Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts

For U.S. Fish and Wildlife Service

Biological Assessment (October 2012)

U.S. Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

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Acronyms and Abbreviations

ADCP	Acoustic Doppler Current Profiler
BOEM	Bureau of Ocean Energy Management
C	Celsius
CODAR	Coastal Ocean Dynamic Application Radar
COP	Construction and Operations Plan
CPT	Cone Penetrometer Test
EA	Environmental Assessment
EPACT	Energy Policy Act of 2005
ESA	Endangered Species Act
F	Fahrenheit
GGARCH	Geological, Geophysical, and Archeological
GIS	Geographic Information System
HRG	High Resolution Geophysical
IP	Interim Policy
LIDAR	Light Detecting and Ranging
NM	Nautical Mile
NMFS	National Marine Fisheries Service
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
ROV	Remotely Operated Vehicle
SAMP	Special Area Management Plan
SAP	Site Assessment Plan
SODAR	Sonic Detection And Ranging
USACE	United States Army Corps of Engineers
USDOC	United States Department of Commerce
USDOI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
WEA	Wind Energy Area

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1 Introduction

The Energy Policy Act (EPACT) of 2005, Public Law No. 109-58, added Section 8(p)(1)(C) to the Outer Continental Shelf Lands Act (OCSLA), which grants the Secretary of the Interior the authority to issue leases, easements, or rights-of-way on the Outer Continental Shelf (OCS) for the purpose of renewable energy development (43 U.S.C. § 1337(p)(1)(C)). The Secretary delegated this authority to the former Minerals Management Service (MMS), now the Bureau of Ocean Energy Management (BOEM). On April 22, 2009, BOEM (formerly the Bureau of Ocean Energy Management, Regulation, and Enforcement [BOEMRE]) promulgated final regulations implementing this authority at 30 CFR 585.

This document is a biological assessment (BA) of impacts to endangered and threatened species listed under the Endangered Species Act (ESA) from proposed commercial wind energy lease issuance, associated site characterization activities, and subsequent site assessment activities on the OCS off Rhode Island and Massachusetts. This BA initiates informal consultation under Section 7 of the ESA.

1.1 Project Area

The Project Area comprises two “Wind Energy Areas” (WEAs) on the OCS, off the coasts of Massachusetts and Rhode Island: the “Massachusetts” WEA (MA WEA) and the “Rhode Island and Massachusetts” WEA (RI/MA WEA) (*see* Figure 1.1). These WEAs comprise a total area of approximately 1,419 square statute miles (907,724 acres) and contain 130 whole OCS lease blocks and 49 partial OCS lease blocks. These WEAs were developed through collaboration and consultation with state intergovernmental task forces, Federal agencies, Native American Tribes, the general public, and other stakeholders. Both WEAs are located in relatively shallow waters (approximately 30-60 m) of the OCS, in the Southern New England planning region of the Northeast Continental Shelf Large Marine Ecosystem (NCSLME) (Cook and Auster, 2007; Sherman, 1991). The coastal waters and OCS in this region are described in detail in the Massachusetts Ocean Management Plan (MAEEA, 2009) and the Rhode Island Ocean Special Area Management Plan (RICRMC and URI, 2011).

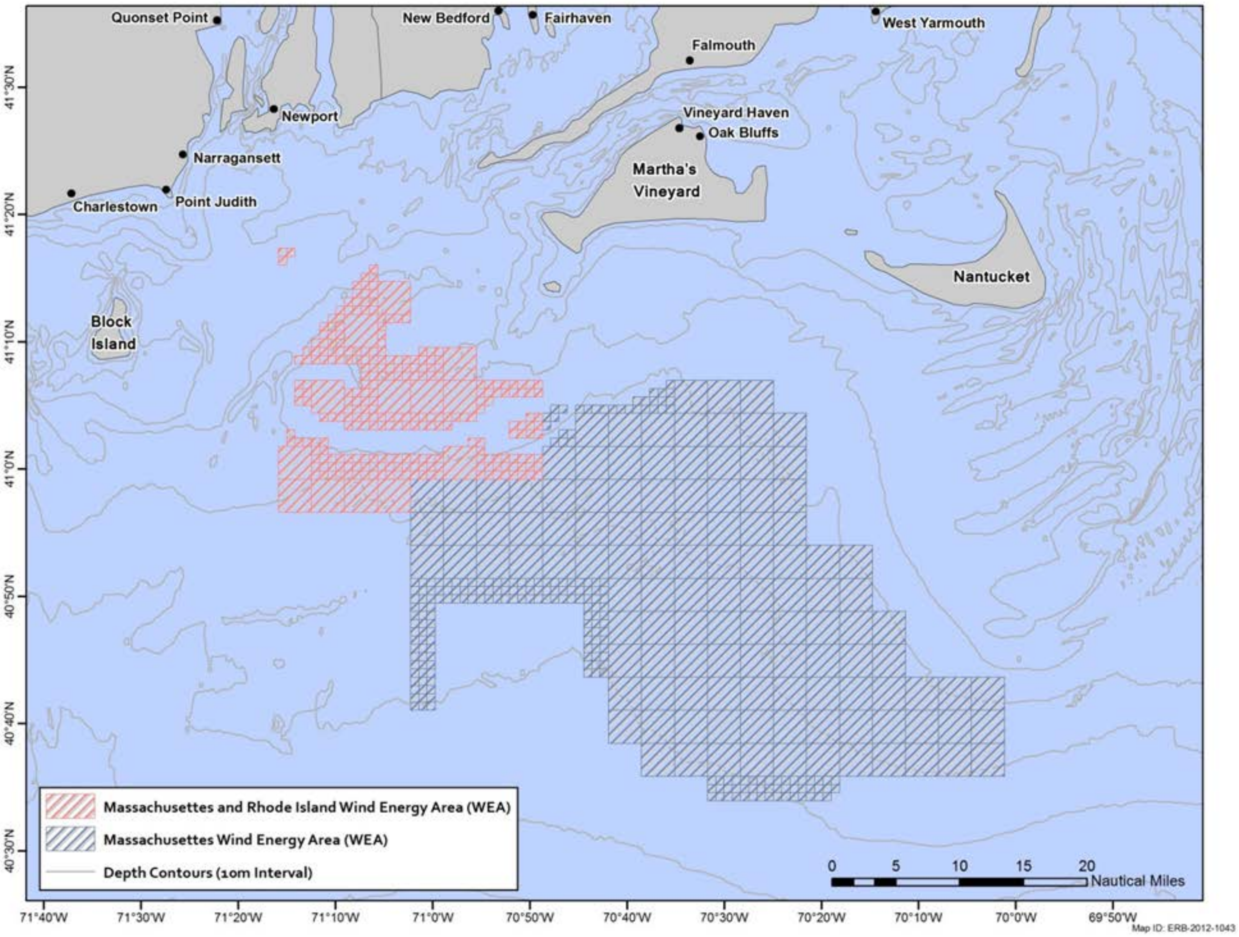

Figure 1.1. Project Area showing the RI/MA and MA WEAs

1.2 Proposed Action

The proposed action, that is the subject of this BA, is the issuance of commercial wind energy leases and the approval of site assessment plans to provide for the responsible development of wind energy resources within all or some of the RI/MA WEA and the MA WEA. This BA will consider the environmental consequences associated with reasonably foreseeable site characterization scenarios associated with leasing (including geophysical, geotechnical, archeological and biological surveys), and site assessment activities (including the installation, operation and decommissioning of meteorological towers and buoys) in the Project Area.

1.3 Renewable Energy Process

Under the renewable energy regulations, the issuance of leases and subsequent approval of wind energy development on the OCS is a staged decision-making process. BOEM's wind energy program occurs in four distinct phases:

1) **Planning and Analysis.** The first phase is to identify suitable areas to be considered for wind energy project leases through collaborative, consultative, and analytical processes using the state's task forces, public information meetings, input from the states, Native American Tribes, and other stakeholders.

2) **Lease Issuance.** The second phase is the issuance of a commercial wind energy lease. The competitive lease process is set forth at 30 CFR 585.210 to 585.225, and the noncompetitive process is set forth at 30 CFR 585.230 to 585.232. A commercial lease gives the lessee the exclusive right to subsequently seek BOEM approval for the development of the leasehold. The lease does not grant the lessee the right to construct any facilities; rather, the lease grants the right to use the leased area to develop its plans, which must be approved by BOEM before the lessee can move on to the next stage of the process (30 CFR 585.600 and 585.601).

3) **Approval of a Site Assessment Plan (SAP).** The third stage of the process is the submission of a SAP, which contains the lessee's detailed proposal for the construction of a meteorological tower and/or the installation of meteorological buoys on the leasehold (30 CFR 585.605 to 585.618). The lessee's SAP must be approved by BOEM before it conducts these "site assessment" activities on the leasehold. BOEM may approve, approve with modification, or disapprove a lessee's SAP (30 CFR 585.613). As a condition of SAP approval, meteorological towers will be required to have visibility sensors to collect data on climatic conditions above and beyond wind speed, direction and other associated metrics generally collected at meteorological towers. These data will assist BOEM and USFWS with evaluating the impacts of future offshore wind facilities on threatened and endangered birds, migratory birds, and bats.

4) **Approval of a Construction and Operation Plan (COP).** The fourth and final stage of the process is the submission of a COP, a detailed plan for the construction and operation of a wind energy project on the lease (30 CFR 585.620 to 585.638). BOEM approval of a COP is a precondition to the construction of any wind energy facility on the OCS (30 CFR 585.628). As with a SAP, BOEM may approve, approve with modification, or disapprove a lessee's COP (30 CFR 585.628).

The regulations also require that a lessee provide the results of surveys with its SAP or COP, including a shallow hazards survey (30 CFR 585.626 (a)(1)), geological survey (30 CFR 585.616(a)(2)), geotechnical survey (30 CFR 585.626(a)(4)), and an archaeological resource survey (30 CFR 585.626(a)(5)). BOEM refers to these surveys as "site characterization" activities. Although BOEM does not issue permits or approvals for these site characterization activities, it will not consider approving a lessee's SAP or COP if the required survey information is not included. *See* "Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585,"[1] referred to herein as the 'GGARCH guidelines' (USDOI, BOEMRE, OAEP, 2011).

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[1] *see* http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx#Notices_to_Lessees,_Operators_and_Applicants

2 ESA Section 7 Consultation History

The proposed action is similar in many respects to the consultation for *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey Environmental Assessment* (IP EA) that was concluded in the Spring of 2009 (USDOI MMS 2009) and the action described in the *Environmental Assessment (EA) for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia* (NJ-VA EA) and its associated biological assessment which were finalized in January 2012 (USDOI, BOEM, OREP, 2012a). Each of these assessments considered the issuance of leases for wind resource data collection, including geological and geophysical, hazards, and archaeological (GGARCH) site characterization surveys. The IP EA considered issuing leases for seven lease blocks and the NJ-VA EA considered issuing leases within all or part of four WEAs while the project area in the NJ-VA EA was comprised of approximately 117 OCS lease blocks across four states.

This BA addresses activities within the RI/MA WEA and the MA WEA, which together comprise a total of 130 whole and 49 partial lease blocks (13 whole and 29 partial lease blocks within the RI/MA WEA and 117 whole and 20 partial lease blocks within the MA WEA) (Figure 1.1). The primary activities that would occur as part of the site assessment described in the Proposed Action for this BA include: geological and geophysical surveys (sonar and sediment work), wind resource assessments (meteorological towers and buoys), biological assessments, and cultural/archeological assessments. This type of activity would be similar across both the MA and RI/MA WEAs.

Informal ESA Section 7 consultations for the IP EA were initiated with USFWS on January 9, 2009. The consultation was concluded in a letter from USFWS dated February 26, 2009. The informal consultation concluded that the site assessment activities would not jeopardize the continued existence of the federally listed roseate tern (*Sterna dougallii dougallii*) and piping plover (*Charadrius melodius*), and the candidate species, red knot (*Calidris canutus rufa*). In addition, USFWS stated that although the extent to which these species occur 8 or more miles offshore is not well known, the likelihood to which these species occur offshore was concluded to be low. USFWS further stated that the greater threat posed to avian species from site assessment activities, specifically the construction of meteorological towers, was the threat collisions between vessels and the structures and subsequent spilling of oil in the case of oil tankers. However, given the low number of proposed structures and the U.S. Coast Guard (USCG) requirements for navigational aids, the risk was still considered to be low. In order to evaluate future collision risk assessment USFWS recommended the placement of a visibility sensor, which measures transparency of the atmosphere by calculating a meteorological optical range, on the meteorological tower in addition to the biological monitoring devices already included.

