CH_4[4]	N_2O[4]	CO_2e[4]
Work Boat											
Main Generators[1]	7.51	9.75	18.77	0.7	0.64	1.5	0.62	2,467.22	0.04	0.11	2,500.60
Main Generators[1]	5.01	6.5	12.51	0.47	0.43	1	0.41	1,644.81	0.03	0.07	1,667.07
Emergency Dive Generator[2]	0	0	0	0	0	0	0	0	0	0	0
Emergency Vessel Generator[2]	0	0	0	0	0	0	0	0	0	0	0
Suction Pump[3]											
Main Engine	8.21E-03	0.3	0.22	1.30E-02	1.26E-02	2.70E-04	9.30E-04	29.36	3.54E-04	1.44E-03	29.8
Total	**12.52**	**16.55**	**31.5**	**1.18**	**1.09**	**2.51**	**1.03**	**4,141.39**	**0.06**	**0.18**	**4,197.46**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

[1] Work boat main generator engines are assumed to meet MARPOL and/or USEPA Tier 3 emission standards for Category 3 engines for NO_X, CO, and HC. An engine speed of 500 rpm was assumed for all Category 3 engines. For PM, the value for Category 3 propulsion engines in USEPA 2022 was used since USEPA has not established a PM standard for Category 3 engines. (For standards presented as a combined NO_X + HC total, the HC fraction was assumed to equal 0.19 g/kWh.) Emission factors for SO_2, CO_2, CH_4, and N_2O are from USEPA 2022. (See emission factors summary page.)

[2] Emission factors for marine vessel emergency engines are from USEPA 2022.

[3] The suction pump engine is assumed to meet the USEPA Tier 2 standards for Category 1 engines in 40 CFR 1042 for NO_X, CO, and HC (displacement 0.9-1.2 L/cylinder, model year 2004+). (For standards presented as a combined NO_X + THC total, the THC fraction was assumed to equal 0.19 g/kWh.) Emission factors for SO_2, CO_2, CH_4, and N_2O are from USEPA 2022.

[4] CO_2e emission rates use the following carbon equivalence factors: 25 for CH_4, and 298 for N_2O.

Transit emissions

Vessels/ Equipment	Total Transit Emissions (tons)										
	VOC	NO_X	CO	PM_{10}	$PM_{2.5}$	SO_2	HAPs	CO_2	CH_4[4]	N_2O[4]	CO_2e[4]
Work Boat											
Main Generators[1]	0.11	0.14	0.28	1.03E-02	9.51E-03	0.02	9.13E-03	36.38	5.54E-04	1.61E-03	36.87
Main Generators[1]	0.07	0.1	0.18	6.89E-03	6.34E-03	1.48E-02	6.09E-03	24.25	3.69E-04	1.07E-03	24.58
Emergency Dive Generator[2]	0	0	0	0	0	0	0	0	0	0	0
Emergency Vessel Generator[2]	0	0	0	0	0	0	0	0	0	0	0
Suction Pump[3]											
Main Engine	0	0	0	0	0	0	0	0	0	0	0
Total	**0.18**	**0.24**	**0.46**	**0.02**	**0.02**	**0.04**	**0.02**	**60.64**	**9.23E-04**	**2.68E-03**	**61.46**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

[1] Work boat main generator engines are assumed to meet MARPOL and/or USEPA Tier 3 emission standards for Category 3 engines for NO_X, CO, and HC. An engine speed of 500 rpm was assumed for all Category 3 engines. For PM, the value for Category 3 propulsion engines in USEPA 2022 was used since USEPA has not established a PM standard for Category 3 engines. (For standards presented as a combined NO_X + HC total, the HC fraction was assumed to equal 0.19 g/kWh.) Emission factors for SO_2, CO_2, CH_4, and N_2O are from USEPA 2022. (See emission factors summary page.)

[2] Emission factors for marine vessel emergency engines are from USEPA 2022.

[3] The suction pump engine is assumed to meet the USEPA Tier 2 standards for Category 1 engines in 40 CFR 1042 for NO_X, CO, and HC (displacement 0.9-1.2 L/cylinder, model year 2004+). (For standards presented as a combined NO_X + THC total, the THC fraction was assumed to equal 0.19 g/kWh.) Emission factors for SO_2, CO_2, CH_4, and N_2O are from USEPA 2022.

[4] CO_2e emission rates use the following carbon equivalence factors: 25 for CH_4, and 298 for N_2O.

Commercial marine vessels

Engine Type		Commercial Marine Vessel Emission Factors (g/kWh)[1, 2, 3]									Fuel Consumption (gal/kWh)[6]
		VOC	NO_x	CO	PM/PM_{10}[4]	$PM_{2.5}$[4]	SO_2[5]	CO_2	CH_4	N_2O	
1.11	USEPA default, Cat 1, Tier 1/2, kW ≥ 37, all displacement ranges (propulsion)	0.43	9.8	1.8	0.43	0.42	0.0062	679	0.0082	0.0332	0.067
1.12	USEPA default, Cat 1, Tier 1/2, kW ≥ 37, all displacement ranges (auxiliary)	0.43	9.8	1.8	0.73	0.71	0.0062	679	0.0082	0.0332	0.067
1.21	USEPA default, Cat 2, Tier 1/2, all kW ranges, all displacement ranges (all)	0.14	10.55	2.48	0.31	0.3	0.0062	679	0.0027	0.0332	0.067
1.31	USEPA default, Cat 3, 1999 and earlier, MSD engines, MGO/MDO fuel (propulsion)	0.53	13.2	1.1	0.19	0.17	0.401	657	0.01	0.029	0.064
1.32	USEPA default, Cat 3, 1999 and earlier, MSD engines, MGO/MDO fuel (auxiliary)	0.42	13.8	1.1	0.19	0.17	0.424	696	0.008	0.029	0.068
2.01	USEPA Tier 2 (Category 1 engines 2004+)	0.19	7.01	5	0.3	0.29	0.0062	679	0.0082	0.0332	0.067
3.03	MARPOL/USEPA Tier 3 (Category 3 engines 2016+)	2	2.6	5	0.19	0.17	0.401	657	0.01	0.029	0.064

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

g/kWh = grams per kilowatt hour; gal/kWh = gallons per kilowatt hour

[1] Default emission factors for NO_X, VOC, CO, PM_{10}, $PM_{2.5}$, SO_2, CO_2, and CH_4 from Category 1 and Category 2 engines (when age is unknown) are based on the worst case of either the Tier 1 or Tier 2 values in the following sections of USEPA 2022: Table H.1 for NO_X; Table H.2 for PM_{10} and $PM_{2.5}$; Table H.3 for VOC and CH_4; Table H.4 for CO; Table H.7 for $SO_2$and CO_2; and Equation 4.3 for N_2O.