More recently, there was an informal ESA Section 7 consultation with USFWS on March 24, 2011, for lease issuance and site assessment activities off of NJ-VA. The consultation was concluded in a letter from USFWS dated June 20, 2011, concurring with the determination that the meteorological tower and buoy construction activities are not likely to adversely affect the three listed species under USFWS jurisdiction (roseate tern, piping plover or red knot). USFWS also found that although the extent to which these species occur between 7 and 37 miles (11.3

and 59.5 kilometers) offshore is not well known, the collision risk throughout these mid-Atlantic WEAs was considered to be negligible. USFWS recommended the placement of visibility sensors on meteorological towers to provide measures of visibility such as how often low visibility conditions occur during various times of year.

3 Threatened and Endangered Species in the Proposed Action Area

The proposed action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). For this activity, the proposed action area includes the Project Area (the two WEAs) as well as waters between the Project Area and shore (*see* Figure 1.1). This area is expected to encompass all effects of the proposed action. Several ESA-listed species occur both seasonally and year round in the action area. Since the proposed activities could occur year-round it can be assumed that these species could be present for all or some of the proposed activity. The Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf (USDOI, MMS, 2007) gives greater detail of the life histories of the species outlined in this Section and is thus incorporated by reference and not repeated herein.

3.1 Marine Birds

3.1.1 Species of Concern

The Atlantic coast is a major flyway for birds, including terrestrial species, shorebirds, waterbirds, and marine birds. Two species of federally listed threatened or endangered bird species are known to occur in the coastal counties of both Rhode Island and Massachusetts – the federally threatened piping plover (*Charadius melodus*) (USFWS, 2012a) and the federally endangered roseate tern (*Sterna dougallii dougallii*) (USFWS, 2012b). Both species use coastal habitats, with the piping plover primarily using beaches, marshes, and intertidal. The roseate tern breeds almost exclusively on small islands that may either be composed of glacial till or barrier islands, although occasionally they may nest on beaches (USFWS, 2010). The red knot (*Caladris canutus rufa*), a candidate for listing under the ESA (USFWS, 2012c), is found along the coastal habitats of Rhode Island and Massachusetts during spring and fall migration. All three species may pass through the Project Area during spring and fall migration.

3.1.2 Piping Plover

The piping plover (*Charadrius melodus*) is a small migratory shorebird that breeds in sandy dune-beach-riparian habitat along the Atlantic Coast, the Great Lakes, and the Great Plains regions of the U.S., and winters in coastal habitats of the southeastern US, coastal Gulf of Mexico, and the Caribbean (Elliot-Smith *et al.*, 2004; USFWS, 2009). The Great Lakes breeding population is listed as endangered, while the Atlantic Coast and Great Plains breeding populations are listed as threatened (USFWS, 2009). Critical wintering habitat has been established for the species along the coast of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (66 FR 36038-36143). Only the Atlantic Coast population is likely to occur within the Project Area.

The most likely cause of its population declines and the primary anthropogenic threat to piping plovers is coastal development. Other threats include disturbance by humans, dogs, and vehicles on sandy beach and dune habitat (Elliott-Smith *et al.*, 2004; USFWS, 2009). Despite these population pressures, there is little risk of near-term extinction of the Atlantic Coast population of piping plovers (Plissner and Haig, 2000). From 1989 and 2011, the New England portion of the Atlantic Coast population of breeding pairs has increased from 206 to 825 (preliminary) and has continued to increase in recent years (USFWS, 2011a, 2011b), while other portions of the population (New York-New Jersey, Eastern Canada, and Southern) have slightly decreased since 2007 from 1,185 to 934 (Hecht and Melvin, 2009; USFWS, 2011a, 2011b.)).

As of 2010, there were 591 nesting pairs nested in Massachusetts and 85 in Rhode Island (USFWS, 2011b). In Massachusetts, piping plovers occur in Barnstable, Bristol, Dukes, Essex, Nantucket, Plymouth, and Suffolk counties (USFWS, 2012a). In Rhode Island, plovers occur in Newport and Washington counties (USFWS, 2012a).

In general, Atlantic Coast piping plovers are found in sandy coastal habitats for nesting, although they may use coastal sand flats, mud flats, ephemeral pools, as well as the wrack line on sandy beaches for foraging. Piping plovers arrive at breeding locations beginning mid-March and extending into April. The piping plover breeding season extends from April through August. Post-breeding staging in preparation for migration and southward migration extends from late July through September; only occasionally are piping plovers observed in October. The breeding season and spring and fall migration overlap; therefore, at either end of the breeding season, there may be plover movement through the project area.

The Atlantic Coast population of piping plovers winters along the southern Atlantic Coast from North Carolina to Florida and in the Bahamas and West Indies (Elliott-Smith and Haig, 2004). The migratory pathways along the coast and to the Bahamas are not well known (USFWS, 2009; Normandeau Associates, 2011), and there are no definitive observations of this species in offshore environments greater than three miles from the Atlantic Coast (Normandeau Associates, 2011). However, it may be very difficult to detect piping plovers in the offshore environment during migration because of nocturnal and/or high elevation migratory flights (Normandeau Associates, 2011). Both breeding and wintering sites include islands greater than three miles from the coast, and significant pre-migratory concentrations of this species have been observed in southeastern Cape Cod and Monomoy Island in late summer (Normandeau Associates, 2011).

3.1.3 Roseate Tern

The roseate tern (*Sterna dougallii dougallii*) is a small tern that breeds in colonies. Only terns in the Northwestern Atlantic population are likely to occur within the Project Area. Birds in this population breed along the coast of the northeastern U.S. and the maritime provinces of Canada and winters along the Northeastern coast of South America. Roseate terns in the Northwestern Atlantic population are listed under the ESA as endangered (USFWS, 2010). No critical habitat has been designated for this species (52 FR 42064-42068). The USFWS recently published a five-year status review of the roseate tern (USFWS, 2010).

In the late 19th Century, roseate terns suffered a drastic population decline in the U.S. due to egg collecting and hunting for their feathers (Gochfeld *et al.*, 1998). Following protection of colonies in North America, their numbers have increased (Gochfeld *et al.,* 1998). However, roseate terns have been displaced from their traditional sites by encroaching gull colonies, resulting in fewer tern colonies and a reduced population size (Gochfeld *et al.*, 1998). Additionally, erosion continues to reduce the number of suitable nest sites for terns and limits the ability of the species to avoid nesting on islands that have high predation rates (Northeast Roseate Tern Recovery Team, 1998).

The Northwestern Atlantic roseate tern population currently breeds on a handful of island colonies from Long Island, New York to the Canadian maritime provinces (Gochfeld *et al.,* 1998; USFWS, 2010). There are many roseate terns breeding in Massachusetts. In 2009, there were 50 breeding pairs of roseate terns each on Norton's Point and Penikese Island, 645 breeding pairs on Ram Island, and 782 pairs on Bird Island (USFWS, 2010). Although roseate terns did breed in Rhode Island (USFWS, 2010), there are currently no breeding populations in Rhode Island (Paton *et al.,* 2010),

Although a group of several uncommon tern species (including roseate terns) is predicted to be in the northern parts of the Project Area near Martha's Vineyard and Nantucket islands (Figure 3.1) (Menza, *et al.,* 2012), very little roseate tern activity is expected to occur within the Project Area during both nesting and post-breeding staging periods. The modeled results from Menza and others (2012) are based on the relationship between of terns (Roseate, Least, Royal, Arctic, Sooty, Bridled, Caspian, and Forster's and unidentified species) and bathymetry, zooplankton biomass, and distance from shore (Menza *et al.,* 2012 [Figure 6.29]). Tern observations from 97 independent surveys from March 1 to August 31 were used to build the model. The model predicts (in blue) that terns are virtually absent from the Project Area with high certainty. Caution should be exercised because the modeling analysis lumped observations of several tern species together which may add to uncertainty to the predicted distribution of roseate terns.

In spring, roseate terns arrive on their Northwestern Atlantic breeding colony sites to initiate courtship activities prior to nesting (Gochfeld *et al.,* 1998). During the nesting period (mid-May to late-July), breeding birds typically remain within 7 km of their nesting colonies while foraging for fish to provision their young (Rocky *et al.,* 2007), but may occasionally travel up to 30 km from their colony (Burger *et al.,* 2011). Roseate terns complete nesting activity between late July to mid-August, and then the adults and young move to the post-breeding staging areas until mid-September before migrating southward (Burger *et al.,* 2011). The coastal region of southeastern Cape Cod, Massachusetts, near Chatham and Monomoy Island, is the most important post-breeding staging area for this species, hosting up to 7,000 individuals representing nearly the entire Northwestern Atlantic population (Burger *et al.,* 2011). During post-breeding period, most foraging activity is concentrated in shallow water close to shore, but some individuals may occur up to 16 km from the coast (Burger *et al.,* 2011).

The migration routes of roseate terns are very poorly known, but are believed to be largely or exclusively pelagic (far from shore) in both spring and fall (Nisbet, 1984; Gochfeld *et al.,* 1998; USFWS, 2010), hence it is likely that roseate terns will traverse the Project Area during this period (Burger *et al.,* 2011). Only a small amount of offshore roseate tern observations have been recorded, including five recoveries of banded individuals at sea on ships (Nisbet, 1984), as well as a small number of additional boat-based observations (Normandeau Associates, 2011).

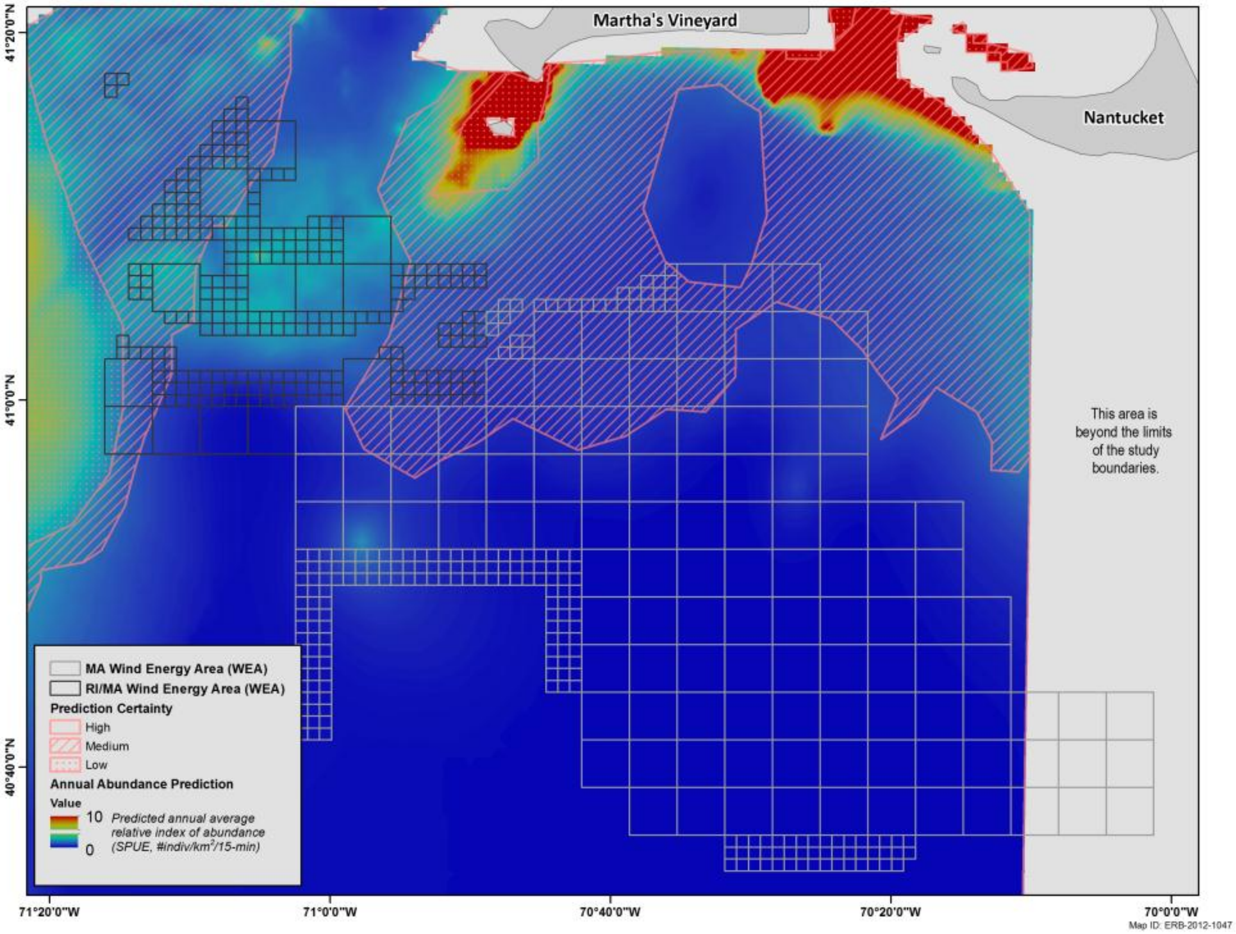


Figure 3.1. Predicted annual distribution and relative abundance of several less common tern species in the project area.

3.1.4 Red Knot (ESA Candidate Species)

The red knot is one of the longest-distance migrants in the world. It breeds in the central Canadian arctic and winters as far south as Tierra del Fuego in South America. In 2006, the USFWS designated the red knot as a candidate species for ESA listing (71 FR 53756-53835). During the past 20 years, the red knot population has declined dramatically from an estimated 100,000 to 150,000 down to 18,000 to 33,000 (Niles *et al.*, 2008). Each spring, red knots congregate in Delaware Bay during their northward migration to feed on horseshoe crab eggs (*Limulus polyphemus*) and refuel for breeding in the Artic. However, the availability of horseshoe crab eggs has been reduced due to the increase in the harvest of adult crabs for bait in the conch and eel fishing industries (Niles *et al.*, 2008). Despite restrictions on the crab harvest, the 2007 horseshoe crab harvest was still larger than the harvest in 1990, and there still has been no detectable recovery in the red knot population (Niles *et al.*, 2009). Other threats to the species include human development and beach replenishment (Niles *et al.*, 2008).

Red knots have the potential to occur in both Massachusetts and Rhode Island, although their locations within these states have not been documented to the county level (USFWS, 2012c). For the last 50 years, Cape Cod and Massachusetts Bay have been important staging areas for red knots during fall migration (Niles *et al.*, 2008). Red knots are found in large numbers throughout fall migration on South Monomoy and South Beach in Chatham, Massachusetts, although they are not as concentrated as in Delaware Bay during spring migration. Nevertheless, during the fall migration, concentrations of 250 to 1000 red knots have been documented at the Monomoy/South Beach island complex, 250 to 600 in the Plymouth Bay area, 150 to 250 at Cape Cod National Seashore and 400 or more at Parker River National Wildlife Refuge (data collected from e-bird at http://ebird.org/content/ebird/ and M. Hake, Cape Cod National Seashore, pers. comm.). In Rhode Island, the species has been documented sporadically at three stop-over locations (Napatree Point-Sandy Point Island, Westerly, Ninigret Pond, Charlestown; and Quicksand Pond, Little Compton), but there are rarely more than 50 individuals at any of the sites, and none of the sites are considered to be critical for the species (Niles *et al.,* 2008).

Red knot occurrence in the Project Area is most likely during the southward fall migration from their breeding to their wintering grounds. Migratory routes of this species are not very well characterized, but recent studies using birds tracked with light-sensitive geo-locators, as well as analysis of large geospatial datasets of coastal observations have begun to reveal some migratory patterns of red knots in the U. S. Atlantic OCS (Niles *et al.*, 2010; Normandeau Associates, 2011; Burger *et al.*, 2012a, 2012b). These studies have revealed that migratory pathways of red knots through this region are fairly widespread and diverse, with some individuals traversing northern sections of the US Atlantic OCS as they travel directly between northeastern U.S. migratory stopover sites and wintering areas or stopover sites in South America and the Caribbean, and others following the U.S. Atlantic coast or traversing the U.S. Atlantic OCS further to the south, as they move between U.S. Atlantic coastal stopover sites and wintering areas in the southern U.S., Caribbean, or northern South America (Niles *et al.,* 2010; Normandeau Associates, 2011; Burger *et al.,* 2012b). Amid this migratory route variation, there appears to be more of a mid-Atlantic and southerly concentration of red knot coastal arrivals in spring, compared with a more northerly concentration, particularly in Massachusetts, of fall migrant activity and departure (Niles *et al.*, 2010; Normandeau Associates, 2011; Burger *et al.*, 2012b), hence it is likely that more red knot migratory passage occurs through the offshore Massachusetts area of interest during fall migration than during spring migration.

3.2 Bats

There are no ESA-listed or ESA-candidate bat species in Massachusetts and Rhode Island (USFWS, 2012d). Although bats have been known to fly on the Atlantic OCS, the neighboring states Maine, New Hampshire, and Connecticut do not have any ESA-listed or ESA-candidate bat species either (USFWS, 2012d). Therefore, no ESA-listed or ESA-candidate bat species are expected to be in the Project Area. Additional information or a more detailed analysis and migration descriptions of bats can be found in the Cape Wind Energy Project DEIS (USDOI, MMS, 2008) and the Alternative Energy Programmatic EIS (USDOI, MMS, 2007).

4 Proposed Action

4.1 Overview

The actions being evaluated as a part of this consultation are the issuance of a renewable energy lease and subsequent site assessment activities to aid in the siting of potential wind turbine generators in the OCS off of Rhode Island and Massachusetts. The issuance of the lease does not constitute an irreversible commitment of the resources toward full development of the lease area. Thus this action does not authorize, and the consultation does not evaluate, the construction of any commercial electricity generating facilities or transmission cables with the potential to export electricity.

The type of activities evaluated for this action includes, but is not limited, to the following:

1. GGARCH assessment
   - High resolution geophysical surveys (surface and subsurface seismic profiling, extent/intensity determined by the area being considered for development (primarily high to mid frequency sonar (i.e., side scan sonar, echo sounder, sub-bottom profilers). The use of airguns is NOT being considered as a part of this activity.
   - Geotechnical sub-bottom sampling (includes CPTs, geologic borings, vibracores, etc).
2. Wind resource assessment
   - Construction of meteorological towers
   - Installation of LIDAR buoys
3. Biological resource assessment:
   - Presence/absence of threatened and endangered species
   - Presence/absence of sensitive biological resources/habitats
4. Archaeological resource assessment
5. Assessment of coastal and marine use

4.1.1 Project Area

The two WEAs offshore of Rhode Island/Massachusetts and Massachusetts comprise a total area of approximately 1,419 square statute miles (907,724 acres) and contain 130 whole OCS lease blocks and 49 partial OCS lease blocks. These areas are collectively referred to as the Project Area (*see* Figure 1.1).

The proposed action consists of the issuance of commercial wind energy leases in the Project Area and implementation of BOEM-approved site assessment and characterization activities on those leaseholds. This action presumes reasonably foreseeable scenarios for leasing, site characterization, and site assessment. Because of the expressions of commercial wind energy interests, BOEM assumes that the entire Project Area would be leased. It should be noted that for the New Jersey WEA only site characterization activities are being assessed. The biological assessment of site assessment activities that was included in the consultation for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia (USDOI, BOEM, OREP, 2012a) remains valid and unchanged. It is also wholly consistent with the site assessment affects analysis in this document. The assessment of site characterization activities off New Jersey is being updated to ensure it remains consistent with the Atlantic G&G DPEIS.

4.2 Site Characterization Surveys

Site characterization surveys include a number of activities that allow the lessee to locate shallow hazards, physical restrictions and cultural and biological resources in the area where a project may take place. The activities are described below.

4.2.1 High-resolution Geophysical (HRG)

Data obtained from the HRG surveys will provide information on geophysical shallow hazards, the presence or absence of archaeological resources, biological resources and to conduct bathymetric charting. This information is used in the design construction and operations of meteorological towers and future wind turbine placement to mitigate the potential impacts to installations, operations and production activities, and structure integrity. The scope of HRG surveys will be sufficient to reliably cover any portion of the site that may be affected by the renewable energy project's construction, operation, and decommissioning. This includes the project area encompassing all seafloor/bottom-disturbing activities. The maximum project area includes but is not limited to the footprint of all seafloor/bottom-disturbing activities (including the areas in which installation vessels, barge anchorages, and/or appurtenances may be placed) associated with construction, installation, inspection, operation, maintenance, and removal of structures.

The geophysical survey grid(s) for the proposed transmission cable route(s) to shore would be oriented with respect to the bathymetry, shallow geologic structures, and renewable energy structure locations. The grid pattern for each survey would cover the project area for all anticipated physical disturbances from construction and operation of a wind facility. Parameters for line spacing include:

For collection of geophysical data for shallow hazard assessments using side scan-sonar/sub-bottom profilers, spacing would not likely exceed 492 feet (150 meter) throughout the project area.

For collecting geophysical data for archaeological resource assessment using magnetometers, side-scan sonar, and all sub-bottom profilers, lines are to be flown at approximately 98 feet (30 meter) throughout the project area.

For bathymetric charting using a multi-beam echo-sounder or side-scan sonar mosaic, construction may vary based on water depth but will provide full coverage of the seabed plus suitable overlap and resolution of small discrete targets of 1.6 to 3.3 feet (0.5 to 1.0 meters) in diameter. This is also necessary for the identification of potential archaeological resources.

4.2.1.1 HRG Survey Instrumentation

Below is an overview of the types of instrumentation that could be used during HRG survey work in the Project Area.

Bathymetry/Depth Sounder. The depth sounder system would record with a sweep appropriate to the range of depths expected in the survey area. Lessees can use multi-beam and/or single-beam bathymetry systems. The use of a multi-beam bathymetry system may be more appropriate for characterizing those lease areas containing complex topography or fragile habitats.

Magnetometer. Magnetometer surveys would be used to detect the identification of ferrous, ferric, or other objects having a distinct magnetic signature. The magnetometer sensor is typically towed as near as possible to the seafloor, which is anticipated to be approximately 20 feet (6 meters) above the seafloor.

Seafloor Imagery / Side-Scan Sonar. A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or 'pingers') located on the sides, which generate and record the returning sound that travels through the water column at a known speed. BOEM assumes that lessees would use a digital dual-frequency side-scan sonar system with frequencies of 445 and 900 kiloHertz (kHz) and no less than 100 and 500 kHz to record continuous planimetric images of the seafloor. The data would be processed in a mosaic form to allow for a true plan view and 100 percent coverage of the project area. The side-scan sonar sensor would be towed above the seafloor at a distance that is 10 to 20 percent of the range of the instrument.

Shallow and Medium Penetration Sub-bottom Profilers. A high-resolution Compressed High-Intensity Radar Pulse (CHIRP) System sub-bottom profiler is used to generate a profile view below the bottom of the seabed, which is interpreted to develop a geologic cross-section of subsurface sediment conditions under the track line surveyed. A boomer sub-bottom profiler system is capable of penetrating depth ranges of 32 to 328 feet (10 to 100 meters) depending on frequency and bottom composition. The sub-bottom profiler would deliver a simple, stable, and repeatable signature that is near to minimum phase output with usable frequency content.