[2] Default emission factors for Category 3 engines are based on the values for 1999 and earlier engines in the following sections of USEPA 2022: Table 3.5 for NO_X; Equation 3.3 for PM_{10}; Table 3.8 for VOC, CO, and CH_4; Equation 3.4 for CO_2; Equation 3.5 for SO_2; and Table 3.9 for N_2O. Brake specific fuel consumption (BSFC) for Category 3 engines is from Table 3.6 of USEPA 2022. $PM_{2.5}$ for Category 3 engines is assumed to be 92% of the PM_{10} value, based on section 3.5.3 of USEPA 2022.

[3] For Category 1 engines assumed to be subject to USEPA Tier 2, the appropriate emission standards from 40 CFR 1042 were used for NO_X, CO, and HC. (For standards presented as a combined NO_X + THC total, the THC fraction was assumed to equal 0.19 g/kWh.) For Category 3 engines assumed to be subject to MARPOL and/or USEPA Tier 3, the appropriate emission standards from 40 CFR 1042 were used for NO_X, CO, and HC. An engine speed of 500 rpm was assumed for all Category 3 engines. For PM, the value for Category 3 propulsion engines in USEPA 2022 was used, since USEPA has not established a PM standard for Category 3 engines. (For standards presented as a combined NO_X + HC total, the HC fraction was assumed to equal 0.19 g/kWh.)

[4] All PM is assumed to less than 10 µm in diameter; therefore, PM emission factor is equivalent to PM_{10} emission factor. For Category 1 and 2 engines, $PM_{2.5}$ is estimated to be 97 % of PM_{10}, per section 4.5.3 of USEPA 2022; for Category 3 engines, $PM_{2.5}$ is assumed to be 92% of PM_{10}, per section 3.5.3 of USEPA 2022.

[5] SO_2 emission factors assume a fuel sulfur content of: 0.0015 percent by weight for Category 1 and 2 engines (Table H.7 of USEPA 2022); and 0.1 percent by weight for Category 3 engines (Equation 3.5 of USEPA 2022).

[6] Fuel consumption for Category 1 and 2 marine engines was based on the brake specific fuel consumption (BSF) value provided in section 4.5.2 of USEPA 2022 for engines≥ 37 kW, with an assumed fuel density of 3.18 kg/gallon. Fuel consumption for Category 3 marine engines was based on the BSFC values (g/kWh) provided in USEPA 2022, with an assumed fuel density of 3.18 kg/gallon.

USEPA NEI HAP emission factors for commercial marine vessels

Pollutant	HAP?[1]	Fraction of[2]	Fraction (all engines Cat 1/2/3, all fuel types, all operating modes)[2]
Ammonia	No	$PM_{2.5}$	0.019247
Antimony	Yes	$PM_{2.5}$	0.000615
Arsenic	Yes	$PM_{2.5}$	2.59E-05
Benz[a]Anthracene	Yes	$PM_{2.5}$	8.82E-06
Benzo(g,h,i)Perylene	Yes	$PM_{2.5}$	0.000132
Benzo[a]Pyrene	Yes	$PM_{2.5}$	4.18E-06
Benzo[b]Fluoranthene	Yes	$PM_{2.5}$	8.35E-06
Benzo[k]Fluoranthene	Yes	$PM_{2.5}$	4.18E-06
Cadmium	Yes	$PM_{2.5}$	0.000236
Chromium (VI)	Yes	$PM_{2.5}$	7.24E-09
Chrysene	Yes	$PM_{2.5}$	1.63E-05
Dibenzo[a,h]anthracene	Yes	$PM_{2.5}$	8.65E-06
Fluoranthene	Yes	$PM_{2.5}$	8.97E-05
Indeno[1,2,3-c,d]Pyrene	Yes	$PM_{2.5}$	8.35E-06
Lead	Yes	$PM_{2.5}$	0.000125
Manganese	Yes	$PM_{2.5}$	3.22E-06
Mercury	Yes	$PM_{2.5}$	4.18E-08
Nickel	Yes	$PM_{2.5}$	0.000687
Polychlorinated Biphenyls	Yes	$PM_{2.5}$	4.18E-07
Pyrene	Yes	$PM_{2.5}$	3.37E-05
Selenium	Yes	$PM_{2.5}$	4.38E-08
Total HAP (ratioed to $PM_{2.5}$)			**0.0213**
1,3-Butadiene	Yes	VOC	0.001013
2,2,4-Trimethylpentane	Yes	VOC	0.00712
Acenaphthene	Yes	VOC	5.09E-05
Acenaphthylene	Yes	VOC	0.000118
Acetaldehyde	Yes	VOC	0.009783

Pollutant	HAP?[1]	Fraction of[2]	Fraction (all engines Cat 1/2/3, all fuel types, all operating modes)[2]
Acrolein	Yes	VOC	0.001848
Anthracene	Yes	VOC	0.000344
Benzene	Yes	VOC	0.004739
Ethyl Benzene	Yes	VOC	0.000439
Fluorene	Yes	VOC	0.000164
Formaldehyde	Yes	VOC	0.042696
Hexane	Yes	VOC	0.00279
Naphthalene	Yes	VOC	0.00273
o-Xylene	Yes	VOC	0.000513
Phenanthrene	Yes	VOC	0.001356
Propionaldehyde	Yes	VOC	0.001517
Toluene	Yes	VOC	0.002035
Xylenes (Mixed Isomers)	Yes	VOC	0.001422
Total HAP (ratioed to VOC)			**0.0807**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

[1] For completeness, all of the pollutants in USEPA's database are shown, but not all are HAP as defined in Section 112 of the Clean Air Act and as updated in 40 CFR 63 Subpart C.

[2] HAP emission factors for commercial marine vessels were determined using the methodology identified by USEPA 2020; i.e., they are calculated as percentages of the $PM_{2.5}$ or VOC emissions from the CMVs.
HAP speciation profiles for Category 1 and 2 engines are from Table 8 of USEPA 2019 for Category 1 and 2 vessels. HAP speciation profiles for Category 3 and 2 engines are from Table 15 of USEPA 2019 for Category 3 vessels.