4.2.1.2 Proposed HRG Survey Action Scenario

It is assumed that the HRG survey would cover the entire Project Area, and geophysical surveys for shallow hazards (approximately 492 feet [150 meters] line spacing) and archaeological resources (approximately 98 feet [30 meters] line spacing) would be conducted at the same time on the same vessels conducting sweeps at the finer line spacing. This would result in about 500 NM of HRG surveys per OCS block (3 by 3 statute miles [approximately 5 by 5 kilometers]), not including turns. Assuming a vessel speed of 4.5 knots and 10 hour days (daylight hours minus transit time to the site), it would take about 11 days to survey one OCS block or about 100 days to survey an average-size lease of eight OCS blocks. To survey all of the Project Area, HRG surveys would have to be conducted by multiple vessels and/or over multiple years and potential cable routes. Assuming 100 percent coverage of the Project Area, the proposed action would result in a total of approximately 79,000 NM or 17,490 hours of HRG surveys (Table 4.1).

Table 4.1
Projected Site Characterization and Assessment Activities for the Proposed Action in the Rhode Island and Massachusetts Wind Energy Areas

		Site Characterization Activities		Site Assessment Activities	
WEA	**Leaseholds**	**High-Resolution Geophysical (HRG) Surveys (max NM/hours)**	**Geotechnical Sampling (min-max)**	**Installation of Meteorological Towers (max)**	**Installation of Meteorological Buoys (max)**
RI/MA	Up to 4	17,500/4,000	500 - 1,400	4	8
MA	Up to 5	61,500/13,490	708 – 2,900	5	10
Total	Up to 9	79,000/17,490	1,208 – 4,300	9	18

4.2.2 Biological Resources

Vessel and/or aerial surveys would need to characterize three primary biological resources categories: (1) benthic habitats; (2) avian resources; and (3) marine fauna. Sub-marine surveys such as the shallow hazard and geological and geotechnical surveys described earlier would be able to capture all the salient features of the benthic habitat on the leasehold. These surveys would acquire information suggesting the presence or absence of exposed hard bottoms of high, moderate, or low relief; hard bottoms covered by thin, ephemeral sand layers; seagrass patches; and other algal beds, all of which are key characteristics of benthic habitat. The various remote sensing activities used in the biological resource survey will likely occur simultaneously with the HRG survey activity and is thus not repeated here. Shipboard observers would monitor and document sightings of marine mammals, sea turtles, fish and birds within the lease area.

4.2.3 Geotechnical Sampling

Geotechnical sampling is used to determine site specific geology profile of a specific site within the lease area. In order to achieve this, geotechnical sampling is typically conducted using cone penetration tests (CPT) or deep sediment boring / drilling at the location of the proposed meteorological tower or wind turbine. The purpose of this work is to assess the suitability of shallow foundation sediments to support a structure of transmission cable under any operational or environmental conditions that may be encountered, and document the soil characteristics necessary for design and installation of all structures. Vibracores may be taken when there are known or suspected archaeological/and or cultural resources present (identified through the HRG survey or other work) or for some limited geological sampling.

Vibracores would likely be deployed from a small (less than 45 foot) gasoline powered vessel. The diameter of a typical vibracore barrel is approximately 4 inches (10.15 centimeters) and the cores are advanced up to a maximum of 15 feet (4.5 meters). Deep borings would be advanced from a truck-mounted drill rig placed upon a jack-up barge that rests on spuds lowered to the seafloor. Each of the four spuds would be approximately 4 feet (1.2 meters) in diameter, with a pad approximately 10 feet (3.05 meters) on a side on the bottom of the spud. The barge would be towed from boring location to location by a tugboat. The drill rig would be powered using a gasoline or diesel powered electric generator. Crew would access the boring barge daily from port using a small boat. Geologic borings generally can be advanced to the target depth (100 to 200 feet [30.5 to 70 meters]) within 1 to 3 days, subject to weather and substrate conditions. Drive and wash drilling techniques would be used; the casting would be approximately 6 inches (15.24 centimeters) in diameter. The CPT or an alternative subsurface evaluation technique would supplement or be used in place of deep borings. A CPT rig would be mounted on a jack-up barge similar to that used for the borings. The top of a CPT drill probe is typically up to 3 inches (7.6 centimeters) in diameter, with connecting rods less than 6 inches (15.24 centimeters) in diameter

Environmental considerations for geotechnical sampling are mainly focused on benthic disturbance. This can come from vessels anchoring or from the boring activity itself. Acoustics from boring are also considered. It is anticipated that the majority of the work will be accomplished by CPT which does not require deep borehole drilling. However, should CPT be found an inappropriate technique given the conditions encountered, borehole drilling may be required.

4.2.3.1 Geotechnical Sampling Scenario

In order to estimate the number of geotechnical samples per leasehold it is necessary to estimate the number of turbine foundations on each leasehold. As discussed in the Programmatic EIS (USDOI, MMS, 2007), spacing between turbines is typically determined on a case-by-case basis to minimize wake effect and is based on rotor diameter associated with turbine size. In Denmark’s offshore applications, for example, a spacing of seven rotor diameters between units has been used (USDOI, MMS, 2007). Spacing of 6 by 9 rotor diameters, or six rotor diameters between turbines in a row and nine rotor diameters between rows was approved for the Cape Wind project (USDOI, MMS, 2009b). In some land-based settings, turbines are separated by much greater distances, as much as 10 rotor diameters from each other (USDOI, MMS, 2007). Based on this spacing range for a 3.6-megawatt (MW) (110 meter rotor diameter) turbine and a 5 MW (130 meter rotor diameter) turbine, it would be possible to place anywhere from 14 to 40 turbines in one OCS block (3 statute miles by 3 statute miles [approximately 5 kilometers by 5 kilometers]).

Based on the information presented above and assuming:

1) “maximum” scenario of wind development on every OCS block (which is extremely unlikely, but the lower amount of samples associated with less development would result in lower environmental impacts)
2) geotechnical sampling (vibracore, CPT, and/or deep boring) would be conducted at every potential wind turbine location throughout the Project Area
3) geotechnical sampling would be conducted every nautical mile along the projected transmission corridors to shore
4) geotechnical sampling would be conducted at the foundation of each meteorological tower and/or buoy, then a total of 1,208 to 4,300 geotechnical surveys could occur as a result of the proposed action (*see* Table 4.1).

4.2.4 Site Assessment

"Site assessment" describes the assessment of wind resources and ocean conditions to allow the lessee to determine whether the lease area is suitable for wind energy development, where on the lease it would propose development, and what form of development to propose in a COP. To determine this, a meteorological tower or buoy would be installed or deployed in the lease area to measure wind speeds and collect other relevant data necessary to assess the viability of a potential commercial wind facility.

To obtain meteorological data, scientific measurement devices, consisting of anemometers, vanes, barometers, and temperature transmitters, would be mounted either directly on the tower or buoy or on instrument support arms. In addition to conventional data collection methods, buoys and/or bottom-founded structures could use LIDAR, Sonic Detecting and Ranging (SODAR) and Coastal Ocean Dynamic Applications Radar (CODAR) technologies for collecting wind resource data. At this time, no proposals have been submitted meteorological towers (towers in this case being up to the estimated hub height for a commercial wind turbine) mounted on a floating platform (e.g., spar, semi-submersible, or tension leg). This BA assumes full-size met towers will utilize a fixed, pile-supported platform (monopile, jackets, or gravity bases) and that buoys would use the floating designs (e.g., boat-shaped, spar-type, tension-leg, disc-shaped or similar).

The following scenario addresses the reasonably foreseeable range of data collection devices that lessees may install under an approved SAP. The actual tower and foundation type and/or buoy type and anchoring system would be included in a detailed SAP submitted to BOEM, along with the results of site characterization surveys. This would be done prior to the installation of any device(s).

4.2.4.1 Proposed Action Scenario

It is assumed that each of the nine leaseholds projected for the Project Area would result in zero or one meteorological tower, zero or two buoys or a combination, being constructed or deployed. This would result in a maximum of 17 meteorological towers and 34 meteorological buoys within the Project Area.

Case Study: Cape Wind Meteorological Tower

Source: Cape Wind Associates, LLC 2011a.

Figure 4.1. Cape Wind Meteorological Tower

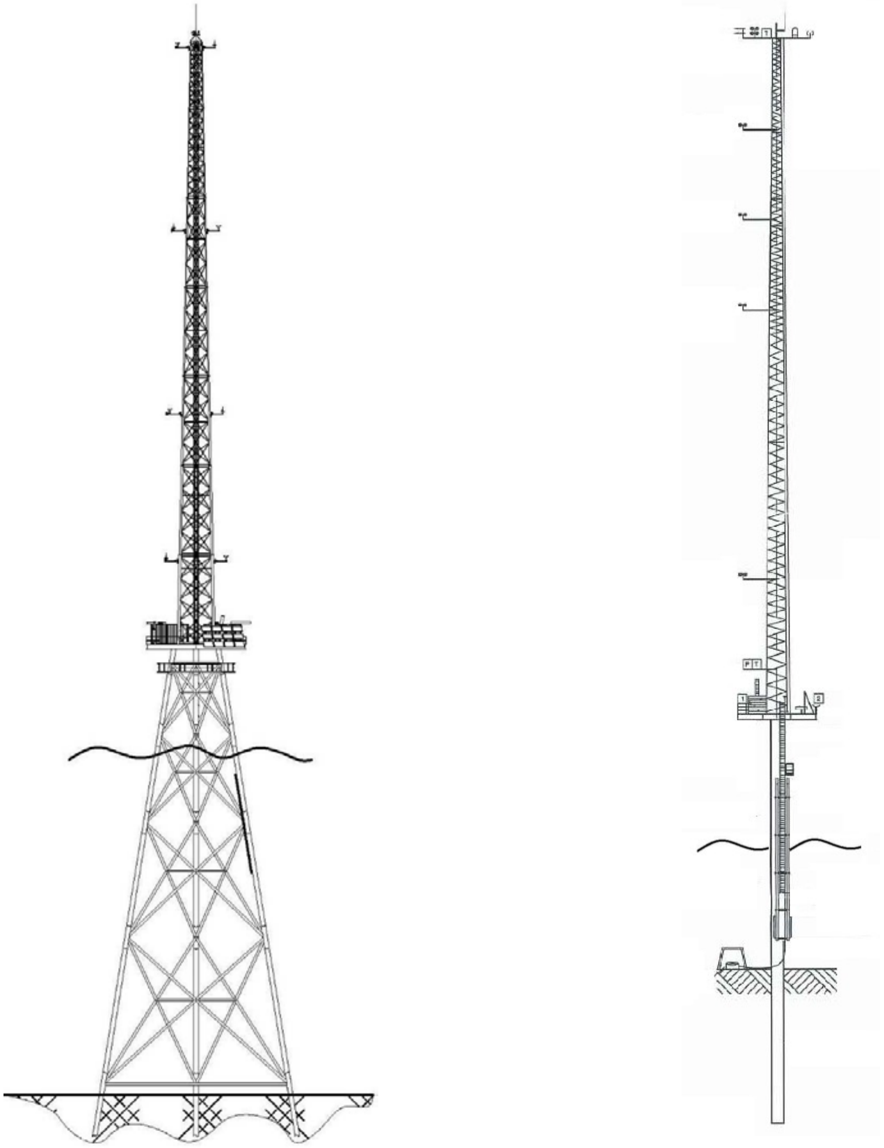
The only meteorological tower currently installed on the United States OCS for the purposes of renewable energy site assessment is located on Horseshoe Shoal, in Nantucket Sound. As shown on Figure 4.1, a monopile mast was used for this meteorological tower. The tower was installed in 2003 and consists of three pilings supporting a single steel pile that supports the deck. The overall height of the structure is 197 feet (60 meters) above the mean lower low water datum with a deck

30 feet off the sea surface. The Cape Wind meteorological tower represents the smaller end of the range of structures anticipated in southern New England. It is located in shallower water (8 to 10 feet [2.4 to 3 meters]) and nearer to shore (approximately 6 miles [9.7 kilometers]) than the Project Area.

4.2.4.2 Meteorological Tower

As mentioned previously in the Cape Wind example, one of the traditional instruments used for characterizing offshore wind conditions is the meteorological tower. At a maximum, a single meteorological tower would be installed per lease area. The foundation structure and a scour control system, if required based on potential seabed scour anticipated at the site, would occupy less than 2 acres. Once installed, the top of a meteorological tower would be 295 to 328 feet (90 to 100 meters) above mean sea level.

A meteorological tower consists of a mast mounted on a foundation anchored to the seafloor. The mast may be either a monopole, such as that used in the Cape Wind project mentioned above (*see* Figure 4.1) or a lattice (i.e. jacket foundation; Figure 4.2). The mast and data-collection devices would be mounted on a fixed or pile-supported platform (monopile, jackets, or gravity bases) or floating platform (spar, semi-submersible, or tension-leg) (Figure 4.3).

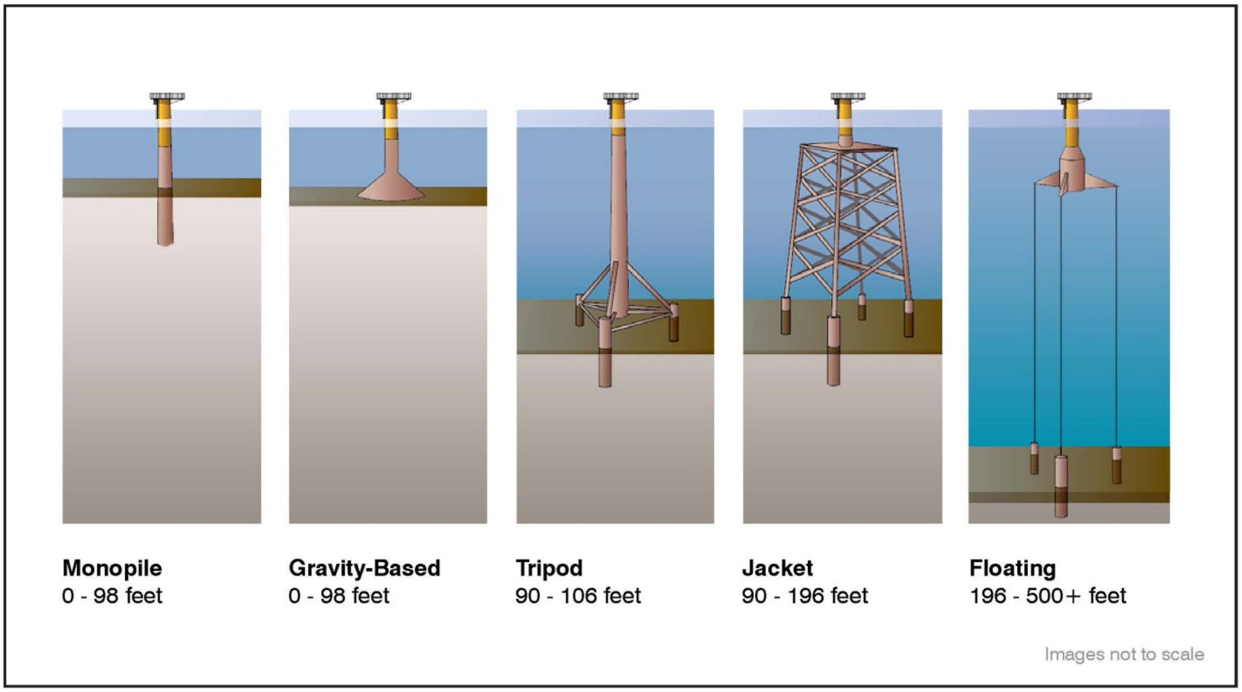


Source: Deepwater Wind, LLC as *cited in* USDOI, BOEM, OREP 2012a.

Source: Fishermen’s Energy of New Jersey, LLC *as cited in* USDOI, BOEM, OREP 2012a.

Figure 4.2. Examples of Lattice Mast Meteorological Towers. The tower on the left depicts a lattice-type mast mounted on a steel jacket foundation whereas the tower on the right depicts a lattice-type mast mounted on a monopole foundation.

In the case of fixed platforms, it is assumed that a deck would be supported by a single 10 foot-diameter (approximately 3 meter diameter) monopile, tripod, or a steel jacket with three to four 36-inch-diameter piles. The monopile or piles would be driven anywhere from 25 to 100 feet (7.6 to 30.5 meters) into the seafloor depending on subsea geotechnical properties. The foundation structure and a scour-control system, if required based on potential seabed scour anticipated at the site, would occupy less than 2 acres (0.81 hectare). Once installed, the top of a meteorological tower would be 295 to 328 feet (90 to 100 meters) above mean sea level. The area of ocean bottom affected by a meteorological tower would range from about 200 square ft (approximately 18.6 square meters), if supported by a monopile, to 2,000 square ft (approximately 184.1 meters) if supported by a jacket foundation. It is important to note that the meteorological towers considered in this BA are anticipated to be much larger and taller, have a larger footprint, and be further from shore than the Cape Wind meteorological tower.



SOURCE: Adapted from Musial, Butterfield, and Ram 2006, as cited in TetraTech EC, Inc. 2010.

Figure 4.3. Types of Foundations for Meteorological Towers

Scour Control Systems

Wave action, tidal circulation, and storm waves interact with sediments on the surface of the OCS, inducing sediment reworking and/or transport. Episodic sediment movement caused by ocean currents and waves can cause erosion or scour around the tower bases. Erosion caused by scour may undermine meteorological tower structural foundations leading to potential failure. BOEM assumes that scour control systems would be installed, based on potential seabed scour anticipated at sites. There are several methods for minimizing scour around piles, such as the placement of rock armoring and mattresses of artificial (polypropylene) seagrass.

Artificial grass mats have been found to be effective in both shallow and deep waters, therefore this is the most likely scour control system to be used for the proposed meteorological towers. These mats are made of synthetic fronds that mimic seafloor vegetation to trap sediment and become buried over time. If used, these mats would be installed by divers or underwater remotely operated vehicle (ROV). Each mat would be anchored at 8 to 16 locations, about 1 foot into the sand. Once installed the mats would not require future maintenance. Monitoring of scouring at the Cape Wind meteorological tower found that at one pile where two artificial seagrass scour mats were installed, there was a net increase of 12 inches (30.5 centimeters) of sand, and at another pile with artificial seagrass scour mats, there was a net scour of 7 inch (18 centimeter) pilings; both occurred over a three-year timeframe (Ocean and Coastal Consultants Inc. 2006).

It is anticipated that for a pile-supported platform, four mats each of about 16.4 by 8.2 feet (5 by 2.5 meters) would be placed around each pile. Including the extending sediment bank, a total area disturbance of about 5,200 to 5,900 square ft (approximately 483 to 548 square meters) for a three-pile structure and 5,900 to 7,800 square ft (approximately 548 to 724.6 square meters) for a four-pile structure is estimated. For a monopile, it is anticipated that eight mats 16.4feet by 16.4 feet (5 meters by 5 meters) would be used, and thus there would be a total disturbance area of about 3,700 to 4,000 square feet (343.74 by 371.61 square meters) per foundation.

A rock armor scour protection system may also be used to stabilize a structure’s foundation area. Rock armor and filter layer material would be placed on the seabed using a clamshell bucket or a chute. The filter layer would help prevent the loss of underlying sediments and sinking of the rock armor (ESS Group, Inc., 2004). In water depths greater than 15 feet (4.5 meters), the median stone size would be about 50 pounds (approximately 22.6 kilograms) with a stone layer thickness of about 3 feet (approximately 0.9 meters). The rock armor for a monopile foundation for a wind turbine has been estimated to occupy 16,000 square feet (0.37 acre [0.15 hectares]) of the seabed (ESS Group, Inc., 2004). While the piles of meteorological tower would be much smaller than those of a wind turbine, a meteorological tower may be supported by up to four piles. Therefore, the maximum area of the seabed impacted by rock armor for a single meteorological tower is estimated to also be 16,000 square feet (0.37 acre [0.15 hectares]).

A scour control system would be monitored throughout the lease term. It is expected that the foundation would be visually inspected monthly for the first year of installation, and then every year after that or after each significant storm activity. Inspections would be carried out by divers or ROVs. Removal of the scour control system is discussed in Section 4.5.

Installation of the Foundation Structure

A jacket or monopile foundation and deck would be fabricated onshore, transferred to barge(s) and the carried or towed to the offshore site. This equipment would typically be deployed from two barges, one containing the pile-driving equipment and a second containing a small crane, support equipment, and the balance of materials needed to erect the platform deck. These barges would be tended by appropriate tugs and workboats, as needed.

The foundation pile(s) for a fixed platform could range from either a single 10-foot (3 meter)-diameter monopile or three to four 36-inch (0.9-meter)-diameter piles (jacket). These piles would be driven anywhere from 25 to 100 feet (7.6 to 30.5 meters) below the seafloor with a pile-driving hammer typically used in marine construction operations. After approximately three days, when the pile-driving is complete, the pile-driver barge would be removed. In its place, a jack-up barge equipped with a crane would be used to assist in the mounting of the platform decking, tower, and instrumentation onto the foundation. Depending on the type of structure installed and the weather and sea conditions, the in-water construction of the foundation pilings and platform would range from several days (monopile construction in good weather) to six weeks (jacket foundation in bad weather) (USDOI, MMS, 2009a). The mast sections would be raised using a separate barge-mounted crane; installation would likely be complete within a few weeks. Total installation time for one meteorological tower would take eight days to ten weeks, depending on the type of structure to be installed and the weather and ocean conditions (USDOI, MMS, 2009a).

During installation, a radius of approximately 1,500 feet (457 meters) around the site would be needed for the movement and anchoring of support vessels. Piles are generally driven into the substrate using impact hammers and/or vibratory hammers (Hansen *et al.*, 2003; Nedwell and Howell 2004). Impact hammers use a heavy weight to repeatedly strike the pile and dive it into the substrate. Vibratory hammers use a combination of vibration and a heavy weight to force the pile into the sediment. As with any sound in the marine environment, the type and intensity of the sound is greatly dependent on multiple factors and can vary greatly. Impact hammers produce sharp striking sounds, whereas vibratory hammers produce more continuous, low frequency sounds (Hanson *et al.,* 2003; Nedwell and Howell 2004). The type of hammer used depends on a variety of factors, such as the material the pile is composed of, and the sediment the pile will be driven into. Impact hammers can be used for any type of pile, and can drive piles into most all substrates. Vibratory hammers are more useful when driving a pile that has a sharp edge that can cut into the sediment (i.e. an open ended steel pile); as opposed to one that displaces the sediment (i.e. closed ended steel pile, wood, or cement). Also, vibratory hammers are most useful in softer sediments such as sand or mud (Hanson *et al.,* 2003). Depending on the substrate a combination of vibratory hammers and impact hammers may be used. For example, a vibratory hammer can be used when there is softer substrate in the upper layers while a impact hammer can then be used to drive the pile the remainder of the depth when harder, more resistance substrates are encountered (Hanson *et al.*, 2003). This method may also be useful in the case of meteorological towers which must meet seismic stability criteria, which required that the supporting piles are either attached to, or driven into, the underlying hard sediment (Hanson *et al.*, 2003).

Meteorological Tower Operation and Maintenance Activities

For the proposed action, BOEM anticipates that a tower may be present for approximately five years before the final decision is made to either allow the tower to remain or be decommissioned. During the life of the meteorological tower, the structure and instrumentation would be accessible by boat for routine maintenance. As indicated in previous site assessment proposals submitted to BOEM, lessees may use solar panels and/or micro wind turbines (diameter of rotor swept up to 2 meters) mounted near or on the platform to charge the batteries that power the equipment on the tower (Figure 4.4). In this case, the lessees would conduct monthly or quarterly vessel trips for operation and maintenance activity over the five-year life of a meteorological tower (USDOI, MMS, 2009a). However, if a diesel generator is used to power the meteorological tower's lighting and equipment, a maintenance vessel would make a trip at least once every other week, if not weekly, to provide fuel, change oil, and perform maintenance on the generator. The maintenance vessel could be 51 to 57 feet in length, powered by 400 to 1,000 horsepower engines and have a 1,800-gallon fuel capacity. Support for the meteorological towers in the Project Area would result in anywhere from of 36 quarterly to

468 weekly round trips per year for up to nine meteorological towers. No additional or expansion of onshore facilities would be required to conduct these tasks.