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APPENDIX C: Planned Action Scenario

C.1 Introduction

This appendix discusses resource-specific ongoing and reasonably foreseeable planned actions that could occur, and for which impacts from the Proposed Action could occur in the same location and timeframe as impacts from these other actions. The Proposed Action is approval of site assessment activities proposed by Beacon Wind LLC (Beacon Wind) in its Site Assessment Plan (SAP) Amendment (Tetra Tech 2023) within the Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0520, approximately 20 miles (32 kilometers) south of Nantucket, Massachusetts, and 60 miles (97 kilometers) east of Montauk, New York.

BOEM used a localized geographic scope to evaluate impacts from planned actions for resources that are fixed in nature (i.e., their location is stationary such as benthic and archaeological resources) or for resources where impacts from the Proposed Action would only occur in waters in the Lease Area (e.g., water quality). Although some resources are mobile, and, in some cases, migratory (e.g., marine mammals, sea turtles, and fish/fishing), impacts from the Proposed Action are anticipated to remain within the Lease Area, and, as a result, the geographic analysis area will remain the same.

BOEM has not defined onshore areas from which the Proposed Action would be visible as part of the analysis area because BOEM has concluded that the equipment and vessels performing these activities would be indistinguishable from existing lighted vessel traffic for an observer onshore.

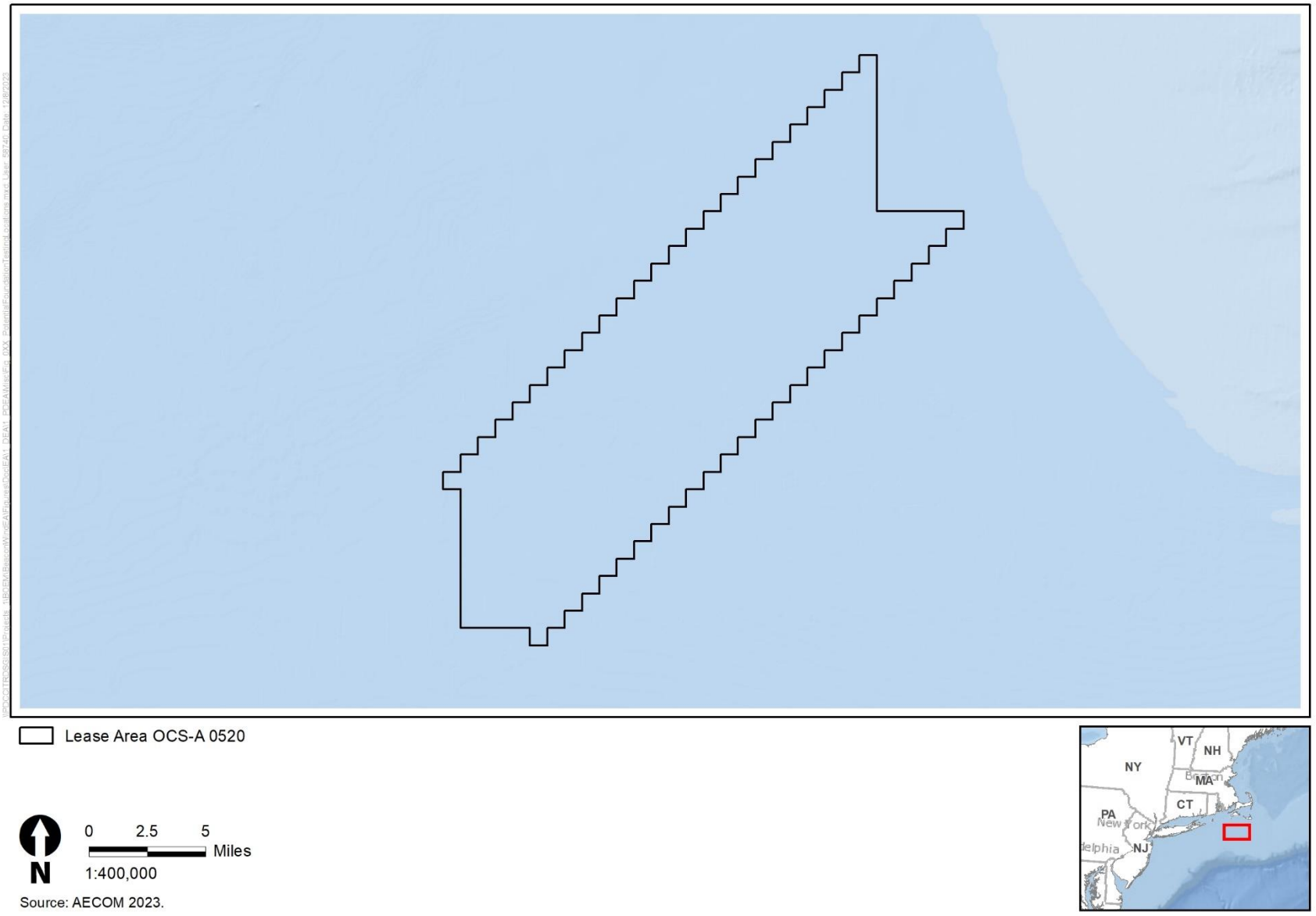

Figure C-1. Beacon Wind Lease Area geographic analysis area

C.2 Ongoing and Reasonably Foreseeable Planned Actions

This section includes a list of the projects and the impact-producing factors (IPFs) that BOEM has identified as potentially contributing to reasonably foreseeable impacts when combined with impacts from the Proposed Action over the geography described in **Section C.1**. Reasonably foreseeable planned actions, which are discussed in the following subsections, include eight types of actions: (1) other wind energy development activities, such as site characterization surveys, site assessment activities, and construction, operation, and decommissioning of wind energy facilities; (2) marine minerals use and ocean dredged material disposal; (3) military use; (4) marine transportation; (5) fisheries use and management; and (6) global climate change.

IPFs associated with the Proposed Action include:

- Increased vessel presence and traffic resulting in associated noise, air emissions, lighting, vessel discharges, and the potential for strikes and spills.
- Space-use conflicts during survey activities.

The six types of actions listed are anticipated to all result in IPFs that overlap both spatially and temporally with the Proposed Action and that would affect the same resources. BOEM (2019) provides additional information about the IPFs associated with each action. The six types of activities that make up the Planned Actions Scenario are described in **Sections C.2.1** through **C.2.6**.