Figure 4.4. Cape Wind meteorological tower platform with a micro wind turbine (*see* arrow) that has a rotor diameter of approximately four feet.

Meteorological Tower Lighting

All meteorological towers and buoys, regardless of height, would have lighting and marking for aviation and navigational purposes. Meteorological towers and buoys would be considered Private Aids to Navigation, and are required to be maintained by the individual owner under the regulations of the USCG. The USCG lighting for navigation safety would consist of two amber lights (USCG Class C) mounted on the platform deck. In accordance with FAA guidelines, the tower would be equipped with a light system consisting of a low intensity flashing red light (FAA designated L-864) for night use.

4.2.4.3 Meteorological Buoys

While a meteorological tower has been the traditional device for characterizing wind conditions, several companies have expressed their interest in installing one or two meteorological buoys per lease instead. Meteorological buoys can be used as an alternative to a meteorological tower in the offshore environment for meteorological resource data collection (i.e., wind, wave, and current). These meteorological buoys would be anchored at fixed locations and would regularly collect data from atmospheric and oceanographic sensors.

Meteorological buoys vary in designs and utilize anemometers, LIDAR and/or SODAR to collect meteorological data. LIDAR is a surface-based remote sensing technology that operates via the transmission and detection of light. SODAR is also a surface-based remote sensing technology; however it operates via the transmission and detection of sound.

A meteorological buoy can vary in height, hull type, and anchoring method. NOAA has successfully used discus-shaped hull buoys and boat-shaped hull buoys for weather data collection for many years. In addition, spar buoy and tension-leg platform buoy designs have been recently submitted to BOEM for approval. Each buoy type will likely be utilized for offshore wind data collection. A large discus buoy has a circular hull range between 32 and 39 feet (10 and 12 meters) in diameter and is designed for many years of service (USDOC, NOAA, NBDC, 2008). The boat-shaped hull buoy (known as a 'NOMAD' [Naval Oceanographic and

Meteorological Automated Device]) is an aluminum-hulled, boat-shaped buoy that provides long-term survivability in severe seas (USDOC, NOAA, NBDC, 2008). This buoy design could be utilized to mount a LIDAR wind assessment system. A typical NOMAD is a 19.6 feet by 10.2 feet (6 meters by 3.1 meters) aluminum hulled buoy with a draft of 10.5 ft (3.2 m). Originally designed by the U.S. Navy in the 1940s, the NOMAD has since been adopted and widely used by researchers, including NOAA's National Data Buoy Center. The following description is from Fishermen's Energy SAP (Fishermen's Energy 2011 *as cited in* USDOI, BOEM, OREP, 2012a).

Primary electrical (DC) power for all equipment on a NOMAD-type buoy could be provided by four deep cycle 12 volt batteries. Batteries will be charged by renewable sources which include two micro wind generators and four 40-watt solar panels. In the event that the renewable power sources fail to keep the batteries adequately charged (extended heavy cloud cover with little wind), the power monitoring system could prompt an onboard diesel fuel powered generator to start and run until the batteries reach the required charge level. The system would revert back to renewable charging once these systems return to proper operation (Fishermen's Energy 2011 *as cited in* USDOI, BOEM, OREP, 2012a). Up to 500 gallons of diesel fuel could be stored on board the buoy to operate the generator.

The anchoring system for the NOMAD-type buoy could be a via a standard ¾ inch steel chain to a 10,000 pounds (4,536 kilograms) steel or concrete block (s). The footprint of the anchor itself is conservatively estimated at 16 square feet (1.49 square meters). Fishermen's Energy conservatively estimates the total bottom-disturbing footprint from the anchor and anchor chain sweep of a disc-shaped or a boat-shaped buoy to range from 121,613 square feet (approximately 11,298 square meters) to 372,440 square feet (approximately 34,600 square meters) assuming approximately 100 feet (30.5 meters) of slack chain at low tide.

Buoys can use a wide range of moorings to attach to the seabed. On the OCS, a larger discus-type or boat-shaped hull buoy may require a combination of a chain, nylon, cable and/or buoyant polypropylene materials designed for many years of ocean service. Some deep-ocean moorings have operated without failure for over 10 years (USDOC, NOAA, NBDC, 2008).

A spar-type buoy can be stabilized through an on-board ballasting mechanism approximately 60 feet (18.3 meters) below the sea surface. Approximately 30 to 40 feet (approximately 9 to 12 meters) of the spar-type buoy would be above the ocean surface where meteorological and other equipment would be located. A spar buoy is a long, thin, typically cylindrical buoy, ballasted at one end so that it floats in a vertical position. This design maintains tension in the anchor chain between the buoy and the anchor, thus eliminating slack in the chain that results in chain sweep around the anchor. Tension-leg platforms use the same tension in the mooring chain, but may utilize a more traditional discus-shaped buoy with a larger mast for mounting data collection instrumentation. As indicated in previous site assessment proposals submitted to BOEM, lessees may use diesel generators, solar panels and/or micro wind turbines (diameter of rotor swept up to 2 meters) mounted near or on the platform to charge the batteries that power the equipment on the buoy (Figure 4.5).

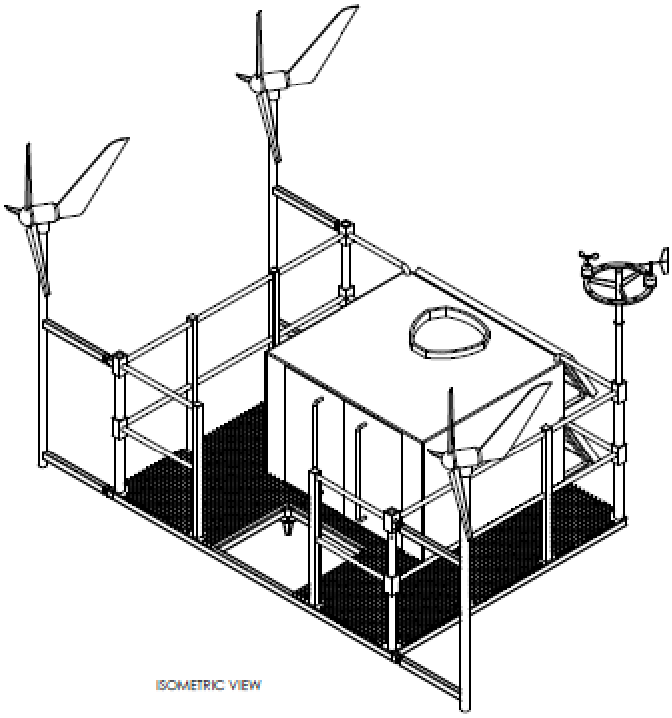


Figure 4.5. Micro wind turbines and equipment on a spar buoy platform.

Buoy Installation

Boat-shaped, spar-type and discus-shaped buoys are typically towed or carried aboard a vessel to the installation location. Once at the location site, the buoy would be either lowered to the surface from the deck of the transport vessel or placed over the final location, and then the mooring anchor dropped. A boat-shaped buoy in shallower waters of the Project Area may be moored using an all-chain mooring, while a larger discus-type buoy would use a combination of chain, nylon, and buoyant polypropylene materials (USDOC, NOAA, NBDC, 2008). Based on previous proposals, anchors for boat-shaped and discus-shaped buoys would weigh about 6,000 to 10,000 pounds (2,721 to 4,536 kilograms) with a footprint of about 16 square feet (approximately 1.49 square meters) and an anchor sweep of about 8.5 acres (approximately 3.4 hectares). After installation, the transport vessel would remain in the area for several hours while technicians configure proper operation of all systems. Boat-shaped and discus-shaped buoys would typically take one day to install. Transport and installation vessel anchoring for one day is anticipated for these types of buoys (Fishermen's Energy 2011 *as cited in* USDOI, BOEM, OREP, 2012a).

Typically, a spar-type buoy would take two days to install. It would be towed to the installation location by a transport vessel after assembly at a land-based facility. Deployment would occur in two phases: deployment of a clump anchor to the seabed as a pre-set anchor (Phase 1) and deployment of the spar buoy and connection to the clump anchor (Phase 2). Phase 1 would take approximately one day and would include placement of the clump anchor on a barge and transporting it to the installation site. The monitoring buoy would be anchored to the seafloor using a clump weight anchor and mooring chain. Installation could take approximately two days. Spar-type buoys may have all-chain moorings or cables. Moorings for a spar-type buoy tension leg anchoring system may weigh up to 165 tons with a 26 by 26 foot (7.9 by 7.9 meter) footprint. The total area of bottom disturbance associated with buoy and vessel anchors would be 28 by 28 feet (8.5 by 8.5 meters), with a total area of 784 square feet (73 square meters) to a 1,200-foot (356.7 meter) radius anchor sweep for the installation vessel with a total of just over 100 acres of disturbance. The maximum area of disturbance to benthic sediments would occur during anchor deployment and removal (e.g., sediment resettlement, sediment extrusion, etc.) for this type of buoy.

4.2.4.4 Other Ocean Monitoring Equipment

In addition to the meteorological buoys described above, a small tethered buoy (typically 3 meters [approximately 10 feet] or less in diameter) and/or other instrumentation also could be installed on, or tethered to, a meteorological tower to monitor oceanographic parameters and to collect baseline information on the presence of certain marine life.

To measure the speed and direction of ocean currents, Acoustic Doppler Current Profilers (ADCPs) would likely be installed on each meteorological tower or buoy. The ADCP is a remote sensing technology that transmits sound waves at a constant frequency and measures the ricochet of the sound wave off fine particles or zooplanktons suspended in the water column. The ADCPs may be mounted independently on the seafloor or to the legs of the platform, or attached to a buoy. A seafloor-mounted ADCP would likely be located near the meteorological tower (within approximately 500 feet [152 meters]) and would be connected by a wire that is hand-buried into the ocean bottom. A typical ADCP has three to four acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300 to 600 kHz with a sampling rate of 1 to 60 minutes. A typical ADCP is about 1 to 2 feet tall (approximately 0.3 to 0.6 meters) and 1 to 2 feet wide (approximately 0.3 to 0.6 meters). Its mooring, base, or cage (surrounding frame) would be several feet wider.

A meteorological tower or buoy also could accommodate environmental monitoring equipment, such as avian monitoring equipment (e.g., radar units, thermal imaging cameras), acoustic monitoring for marine mammals, data-logging computers, power supplies, visibility sensors, water measurements (e.g., temperature, salinity), communications equipment, material hoist, and storage containers.

4.2.4.5 Timing of Wind Resource Assessment Equipment Installation

Total installation time for a single meteorological tower would take eight days to ten weeks depending on the type of structure installed and the weather and sea state conditions. It is anticipated that an average meteorological buoy installation would likely take one to two days. Installation of meteorological towers and buoys would likely occur in the spring and summer months during calmer weather, however, installation could potentially occur at any time of year when weather permits.

4.3 Vessel Traffic

Vessel traffic, both by air and by sea, occurs during all phases of the site characterization and assessment activities. Due to concerns with collisions and potential pollution, vessel traffic for all phases of the site assessment is addressed in this section.

4.3.1 HRG Survey Traffic

As detailed in Section 4.2.1.2, it is assumed that the HRG survey would cover the entire Project Area, and geophysical surveys for shallow hazards (492 feet [150 meters] line spacing) and archaeological resources (98 feet [30 meters] line spacing) would be conducted at the same time on the same vessels conducting sweeps at the finer line spacing array. This would result in about 500 NM of HRG surveys per OCS block (3 by 3 statute miles [approximately 5 by 5 kilometers]), not including turns. Assuming a vessel speed of 4.5 knots and 10-hour days (daylight hours minus transit time to the site), it would take about 11 days to survey one OCS block or about 100 days to survey an average-size lease of eight OCS blocks. To survey all of the Project Area, HRG surveys would have to be conducted by multiple vessels and/or over multiple years. Assuming 100 percent coverage of the Project Area, the proposed action would result in a total of approximately 79,000 NM or 17,490 hours/ 1,900 round trips of HRG surveys (*see* Tables 4.1 and 4.2).

Vessels would be required to maintain a vigilant watch for marine mammals and sea turtles during transit to and from the survey area, as well as during the HRG survey itself.

4.3.2 Geotechnical Sampling Vessel Traffic

As described in the geotechnical sampling activity scenario, it is anticipated that there would be approximately 1,208 – 4,300 geotechnical samples taken within the Project Area. The amount of effort and vessel trips vary greatly by the type of technology used to retrieve the sample, and each work day would be associated within one round trip. The following details the type of vessels and collection time per sample:

Vibracores: Would be likely be advanced from a single small vessel (~45 feet [~14.7 meters]), and collect 1 sample per day.

Cone Penetrometer Test (CPT): Depending on the size of the CPT, it could be advanced from medium vessel (~65 feet [~19.8 meters]), a jack-up barge, a barge with a 4-point anchoring system, or a vessel with a dynamic positioning system. Each barge scenario would include a support vessel. This range of vessels could sample 1 location per day.

Geologic boring: Would be advanced from a jack-up barge, a barge with a 4-point anchoring system, or a vessel with a dynamic positioning system. Each barge scenario would include a support vessel. Each deep geologic boring could take 1 day.

Based on the expected number of both HRG surveys and geotechnical samples, as well as, presumed independent biological surveys (approximately 432-672 surveys in both WEAs), approximately 3,540 to 6,872 vessel trips (round trips) associated with site characterization surveys are projected to occur as a result of the proposed action over five years (2013 to 2018).

4.3.3 Meteorological Tower Construction and Operation Traffic

The proposed action scenario estimates a maximum of nine meteorological towers to be constructed within the Project Area. During installation, a radius of approximately 1,500 feet (457.2 meters) around the site would be needed for the movement and anchoring of support vessels. A maximum of 40 round trip vessel trips are expected during construction of each meteorological tower or 360 rounds trips for up to nine meteorological towers.

Several vessels would be involved in installing and constructing a meteorological tower. Vessels delivering construction material or crews to the site will be present in the area between the mainland and the construction site, as well as vessel being present at the site during installation. The barges, tugs and vessels delivering construction materials will typically be 65 to 270 feet (19.8 to 82.3 meters) in length, while the vessel carrying construction crews will typically be 51 to 57 feet (15.5 to 17.4 meters) in length.

After installation data would be monitored and processed. The structure and instrumentation would be accessed by boat for routine maintenance. Assuming a single maintenance trip to each meteorological tower quarterly to weekly, the proposed action would result in an additional 36 to 468 vessel trips per year for up to nine meteorological towers, or 180 to 2,340 vessel trips over a five-year period (Table 4.2). These vessel trips would not require any additional or expansion of onshore facilities. It is projected that crew boats 51 to 57 feet (15.5 to 17.4 meters) in length would be used to service the structure.

Vessel usage during decommissioning will be similar to that during construction. Up to approximately 40 round trips by various vessels are expected during decommissioning of each meteorological tower. Similar to construction, this yields an average of 360 round trips for the decommissioning of up to nine meteorological towers (Table 4.2).

4.3.4 Meteorological Buoy Deployment and Operation Traffic

The proposed action scenario estimates a maximum of 18 meteorological buoys could be deployed throughout the Project Area. The installation of each buoy could utilize 1-2 round trips per buoy deployment. The types of vessels involved in the deployment include barge/tug (for buoy and/or anchoring system), large work vessel (for towing and/or carrying the buoy), and an additional support vessel (for crew and other logistical needs).

Similar to the meteorological towers, it is expected that maintenance for the buoy would be required on a quarterly to weekly basis resulting in maximum of 72-936 to round-trips per year for up to 18 buoys, or 360-4,680 vessel trips over a five year period (Table 4.2). It should be noted that it is unlikely that all 18 meteorological buoys would be in service at the same time over the entire period. For meteorological buoys, the decommissioning is expected to be the reverse of the deployment, with one round trip required to retrieve each buoy.

Table 4.2
Total Number of Estimated Vessel Trips for Project Area Over a Five Year Period

WEA	HRG Survey	Geotechnical sample	Met tower install	Met buoy install	Met tower ops	Met buoy ops	Met tower decom	Met buoy decom
Rhode Island / Massachusetts	400	500 – 1,400	160	8-16	80-1,040	160-2,080	160	8-16
Massachusetts	1500	708 – 2,900	200	10-20	100-1,300	200-2,600	200	10-20
Total	1900	1,208 – 4,300	360	18-36	180-2,340	360-4,680	360	18-36

Note:
Met = Meteorological
ops = operations
decom = decommissioning

4.4 Onshore Activity

Several southern New England ports would be used as a fabrication sites, staging areas and crew/cargo launch sites. Existing ports or industrial areas are expected to be used. The fabrication facilities in the relevant major port areas are large and have high capacities, therefore BOEM does not anticipate that the fabrication of meteorological towers or buoys associated with the proposed action would have any substantial effect on the operations of, transportation to or from, or conditions at these facilities.

Several major ports exist near the Project Area that are suitable to support the fabrication and staging of meteorological towers and buoys, including the ports of New Bedford, Massachusetts and Quonset Point, Rhode Island. A meteorological tower platform or meteorological buoy would be constructed or fabricated onshore at an existing fabrication yard or final assembly of the tower could be completed offshore. The location of these fabrication yards is directly tied to the availability of a large enough channel that would allow the towing of these structures. The average bulkhead depth needed for water access to fabrications yards is 15 to 20 feet (4.6 to 6.1 meters).

4.5 Decommissioning

No later than two years after the cancellation, expiration, relinquishment, or other termination of the lease, the lessee would be required to remove all devices, works, and structures from the site and restore the leased area to its original condition before issuance of the lease (30 CFR 585, Subpart I).

It is estimated that the entire removal process of a meteorological tower would take one week or less. Decommissioning activities would begin with the removal of all meteorological instrumentation from the tower, typically using a single vessel. A derrick barge would be transported to the offshore site and anchored next to the structure. The mast would be removed from the deck and loaded onto the transport barge. The deck would be cut from the foundation structure and loaded onto the transport barge. The same number of vessels necessary for installation and frequency of use would likely be required for decommissioning. The sea bottom area beneath installed structures would be cleared of all materials that have been introduced to the area in support of the lessee's project.

Buoy decommissioning is the reverse of the installation process. Equipment recovery would be performed with support of a vessel(s) equivalent in size and capability to those used for installation. For small buoys, a crane lifting hook would be secured to the buoy. A water/air pump system would de-ballast the buoy into the horizontal position. The mooring chain(s)/cable(s) and anchor would be recovered to the deck using a winching system. The buoy would then be towed to shore by the barge. All buoy decommissioning is expected to be completed within one or two days. Buoys would be returned to shore and disassembled or reused in other applications. It is anticipated that the mooring devices and hardware would be reused or disposed of as scrap iron for recycling (Fishermen's Energy 2011 *as cited in* USDOI, BOEM, OREP, 2012a).

4.5.1 Cutting and Removing Piles

As required by BOEM, the lessee would sever bottom-founded structures and their related components at least 15 feet (5 meters) below the mud line to ensure that nothing would be exposed that could interfere with future lessees and other activities in the area (30 CFR 585.910(a)). The choice of severing tool depends on the target size and type, water depth, economics, environmental concerns, tool availability, and weather conditions (USDOI, MMS, 2005). Meteorological tower piles in the Project Area would be removed using non-explosive severing methods.

Common non-explosive severing tools that may be used consist of abrasive cutters (e.g., sand cutters and abrasive water jets), mechanical (carbide) cutters, diver cutting (e.g., underwater arc cutters and oxyacetylene/oxyhydrogen torches), and diamond wire cutters. Of these, the most likely tools to be employed would be an internal cutting tool, such as a high-pressure water jet-cutting tool that would not require the use of divers to set up the system or jetting operations to access the required mud line (Kaiser *et al.,* 2005). To cut a pile internally, the sand that had been forced into the hollow pile during installation would be removed by hydraulic dredging/pumping and stored on a barge. Once cut, the steel pile would then be lifted onto a barge and transported to shore. Following the removal of the cut pile and the adjacent scour control system, the sediments would be returned to the excavated pile site using a vacuum pump and diver-assisted hoses. As a result, no excavation around the outside of the monopile or piles prior to the cutting is anticipated. Cutting and removing piles would take anywhere from several hours to one day per pile. After the foundation is severed, it would be lifted on the transport barge and towed to a decommissioning site onshore (USDOI, MMS, 2009a).

4.5.2 Removal of Scour Control System

Any scour control system would be removed during the decommissioning process. Scour mats would be removed by divers or ROV and a support vessel in a similar manner to installation. Removal is expected to result in the suspension of sediments that were trapped in the mats. If rock armoring is used, armor stones would be removed using a clamshell dredge or similar equipment and placed on a barge. It is estimated that the removal of the scour control system would take a half-day per pile. Therefore, depending on the foundation structure, removal of the scour system would take from one half to two days to complete (USDOI, MMS, 2009a).

4.5.3 Disposal

All materials would be removed by barge and transported to shore. The steel would be recycled and remaining materials would be disposed of in existing landfills, in accordance with applicable law.

4.5.4 Artificial Reefs

Obsolete materials have been used as artificial reefs along the coastline of the U.S. to provide valuable habitat for numerous species of fish in areas devoid of natural hard bottom. The meteorological tower structures and scour control systems may have the potential to serve as artificial reefs. However, the structure must not pose an unreasonable impediment to future development. If the lessee ultimately proposes to use the structure as an artificial reef, its plan must comply with the artificial reef permitting requirements of the USACE and the criteria in the National Artificial Reef Plan of 1985 (33 U.S.C. 35.2103). The state agency responsible for managing marine fisheries resources must accept liability for the structure before BOEM would release the federal lessee from the obligation to decommission and remove all structures from the lease area (USDOI, MMS, 2009a).

5 Effects of the Proposed Action

The proposed action has five primary activities that will likely have environmental effects. These activities are: (1) HRG surveys; (2) geotechnical sampling; (3) deployment of a meteorological buoy or construction of a meteorological tower; (4) operation of a meteorological buoy or meteorological tower; and (5) other activities. The potential effects from these activities can be grouped into the following categories: (1) acoustic effects; (2) vessel and tower collision effects; (3) lighting effects; and (4) other effects (e.g., contact with waterborne pollution).

5.1 Acoustic Effects

5.1.1 High Resolution Geologic Survey and Geotechnical Sampling

As with any sound in the marine environment, the type and intensity of the sound is greatly dependent on multiple factors and can vary greatly. High resolution geologic (HRG) surveys will be used to characterize ocean-bottom topography and subsurface geology and to investigate potential benthic biological communities and archaeological resources. In addition, geotechnical sampling (vibracore, CPT, and/or deep boring) would be conducted at every potential tower location throughout the Project Area. In both cases, sound will be traveling in the water column. Roseate terns, piping plovers, and red knots are unlikely to be on the OCS during HRG surveys and geotechnical sampling, therefore no impacts are anticipated.

5.1.2 Meteorological Tower Pile-Driving and Construction

As with any sound in the marine environment, the type and intensity of the sound is greatly dependent on multiple factors and can vary greatly. These factors include the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact hammer (Madsen *et al.,* 2006). Although loud noises from pile driving and construction activities can disturb nesting birds, the noise associated with these activities will occur on the Atlantic OCS, far from the nesting habitat of piping plovers in Massachusetts and Rhode Island and the nesting colonies of roseate terns in Massachusetts. Thus, noise from these activities will have no impact on nesting roseate terns and piping plovers. Additionally, noise from these activities is not anticipated to impact the migratory movement or migratory behavior of the piping plover, roseate tern, or the red knot through the two WEAs. Therefore, acoustic effects to ESA-listed and candidate bird species are considered negligible.

5.2 Collision Effects

This section discusses the potential for impacts to protected species resulting from collisions with vessels and structures associated with the proposed action. BOEM anticipates that marine animals will avoid fixed structures, such as meteorological towers, reducing the risk of collisions with these structures. Collisions with vessels and/or structures associated with the proposed action could result in injury to the animal and/or damage to the vessel or structure. A bird that collides into meteorological tower maybe injured or killed. However, the area over which up to 9 meteorological towers may be placed is over 1,200 sq. nautical miles and the distance from shore will exclude nesting or foraging roseate terns and piping plovers. Only migrating roseate terns, piping plovers, and red knots are anticipated to cross the WEA for a short period of time during migration, and the number of passages would be very low (i.e., one bird = one pass per migration). Therefore, the likelihood of a roseate terns, piping plovers, and red knots encountering a meteorological tower under climatological conditions that would force a migrating bird low enough to actually collide with a tower is so small that the impact such collisions on federally listed or ESA candidate bird species is discountable.