C.2.1 Other Wind Energy Development Activities

These activities would include site assessment activities (similar to the Proposed Action), as well as construction and operation of wind turbines for any other wind energy projects in the timeframe that overlaps with the Proposed Action (2024). **Table C-1** provides a list of these Atlantic offshore wind development projects.

Table C-1. Ongoing and planned wind energy development in the geographic analysis area within the timeframe of the Proposed Action

Lease	Lease/Project/Lease Remainder	Status	Estimated Offshore Construction Schedule
Block Island (Rhode Island state waters)	Block Island	Five turbines	Built
OCS-A 0501	Vineyard Wind 1, part of OCS-A 0501	Existing and ongoing	2023–2025
OCS-A 0517	South Fork	Existing and ongoing	2021–2023
OCS-A 0486	Revolution Wind	Existing and ongoing	2023–2025
OCS-A 0487	Sunrise Wind, part of OCS-A 0487	Planned	2023–2025
OCS-A 0534	New England Wind OCS-A 0534 and portion of OCS-A-501 (Phase 1 [i.e., Park City Wind])	Planned	2025–2026

C.2.2 Marine Minerals Use and Ocean Dredged Material Disposal

To help meet the sand resource needs of coastal communities, BOEM-funded reconnaissance or design-level Outer Continental Shelf (OCS) studies along the East Coast from Rhode Island to Florida have identified potential future sand resources in many areas. No sand resources were identified within the Project Lease Area. Sand resources identified nearest the Project include OCS locations offshore Massachusetts and Rhode Island; many of these potential sand resources are within 5 miles of the Project Lease Area and associated planned infrastructure (e.g., export cables) (Mabee and Woodruff 2016, King et al. 2016).

U.S. Environmental Protection Agency (USEPA) Region 1 is responsible for designating and managing ocean disposal sites for all materials except dredged material in the region of the Project. The U.S. Army Corps of Engineers (USACE) is the permitting agency for ocean disposal of dredged material; all ocean sites for the disposal of dredged material are permitted or authorized under the Marine Protection, Research, and Sanctuaries Act (16 United States Code [U.S.C.] § 1431 et seq. and 33 U.S.C. § 1401 et seq.). There is one active disposal site along the southern Massachusetts/Rhode Island Coast, the Rhode Island Sound Disposal Site (RISDS) located approximately 10 miles (16 kilometers) northeast of Block Island. The RISDS was first used in 2003 and was last used in 2019 (USACE 2022). The Eastern Long Island Sound Disposal Site (ELDS) offshore New London, Connecticut, is permitted for offshore disposal but has not been used (USACE 2022).

C.2.3 Military Use

The Lease Area is within the Narragansett Bay Operations Area. The Narragansett Bay Operations Area extends from the shoreline seaward to approximately 180 nautical miles (nm) (333 kilometers) from land at its farthest point; the subsurface portion of the Narragansett Bay Operations Area has the same boundaries as the surface water portion. The offshore Narragansett Bay Range Complex provides infrastructure for U.S. Atlantic Fleet training and testing exercises (U.S. Navy 2018). The offshore Narragansett Bay Range Complex also supports training and testing by other services (Ecology & Environment 2016).

Military activities with the Narragansett Bay Range Complex 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 the USCG Academy (BOEM 2013; Rhode Island Coastal Resources Management Council 2010). The U.S. Atlantic Fleet also conducts training and testing exercises in the Narraganset Bay Operations Area, and the Newport Naval Undersea Warfare Center routinely performs testing in the area (BOEM 2013).

C.2.4 Marine Transportation

Marine transportation in the region is diverse and sourced from many ports and private harbors. Commercial vessel traffic in the region includes research, tug/barge, tankers (such as those used for liquid petroleum), cargo, cruise ships, smaller passenger vessels, and commercial fishing vessels. Recreational vessel traffic includes private motor and sailboats. A number of Federal agencies, state agencies, educational institutions, and environmental non-governmental organizations participate in ongoing research offshore—including oceanographic, biological, geophysical, and archaeological surveys. Most vessel traffic, excluding recreational vessels, tends to travel within established vessel traffic routes, and the number of trips, as well as the number of unique vessels, has remained consistent since 2017 (USCG 2021). In response to future offshore wind projects in the New York Bight, multiple additional fairways and a new anchorage may be established to route existing vessel traffic around wind energy projects (USCG 2021). Two Maritime Highway Routes are designated in the Atlantic Coast by the U.S. Department of Transportation Maritime Administration: Marine Highway M-95 (Atlantic Ocean Coastal Waters), which extends from Florida to Maine, and Marine Highway M-295, which includes the East River (New York Harbor) and Long Island Sound (New York and Connecticut) to Block Island Sound (Rhode Island) (USDOT 2022).

C.2.5 Fisheries Use and Management

The National Marine Fisheries Service (NMFS) implements regulations to manage commercial and recreational fisheries in federal waters, including those within which the Project would be located; the State of Massachusetts regulates commercial fisheries in state waters (within 3 nm [5.6 kilometers] of the coastline). The Project (including landfall and potential marshalling and operations and maintenance [O&M] port locations) overlaps two of NMFS's 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 NEFMC, which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (NEFMC 2022). The councils manage species with many Fishery Management Plans (FMPs) that are frequently updated, revised, and amended and coordinate with each other to jointly manage species across jurisdictional boundaries (MAFMC 2022). 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). The ASMFC is composed of the 15 Atlantic coast states and coordinates the management of marine and anadromous resources found in the states' marine waters. In addition, the states and NMFS, under the framework of ASMFC's *Amendment 3 to the Interstate Fishery Management Plan for American Lobster* cooperatively manage the American lobster resource and fishery (NOAA 1997).

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

NMFS also manages highly migratory species, such as tuna and sharks, that can travel long distances and cross domestic boundaries. **Table C-2** summarizes other FMPs and actions in the region.

Table C-2. Other fishery management plans

Area	Plan and Projects
ASMFC	ASMFC *Five-Year Strategic Plan 2019–2023* (ASMFC 2019) ASMFC 2022 Action Plan (ASMFC 2021) *Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change* (ASMFC 2018).
Massachusetts	Massachusetts Shellfish Initiative 2021–2025 Strategic Plan (MSI 2021).
Rhode Island	Rhode Island 2018 Shellfish Sector Management Plan (RIDEM 2018) Rhode Island Department of Environmental Management Division of Marine Fisheries Strategic Plan (2021–2025) (RIDEM 2021).

C.2.6 Global Climate Change

Climate change results primarily from the increasing concentration of greenhouse gas (GHG) emissions in the atmosphere, which causes planet-wide physical, chemical, and biological changes, substantially affecting the world's oceans and lands. Changes include increases in global atmospheric and oceanic temperature, shifting weather patterns, rising sea levels, and changes in atmospheric and oceanic chemistry (Blunden and Arndt 2020). Section 7.6.1.4 of the *Programmatic EIS for Alternative Energy*

Development and Production and Alternate Use of Activities on the Outer Continental Shelf (MMS 2007) describes global climate change with respect to assessing renewable energy development. Key drivers of climate change are increasing atmospheric concentrations of carbon dioxide (CO_2) and other GHGs, such as methane (CH_4) and nitrous oxide (N_2O). These GHGs reduce the ability of solar radiation to reradiate out of Earth's atmosphere and into space. Although all three of these GHGs have natural sources, the majority of these GHGs is released from anthropogenic activity. Since the industrial revolution, the rate at which solar radiation is reradiated back into space has slowed due to increasing GHG concentrations in the atmosphere, resulting in a net increase of energy in the Earth's system (Solomon et al. 2007). This energy increase presents as heat, raising the planet's temperature and causing climate change.

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

The Intergovernmental Panel on Climate Change 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 due to climatic changes such as extreme weather and drought; global sea level rise; impacts on terrestrial ecosystems; impacts on marine biodiversity, fisheries, and ecosystems and their functions and services to humans; and impacts on health, livelihoods, food security, water supply, and economic growth (IPCC 2018). Higher global temperatures increase the chances of sea level rise by the end of the century, with a projected relative sea level rise of 2 to 7.2 feet (0.6 to 2.2 meters) along the contiguous U.S. coastline by 2100 (NOAA 2022). Expected relative sea level rise would cause tide and storm surge heights to increase, leading to a shift in the U.S. coastal flood regimes by 2050 with major and moderate high tide flood events occurring as frequently as moderate and minor high tide flood events occur today (NOAA 2022).

Global emissions of GHGs have impacts whose local effects are being increasingly elucidated through research. For example, a recent study concerning the North Atlantic right whale provides evidence that the whale's feeding area moved north following relocation of its food source related to climate change, and whale mortality may have increased because of fewer controls on fishing activities in the new, more northerly area (Meyer-Gutbrod et al. 2021). Climate change is predicted to affect Northeast fishery species in different ways (Hare et al. 2016), and the NMFS biological opinion discusses in detail the potential impacts of global climate change on protected species that occur within the Proposed Action area (NMFS 2013).

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

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APPENDIX E: Public Comments and BOEM's Responses

E.1 Introduction

BOEM solicited comments from the public on the Environmental Assessment (EA) for Additional Site Assessment Activities on Beacon Wind, LLC's Renewable Energy Lease OCS-A 0520 during a 30-day public scoping period from November 7 to December 7, 2023. This appendix outlines the methodology used to analyze public comments, summarizes key themes or issues conveyed in comments, and provides BOEM's responses.

E.1.1 Notice of Intent to Prepare an EA

On November 7, 2023, BOEM released a Notice of Intent (NOI) (https://www.federalregister.gov/documents/2023/11/07/2023-24610/notice-of-intent-to-prepare-an-environmental-assessment-for-additional-site-assessment-activities-on) to prepare this EA for additional site assessment activities in Lease Area OCS-A 0520 offshore Massachusetts, which commenced the public scoping process for identifying issues for consideration in the EA. The formal scoping period was from November 7 through December 7, 2023. During this timeframe, federal agencies, state and local governments, and the general public had the opportunity to help BOEM identify potential significant resources and issues, impact-producing factors (IPFs), reasonable alternatives, and potential mitigation measures to analyze in the EA, as well as to provide additional information. During the 30-day comment period, BOEM received 9 unique comment submissions from representatives of federal, state, or regional government entities; business associations; advocacy groups; and the general public. The comments can be viewed at www.regulations.gov by searching for docket ID BOEM-2023-062.

E.1.2 Comment Review and Response Protocol

All comment submissions were reviewed and systematically categorized in the same manner. One or more comment excerpts from each submission were categorized to a single topic and summarized for review and response.

E.2 Summary of Comments

This section provides an overview and summary of the comments received by topic and is not intended to be a reproduction of the exact wording of individual comments. The summaries illustrate the varied issues, concerns, and requested changes presented in the public comments. BOEM responses to comments refer readers to where issues are discussed in the Draft Environmental Assessment (EA), acknowledge revisions made in response to comments or provide rationale for not making revisions, and provide other clarifications and information.

E.2.1 Proposed Action/ Project Design Envelope

Comment Summary

Commenters urged BOEM to require relevant geological information to be available early in the process, stating that it has the potential to change the project design.

One commenter requested that the resiliency of suction buckets to extreme weather conditions be analyzed as storm frequency will increase due to climate change, and another stated that the proposed sites for the foundation tests should be representative of the entire project area and contain multiple soil types.

Commenters encouraged the use of quieter foundations during project installation and encouraged these options to be selected as the Preferred Alternative.

BOEM Response to Comments

Comments in support of, and opposition to, the site assessment activities within the Beacon Wind Lease Area are noted.

As discussed in Section 2 of the EA, this analysis does not consider whether a site is suitable for commercial development, as will be determined during BOEM's review of the lessee's Construction and Operations Plan (COP). An environmental analysis of the project-specific design parameters would be conducted at that time.

E.2.2 Alternatives

Comment Summary

One commenter discussed various concepts, strategies, tools, and safeguards for BOEM to consider including when developing the range of alternatives for the Proposed Action. These consisted of vessel traffic plans, additional monitoring technologies such as infrared camera detection devices, limitations on vessel speeds to less than 10 knots, and requiring vessels to be equipped with Class A automatic Identification System devices in order to minimize effects on marine wildlife, specifically North Atlantic right whales (NARWs).

A commenter encouraged BOEM to include alternatives specific to each phase of the project to ensure environmental effects are avoided or mitigated.