5.3 Lighting Effects

Under poor visibility conditions (fog and rain), migrating birds become disoriented and circle lighted communication towers instead of continuing on their migratory path, greatly increasing their risk of collision (Huppop *et al.*, 2006). Meteorological tower lighting would have the greatest impact on bird species during evening hours when nocturnal migration occurs. However, red flashing lights are commonly used at land-based wind facilities without any observed increase in avian mortality compared with unlit turbine towers (Kerlinger *et al.*, 2010). Thus, red flashing lights would be used at the meteorological towers to reduce the risk of bird collisions. Though there is the potential for the lighting of the meteorological towers to affect the collision probability of the piping plover, roseate tern, and red knot during migration, the anticipated small number of meteorological towers that will be present will greatly decrease the likelihood of these species being in proximity of a tower. Finally, it is anticipated that any additional lights (e.g., work lights) on towers and support vessels will be used only when necessary and be hooded downward and directed when possible to reduce upward illumination and illumination of adjacent waters. Therefore, the potential impacts from the artificial lighting of the meteorological towers on federally listed or ESA candidate bird species would be negligible.

5.4 Micro Wind Turbines

Small turbines might be mounted near the platform of meteorological towers and buoys to charge batteries to power electrical equipment (*see* Figures 4.4 and 4.5). These micro turbines are commonly used to charge batteries in the marine environment and are anticipated to have a rotor swept diameter of two meters or less. It is possible that a bird flying near the deck of a tower or buoy could collide with a rotor and get injured or killed. However, the likelihood that a bird would collide with a meteorological tower is already discountable, the addition of micro turbines does not expand the footprint of the meteorological tower or buoy, and the rotor swept zone of micro turbines is very small. Therefore, the likelihood of a collision with micro turbine is also very, very small and the potential impacts from micro turbines on federally listed or ESA candidate bird species would be negligible.

5.5 Discharge of Waste Materials and Accidental Fuel Leaks

Operational waste generated from all vessels associated with the proposed action includes bilge and ballast waters, trash and debris, and sanitary and domestic wastes. A vessel collision with a meteorological tower or other vessel has the potential to result in the spillage of diesel fuel into the marine environment. Vessels associated with the proposed action are expected to comply with the USCG requirements for the prevention and control or oil and fuel spills. Approximately 10 percent of vessel collisions with fixed structures on the OCS caused diesel spills.

Most equipment on the meteorological towers and buoys would be powered by batteries charged by micro wind turbines or solar panels. However, there is a possibility that diesel generators may be used on some of the meteorological towers and buoys, which may cause minor diesel fuel spills during refueling of generators. If a diesel fuel spill were to occur it would be expected to be small and dissipate quickly, then evaporate and biodegrade within a few days (USDOI, MMS, 2007).

Marine and coastal birds could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. Many species of marine birds (such as gulls) often follow ships to forage on fish and other prey inured or disoriented by the passing vessel. In doing so, these birds may be affected by discharges of waste fluids (such as bilge water) generated by the vessels. Operational discharges from construction vessels would be released into the open ocean where they would be rapidly diluted and dispersed, or collected and taken to shore for treatment and disposal. Sanitary and domestic wastes would be processed through on-site waste treatment facilities before being discharged overboard. Deck drainage would also be processed prior to discharge. Thus, impacts to marine and coastal birds from waste discharges from construction vessels are expected to be negligible.

Coastal and pelagic birds may become entangled in or ingest floating, submerged, and beached debris. Entanglement may result in strangulation, the injury or loss of limbs, entrapment, or the prevention or hindrance of the ability to fly or swim, and all of these effects may be considered lethal (Ryan, 1990; Gregory, 2009). However, the discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by the BOEM (30 CFR 250.300) and the USCG (MARPOL, Annex V, Public Law 100-220 [101 Statute 1458]), Thus, entanglement or ingestion of OCS-related trash and debris by marine and coastal birds is not expected, and impacts to marine and coastal birds would be negligible.

Because of the very limited amount of vessel traffic and construction activity that might occur with construction and operation of a meteorological tower, the release of wastes, debris, hazardous materials, or fuels would occur infrequently and would cease following completion of the geological and geophysical surveys, meteorological tower construction, and meteorological tower decommissioning. The likelihood of an accidental fuel release would also be limited to the active construction and decommissioning periods of the site characterization. Piping plovers and red knots are strictly terrestrial foragers, and roseate terns typically feed only in shallow waters, so these species are not expected to follow vessels to forage. In addition, the areas where these impacts could occur do not strictly overlap with the foraging range of breeding piping plovers and roseate terns and only encompass a very small proportion of the migratory range of the piping plover, roseate tern, and red knot. As such, impacts to ESA-listed and candidate bird species from the discharge of waste materials or the accidental release of fuels are expected to be negligible.

5.6 Meteorological Tower and Buoy Decommissioning

Section 4.5 discusses in detail the proposed scenario for the decommissioning of meteorological towers and buoys. This section focuses on the decommissioning of a meteorological tower as it is a more extensive process than that of a meteorological buoy. The decommissioning of a meteorological tower involves more than potential impacts from vessel trips (which are addressed separately in Section 5.2). Decommissioning activities are not expected to have any impacts on ESA-listed birds or bats.

6 Natural and Unanticipated Events

The potential exists for natural and/or unanticipated events to cause environmental impacts during site assessment or characterization activities. A natural event such as a hurricane or severe storm could impact meteorological towers or buoys at some point during their operation. Depending on the severity of the event, components of the facility could be damaged, destroyed or lost from the structure. These could cause temporary sea hazards and would be retrieved, removed or repaired as soon as possible. Buoys are equipped with GPS systems that alert operators when they have moved outside their operating area. Mariners would be alerted if this were to happen, or if a tower had experienced severe damage.

A vessel collision with the meteorological structures or collision with other vessels may result in the spillage of diesel fuel. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. Spills are not projected to have significant impacts due to the small size of a projected spill. A vessel spill could occur while en route to and from the Project Area, but this is considered unlikely. If a spill were to occur, either inside or outside of the Project Area, the spill size would likely be small. From 2000 to 2009, the average spill size for vessels similar to those anticipated to be used during activities associated with the proposed action was 88.36 gallons (USCG, 2012). Vessel allision with a meteorological buoy containing diesel powered generator may also occur. It is estimated that a buoy generator could contain 240 gallons of diesel fuel (Fishermen's Energy 2011 *as cited in* USDOI, BOEM, OREP, 2012a). If a diesel spill of this size were to occur, it would be expected to dissipate very rapidly in the water column of the open ocean, then evaporate and biodegrade within a few days.

It is also possible that larger vessels, such as tankers or container ships, could collide with meteorological structures within the project area. Such a collision is considered unlikely, as these structures would be sparsely placed on the OCS offshore Massachusetts and Rhode Island, and will be lit and marked for navigational purposes. If a larger vessel should collide with a meteorological facility/structure, a large spill would be extremely unlikely (*see* Section 5 of this BA). Thus, the largest spill that could result in the unlikely event that a larger ship was to collide with a meteorological facility is on the order of 240 gallons (as indicated above for a buoy-mounted generator).

6.1 Non-Routine or Accidental Activities

Non-routine activities also include hurricanes or severe storms impacting meteorological towers or buoys and/or blowing birds into the two WEAs, resulting in an increased risk of collision with a meteorological tower or buoy. These events are anticipated to be infrequent. In addition, given the small number of structures, their small footprint size, and their distance from shore and each other, impacts to federally listed and ESA candidate bird species resulting from this type of non-routine activity are expected to be negligible.

Accidental activities that could cause impacts to the environment during site assessment activities might include vessel collision with meteorological towers or buoys, causing damage to the structure and/or vessel and resulting in the discharge of the vessel's cargo (i.e., oil, liquefied natural gas, chemicals, or other commodities). Vessel collision is unanticipated since it would require a loss of vessel power or steerage, high winds, or a sea state that would drive the vessel toward the structure, and failure of the vessel's and/or structure's design to withstand the impact.

As such, impacts to federally listed and ESA candidate bird species resulting from accidental activities are also expected to be negligible.

7 Conclusions

The following are the conclusions reached by BOEM regarding the anticipated impacts of lease issuance, site assessment, and site characterization activities described herein for the Project Area to ESA-listed birds / bats. There is no critical habitat for any ESA-listed species in the Project Area or its surrounding waters.

The proposed action is not anticipated to impact the ESA-listed piping plover and roseate tern and the ESA candidate species red knot as the action area has no overlap with both species' nesting and foraging areas. Due to the small number of structures, the anticipated use of flashing red aviation hazard lights on towers, and the restricted time period of exposure during migration, BOEM concludes that the effects of the proposed action are discountable and is not likely to adversely affect the piping plover, roseate tern, or red knot.

8 Standard Operating Conditions for Protected Species

This section outlines the standard operating conditions that are part of the proposed action and which minimize or eliminate potential impacts to protected species including ESA-listed species of birds. Additional conditions, including mitigation, monitoring or reporting measures, may be included in any issued BOEM lease or other authorization, including those that may be developed during the Federal ESA Section 7 consultation process.

8.1 Measures for ESA-Listed Birds and Bats

Based on the following assumptions regarding the Proposed Action (*see* Section 1.2) within the Project Area (*see* Figure 1.1), no additional mitigations for ESA-listed and ESA candidate species are necessary.

- It is anticipated that metrological towers constructed for site assessment activities would be self-supported structures and would not require guy wires for support or stability.
- It is anticipated that only red flashing strobe-like lights metrological towers will be used for metrological towers to meet FAA requirements. In addition, it also anticipated that navigation lights for towers and buoys will be compliance with USCG requirements. Finally, it is anticipated that any additional lights (e.g., work lights) on towers and support vessels will be used only when necessary and be hooded downward and directed when possible to reduce upward illumination and illumination of adjacent waters.

In addition, meteorological towers will be required to have visibility sensors to collect data on climatic conditions above and beyond wind speed, direction and other associated metrics generally collected at meteorological towers. This information will assist BOEM and USFWS with evaluating the impacts of future offshore wind facilities on threatened and endangered birds, migratory birds, and bats.

8.2 Requirements During Decommissioning

Section 4 of this BA contains detail on the proposed scenario for decommissioning and removal of the meteorological towers and buoys. Essentially, the decommissioning process is the reverse of the construction process (absent pile driving), and the impacts from decommissioning would likely mirror those of construction. In addition, vessel activity during decommissioning would be essentially the same as that required during construction.

Foundation structures must be removed by cutting at least 15 feet (4.6 meters) below mudline (*see* 30 CFR 585.910(a)). BOEM assumes the meteorological towers to be constructed in southern New England can be removed using non-explosive severing methods. As detailed in 30 CFR Part 585.902, before the lessee decommissions the facilities under their SAP, the lessee must submit a decommissioning application and receive approval from the BOEM. Furthermore, the approval of the decommissioning concept/methodology in the SAP is not an approval of a decommissioning application.

8.3 Other Non-ESA Related Standard Operating Conditions

The regulations for site assessment plans found at 30 CFR Part 585.610 specify the requirements of a site assessment plan. These include a description of the measures the lessee will use to avoid or minimize adverse effects and any potential incidental take of endangered species before conducting activities on the lease, and how the lessee will mitigate environmental impacts from your proposed activities. 30 CFR 585.801 also specify requirements of the lessee to reduce impacts to protected species.

8.4 Site Characterization Data Collection

In addition to the collection of meteorological and oceanographic data, the purpose of these meteorological towers/buoys and site characterization surveys are to also collect biological and archaeological data. This data will assist in future analysis of proposed wind facilities. In addition to required reports, all site characterization data will be shared with NMFS, USFWS, and appropriate State agencies, upon request.

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