BOEM Response to Comments

The EA will include all relevant Project Design Criteria (PDC) and Best Management Practices (BMPs) from the 2021 programmatic consultation for site characterization activities associated with offshore

wind leases on the Atlantic Outer Continental Shelf as mitigation measures rather than alternatives.[4] These PDC and BMPs include many of the measures suggested by commenters. BOEM will review any novel suggestions and consider them for inclusion in the EA. BOEM will ensure that impacts of the Proposed Action are avoided or minimized to the greatest extent practicable and that the Proposed Action includes robust, enforceable mitigation measures for anticipated impacts.

E.2.3 National Environmental Policy Act / Public Involvement Process

Comment Summary

One commenter felt that an EA is not required for the Proposed Action, stating that the 2014 EA was comprehensive enough to cover the planned actions and anticipated impacts and encouraging BOEM to approve revisions to the Site Assessment Plan (SAP) without preparing an EA. The commenter cited concern for delays that could be a disincentive or preclude the use of the foundation technology, urging BOEM to be mindful of timing issues when preparing and publishing the EA. The commenter suggested that if BOEM was to move forward to an EA, to do so under certain conditions including immediately preparing a final EA at the close of the scoping period, revising the 2014 EA based on comments received, and/or applying applicable Standard Operating Conditions from the 2014 EA.

Commenters also requested for BOEM to ensure the SAP clarifies which data relative to the Proposed Action would be treated as public versus confidential business information, data used in preparing the EA is based on actual observations and representative of key processes, and the project complies with existing laws. One commenter asked that BOEM prepare an Environmental Impact Statement (EIS) if impacts from the Proposed Action are found to be significant.

Commenters requested that data from the suction bucket foundation tests be made available to the public and accessible on a publicly available website as quickly as possible, along with any other site assessment information and reports and data related to the project and its monitoring program.

Multiple commenters expressed concern regarding BOEM's current approach to public engagement. Commenters stated that BOEM has historically ignored requests for transparency and authentic inclusion, preventing meaningful engagement. Commenters requested that BOEM work to improve communication and forge working relationships with stakeholder groups and the public.

BOEM Response to Comments

BOEM notes the commenter's request to immediately prepare a final EA.

BOEM has published the SAP Amendment on the Beacon Wind webpage available at: https://www.boem.gov/renewable-energy/state-activities/beacon-wind.

[4] Available at: https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%201222021.pdf.

BOEM is using regulatory tools and working with partners and stakeholders to avoid, minimize, and mitigate impacts and equitably distribute benefits. BOEM is also working to enhance engagement with environmental justice communities.

E.2.4 Connected Actions, Planned Actions Scenario, and Cumulative Impacts

Comment Summary

One commenter encouraged BOEM to consider both immediate and cumulative impacts on ocean wildlife when reviewing the Proposed Action and include an analysis of the effects of the Proposed Action on species listed under the Endangered Species Act and Marine Mammal Protection Action.

BOEM Response to Comments

Cumulative impacts are referred to as planned actions in this EA. Planned actions are described in **Appendix C**. This EA addresses site assessment activities in the specifically identified Beacon Wind Lease Area. Potential impacts of offshore wind development will be assessed in the EIS as the lessee submitted a Construction and Operations Plan (COP) to BOEM on June 5, 2023.

E.2.5 Mitigation and Monitoring

Comment Summary

Commenters provided various mitigation and monitoring measures to minimize impacts to marine mammals, particularly NARW, for BOEM to consider or include in the EA. Suggested measures included use of Protected Species Observers, implementation of clearance and shutdown zones, seasonal restrictions for noise-producing activities, vessel speed restrictions, implementation of vessel separation distances, and training and reporting requirements. Commenters also recommended vessel speed restrictions in areas where sea turtles may be foraging. Commenters also urged BOEM to incentivize the use of environmentally responsible design alternatives, to ensure the developer's actions aim to avoid, mitigate, and monitor impacts, and to increase the overall rigor of the mitigation measures proposed for the Proposed Action.

BOEM Response to Comments

The EA will include all relevant PDC and BMPs from the 2021 programmatic consultation for site characterization activities associated with offshore wind leases on the Atlantic Outer Continental Shelf.[5] These PDC and BMPs include many of the measures suggested by commenters. BOEM will review any novel suggestions and consider them for inclusion in the EA. BOEM will ensure that impacts of the Proposed Action are avoided or minimized to the greatest extent practicable and that the Proposed Action includes robust, enforceable mitigation measures for anticipated impacts.

[5] Available at: https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%201222021.pdf

E.2.6 Benthic Resources

Comment Summary

One commenter requested that benthic resources be studied further. Comments encouraged studies on sediment characterization, resuspension of sediments, plume dispersal, and deposition to be conducted.

One commenter stated that the Proposed Action may have different habitat impacts compared to other foundation technologies and urged BOEM to ensure this difference was fully accounted for and analyzed in the EA.

BOEM Response to Comments

The EA evaluates all potential impacts of the Proposed Action, including but not limited to resuspension of sediments, sediment plume dispersal, and sediment deposition. Additionally, habitat impacts related specifically to suction-bucket foundations are analyzed using best available information.

E.2.7 Finfish, Invertebrates, and Essential Fish Habitat

Comment Summary

Commenters urged BOEM to assess impacts on ichthyoplankton and ensure discussions of sediment and habitat disturbance, direct and indirect effects, the extent of the area effected, and effects of pumping water on eggs, larvae, and prey organisms, as well as how activities will avoid and minimize adverse impacts on Essential Fish Habitat (EFH), were included in the Proposed Action's EA, Biological Assessment, and EFH assessment.

Another commenter requested that the EA include a detailed assessment of the effects the project will have on EFH, as well as a range of alternatives to minimize effects and conserve these habitats. The commenter requested that particular attention be given to areas designated as Habitat Areas of Particular Concern (HAPC) due to their ecological importance and sensitivity. The commenter noted that The New England Fishery Management Council voted to establish a new HAPC that overlaps with offshore wind energy lease sites in Southern New England and requested that BOEM ensure this area is considered in its EFH consultation.

The commenter also encouraged BOEM to consult with the New England Fishery Management Council to provide recommendations concerning activities that may affect EFH, as well as with state and regional managers of the Atlantic States Marine Fisheries Commission to minimize effects on inshore fisheries and habitats.

BOEM Response to Comments

The EA will evaluate all potential impacts on finfish, invertebrates, and EFH, including but not limited to potential disturbance of sediments and habitat and entrainment. Evaluations will include the spatial extent of impacts where appropriate. The EA will also include measures to avoid or minimize impacts. Detailed evaluations for Endangered Species Act (ESA)-listed fish species and EFH will be provided in the Biological Assessment and EFH Assessment for the Proposed Action, respectively.

The EA will identify species with EFH in the area affected by the Proposed Action and evaluate all potential impacts on these habitats. No designated HAPCs are present within the area that would be affected by the Proposed Action.

BOEM is consulting with National Marine Fisheries Service (NMFS) under the Magnuson-Stevens Fishery Conservation and Management Act regarding potential impacts on EFH. Other interested agencies will have the opportunity to comment on the draft EA when it is published, and their comments will be addressed in the final EA.

E.2.8 Marine Mammals

Comment Summary

Commenters expressed concern over potential negative effects the Proposed Action could have on marine mammals, including the NARW. Commenters stated that wind turbines could disrupt dense concentrations of zooplankton whales depend upon and that whales could be accidentally hit by vessels or entangled in offshore wind turbine cables and killed. One commenter felt that there were significant knowledge gaps in the feeding patterns and prey selection of NARWs in the Nantucket Shoals region, stating that more information is needed before offshore wind construction can begin.

Commenters were also concerned about the potential direct and indirect noise impacts on whales and sea turtles, including habitat displacement. One commenter requested that a visual clearance zone and exclusion zone be established around each vessel conducting activities with noise levels that could harm whales.

Multiple commenters expressed concern over the potential for the Proposed Action to result in NARW mortalities from vessel strikes. Many commenters urged BOEM to require restrictions on vessel speeds, specifically between certain times of the year, for vessels of greater size, and within NARW Dynamic Management Areas. Commenters also felt that vessels should be required to carry and use protected species observers and maintain specified separation distances from large whales.

One commenter requested that BOEM conduct consultation and permitting under the ESA and Marine Mammal Protection Act, completing a Biological Opinion and obtaining Incidental Harassment Authorizations.

BOEM Response to Comments

The EA will evaluate all potential impacts of the Proposed Action, including but not limited to noise and vessel strikes, on marine mammals. Impacts on NARW will be further evaluated in the Biological Assessment for the Proposed Action. As described in Section E.2.5, the EA will include mitigation measures to ensure that impacts of the Proposed Action are avoided or minimized to the greatest extent practicable. The Proposed Action will undergo all applicable consultations, including consultations under the National Environmental Protection Act, the ESA, and the Marine Mammal Protection Act. BOEM notes that the Proposed Action does not include construction of any offshore wind structures, as is suggested by some comments received on the NOI.

E.2.9 Navigation and Vessel Traffic

Comment Summary

One commenter requested requirements for all vessels to follow vessel plans and rules and specifying that developers are liable for the behavior of all employees, vessels, and machineries.

BOEM Response to Comments

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

E.2.10 Noise

Comment Summary

One commenter asked BOEM to ensure that the Biological Assessment, EFH Assessment, and EA fully addressed potential noise impacts, specifically from vessel survey equipment. Another commenter requested the EA require the best available technology to be used to minimize sound levels, coupled with a monitoring and reporting program to ensure compliance. One commenter felt that more information is needed on how much noise suction pump technologies generate relative to background noise.

BOEM Response to Comments

The EA will evaluate noise impacts of the Proposed Action based on the best available science. As noted above, the EA will include appropriate mitigation measures to ensure that impacts of the Proposed Action are avoided or minimized to the greatest extent practicable.

E.2.11 Commercial and Recreational Fishing

Comment Summary

One commenter requested that BOEM refer to their previous comments submitted on the Beacon Wind Construction and Operations Plan Environmental Impact Statement for further information on fisheries and fishing communities that may be affected by the Proposed Action.

BOEM Response to Comments

The Draft EA will provide a description of commercial and recreational fisheries resources in the Lease Area based on NMFS socioeconomic impact summary reports from 2008 to 2021. The description of resources will be broken down by species and by fishing port to characterize fisheries and fishing communities that may be affected by the Proposed Action.

E.2.12 General Support or Opposition

Comment Summary

BOEM received comments both in support of and opposition to the development of the Proposed Action. Many commenters expressed their support for the use of quiet foundation types and were hopeful that the Proposed Action could provide valuable information to advance deployment of quiet foundation technologies for offshore wind and mitigate noise impacts from offshore wind construction. Commenters felt that more information, as an outcome of the Proposed Action, could enable developers to make more reasonable and rational decisions. Commenters also expressed support for conducting an environmental review of the Proposed Action during the Site Assessment phase of development.

One commenter expressed his opposition for the Proposed Action, stating that offshore wind farms pose a significant threat to endangered wildlife, specifically NARWs, during both initial construction and operation.

BOEM also received comments that addressed multiple topics more generally. These comments urged BOEM to use the best available science, ensure the EA is updated with current knowledge, science, technology, and practice, and one comment recommended the use of turbines that emit lower noise levels.

BOEM Response to Comments

BOEM acknowledges both the public's support and opposition for the Proposed Action and offshore wind development generally.

APPENDIX F: Standard Operating Conditions

1 This section lists the Standard Operating Conditions (SOCs) and mitigation that are part of the Proposed Action. The SOCs were developed by the Bureau of Ocean Energy Management (BOEM) in coordination with cooperating agencies to avoid, minimize, or mitigate potential impacts. General Requirements

1.1 Prior to the start of operations, the Lessee must hold a briefing to establish responsibilities of each involved party, define the chains of command, discuss communication procedures, provide an overview of monitoring procedures, and review operational procedures. This briefing must include all relevant personnel, crew members, and protected species observers (PSOs). New personnel must be briefed as they join the work in progress.

1.2 The Lessee must ensure that all vessel operators and crew members, including PSOs, are familiar with, and understand, the requirements specified in Addendum C [https://www.boem.gov/sites/default/files/documents/regions/pacific-ocs-region/renewable-energy/Lease%20OCS-A%200520.pdf] of the lease.

1.3 Endangered Species Act (ESA) Consultation for Biological Surveys. The Lessee must consult with BOEM, the National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS) prior to designing and conducting a literature review intended to support offshore renewable energy plans that could interact with ESA-listed species.

2 Protected Species

2.1 Protected Species. Unless otherwise authorized by BOEM, Lessee's Outer Continental Shelf (OCS) activities must adhere to the standards outlined in the most recent literature review as well as any NMFS-approved measures for the protection of endangered and protected species in effect at the time the activity is initiated under this lease. Lessee, its operators, personnel, and contractors have the option to fulfill this requirement by complying with the latest NMFS-approved measures designed to safeguard these species, which may include updated versions of the literature review, or by engaging in new, activity-specific consultations.

3 Archaeological Requirements

3.1 Archaeological Survey Required. The Lessee must provide the results of an archaeological survey with its plans.

3.2 Qualified Marine Archaeologist. The Lessee must ensure that the analysis of archaeological survey data collected in support of plan (e.g., Site Assessment Plan [SAP] and/or Construction and Operations Plan [COP]) submittal and the preparation of archaeological reports in support of plan submittal are conducted by a Qualified Marine Archaeologist.

3.3 Monitoring and Avoidance. The Lessee must inform the Qualified Marine Archaeologist that he or she may elect to be present during the bottom-disturbing activities performed in support of plan (i.e., SAP and/or COP) submittal to ensure avoidance of potential archaeological resources, as determined by the Qualified Marine Archaeologist assessment detailed in the Marine

Archaeological Resources Assessment(MARA) (including bathymetric, seismic, and magnetic anomalies; side-scan sonar contacts; and other seafloor or sub-surface features that exhibit potential to represent or contain potential archaeological sites or other historic properties). In the event that the Qualified Marine Archaeologist indicates that he or she wishes to be present, the Lessee must reasonably facilitate the Qualified Marine Archaeologist's presence, as requested by the Qualified Marine Archaeologist, and provide the Qualified Marine Archaeologist the opportunity to inspect data quality.

3.4 **BOEM will include the following avoidance measures for adverse effects within the marine area of potential effects (APE):**

3.4.1 The Lessee will avoid all known and potential shipwrecks previously identified during marine archaeological surveys by a distance of no less than 55 yards (50 meters) from the known extent of the resource for placement of Project structures and when conducting seafloor-disturbing activities.

3.4.2 The Lessee will avoid all magnetic anomalies or acoustic contacts identified during marine archaeological surveys by a distance of no less than 55 yards (50 meters) from the known extent of the resource for placement of Project structures and when conducting seafloor-disturbing activities.

3.4.3 The Lessee will avoid all ancient submerged landform features (ASLFs). No additional avoidance buffer is required for these ASLFs given avoidance of the ASLFs is based on the defined spatial extent of each ASLF, which has been determined based on the maximum observed presence of the seismic reflector and unique buffer area designed to account for minimal positioning errors or lack of resolution.

3.5 No Impact without Approval. In no case may the Lessee knowingly impact a potential archaeological resource without the Lessor's prior approval.

3.6 Post-Activity Reporting. A series of as-placed plats must show the location of the placement of the testing infrastructure in relation to all known or potential shipwrecks, magnetic anomalies and sonar targets that require avoidance, and all ASLFs and their avoidance buffers. These plats must include both horizontal and vertical penetration into the seafloor and its distance from the above-named cultural resources.

3.7 Post-Review Discovery Clauses. If the Lessee, while conducting bottom-disturbing activities in support of plan submittal and after review of the location by a Qualified Marine Archaeologist under Section 4.2.4 of the lease, discovers an unanticipated potential archaeological resource, such as the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock) or evidence of a pre-contact archaeological site (e.g., stone tools, pottery, or other pre-contact artifacts) within the Project area, the Lessee must:

3.7.1 Immediately halt seafloor/bottom-disturbing activities within the area of discovery;

3.7.2 Notify the Lessor within 24 hours of discovery;

3.7.3 Notify the Lessor in writing via report to the Lessor within 72 hours of its discovery;

3.7.4 Keep the location of the discovery confidential and take no action that may adversely impact the archaeological resource until the Lessor has made an evaluation and instructs the applicant on how to proceed; and

3.7.5 If (1) the site has been impacted by the Lessee's Project activities or (2) impacts on the site or on the APE cannot be avoided, conduct additional investigations, as directed by the Lessor, to determine if the resource is eligible for listing in the National Register of Historic Places (NRHP) (30 Code of Federal Regulations [CFR] 585.802(b)). If investigations indicate that the resource is potentially eligible for listing in the NRHP, the Lessor will inform the Lessee how to protect the resource or how to mitigate adverse effects on the site. If the Lessor incurs costs in protecting the resource, then, under Section 110(g) of the National Historic Preservation Act (NHPA), the Lessor may charge the Lessee reasonable costs for carrying out preservation responsibilities under the OCS Lands Act (30 CFR 585.802(c-d)).

Progressive Transport/"Hopping." If at any point in the proposed testing operations, progressive transport/"hopping" activities are required to transport the jacket assembly or to support material barge loading (i.e., placing on the seafloor any part of the suction bucket structure assembly or jacket in between tests), a prior written request must be submitted, and approval must be obtained from the Office of Renewable Energy Programs. The request to use progressive transport must include a detailed procedural narrative and separate location plat for each "set-down" site, showing the location of all cables, anchor patterns for the derrick barge, and pipelines and any known archaeological or potentially sensitive biological features previously identified in that location. The diagram/map of the route to be taken from the initial or previous testing location along the transport path to each site must also be submitted with the request. If the proposed areas intended to be used as "set-down" sites have not been surveyed, the Lessee may be required to conduct the necessary surveys/reporting prior to mobilizing on site and conducting any seafloor-disturbing activities associated with the proposed testing operations.

4 Avian and Bat Survey and Reporting Requirements

4.1 Lighting. Nothing in this condition supersedes or is intended to conflict with lighting, marking, and signaling requirements of the Federal Aviation Administration (FAA), U.S. Coast Guard (USCG), or BOEM. Any lights used by the Lessee during site assessment activities must meet BOEM's Guidelines for Lighting and Marking of Structures Supporting Renewable Energy Development [https://www.boem.gov/2021-lighting-and-marking-guidelines]. For any additional lighting, the Lessee must use such lighting only when necessary, and the lighting must be hooded downward and directed, when possible, to reduce upward illumination and illumination of adjacent waters.

4.2 Incidental Mortality Reporting. The Lessee must provide an annual report to BOEM, the Bureau of Safety and Environmental Enforcement (BSEE), and USFWS documenting any dead (or injured) birds or bats found on vessels and structures during testing. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the U.S. Geological Survey Bird Band Laboratory, available at https://www.pwrc.usgs.gov/BBL/bblretrv/.