UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
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Maureen Bornholdt
Program Director
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US Department of the Interior
Bureau of Ocean Energy Management, Regulation and Enforcement
Washington, DC 20240

RE: Programmatic Informal Consultation – mid-Atlantic WEAs

Dear Ms. Bornholdt:

In March 2011, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) requested informal, programmatic consultation pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.), concerning the proposed lease issuance, associated site characterization, and subsequent site assessment activities for siting of wind energy facilities in the mid-Atlantic OCS at identified Wind Energy Areas (WEAs). Additional information was received from BOEMRE on June 22 and June 23, 2011. Additionally, on July 12, 2011, BOEMRE published a draft Environmental Assessment (DEA) on Commercial Wind Lease Issuance and Site Characterization on the Atlantic Outer Continental Shelf New Jersey, Maryland, Delaware and Virginia (76 FR 40925).

BOEMRE has made a preliminary determination that the issuance of leases and the carrying out of certain activities pursuant to special conditions detailed below, may affect but is not likely to result in adverse affects to any species listed by NOAA's National Marine Fisheries Service (NMFS) and has requested NMFS concurrence with this determination. Below, NMFS explains BOEMRE's proposed action, outlines the activities that are considered in this consultation, explains the project design criteria (i.e., special conditions), considers the effects of these activities on listed whales and sea turtles and explains how the programmatic consultation will be carried out.

Description of the Proposed Action

The BOEMRE is proposing to issue offshore wind energy leases and subsequently approve site assessment activities in the mid-Atlantic region of the Outer Continental Shelf (OCS), within the WEAs offshore New Jersey, Delaware, Maryland and Virginia (see Figure 1). Pursuant to BOEMRE's regulations at 30 CFR Part 285, there are generally three phases of renewable energy development on the OCS: lease issuance, site assessment, and construction and operation of a renewable energy facility. A commercial and research renewable energy lease gives the lessee an exclusive right to apply for subsequent approvals that are necessary to advance to the next

stage of the renewable energy development process. The second phase is BOEMRE review and approval of a site assessment plan (SAP); approval of this plan allows the lessee to install a meteorological tower and/or buoys (30 CFR 285.600; .605-.618). After the lessee has collected sufficient site characterization and assessment data the lessee may submit a construction and operation plan (COP), approval of which would authorize the actual construction and operation of a renewable energy facility (30 CFR 285.620-621).

Although BOEMRE does not have the regulatory authority to issue permits for site characterization activities (i.e., geological and geophysical surveys and core samples), a lessee must submit the results of such survey before BOEMRE can consider approving its COP (30 CFR 285.626). The Army Corps of Engineers (ACOE) has the regulatory authority to permit certain site characterization activities (e.g., vibracores or other sediment disturbing activities). Site characterization surveys are a reasonably foreseeable result of lease issuance and are an interrelated and interdependent activity associated with the issuance of the lease and subsequent approval of a lessee's SAP. Therefore, site characterization activities are considered in the scope of this consultation as effects of the proposed action.

In addition to commercial leases, BOEMRE has the authority to issue OCS leases to Federal agencies and State agencies for renewable energy research activities that support the future production, transportation, or transmission of renewable energy (30 CFR 285.238). In issuing leases to a Federal agency or a State on the OCS for renewable energy research activities, BOEMRE will coordinate and consult with other relevant Federal agencies, any other affected State(s), affected local government executives, and affected Indian tribes. The Director and the head of the Federal agency or the Governor of a requesting State, or their authorized representatives, will negotiate the terms and conditions of such renewable energy lease on a case-by-case basis. The framework for such negotiations, and standard terms and conditions of such a lease, may be set forth in a memorandum of agreement (MOA) or other agreement between BOEMRE and a Federal agency or a State.

This consultation considers the effects to listed whales and sea turtles associated with reasonably foreseeable site characterization scenarios associated with leasing (including geophysical, geotechnical, archeological and biological surveys), and reasonably foreseeable site assessment scenarios (including the installation and operation of meteorological towers and buoys) in the WEAs.

BOEMRE will make it a stipulation of its leases that the applicant must comply with all applicable laws, including the Marine Mammal Protection Act (MMPA) as specifically required by 30 CFR §285.801(b).

Programmatic Consultations

NMFS has developed a range of techniques to streamline the procedures and time involved in consultations for broad agency programs or numerous similar activities with predictable effects on listed species and critical habitat. Some of the more common of these techniques and the requirements for ensuring that streamlined consultation procedures comply with section 7 of the ESA and its implementing regulations are discussed in the October 2002 joint Services

memorandum, *Alternative Approaches for Streamlining Section 7 Consultation on Hazardous Fuels Treatment Projects* (http://www.fws.gov/endangered/pdfs/MemosLetters/streamlining.pdf; see also, 68 FR 1628 (January 13, 2003)). Pursuant to this guidance, programmatic consultations may be conducted on any Federal agency's proposal to apply specified standards or design criteria to future proposed actions. Programmatic consultations can be used to evaluate the anticipated effects of groups of related agency actions expected to be implemented in the future, where specifics of individual projects such as project location are not definitively known. A programmatic consultation must identify project design criteria and/or standards that will be applicable to all future projects implemented under the consultation document. These criteria and standards serve to prevent adverse effects to listed species (informal consultation), or to limit adverse effects to predictable levels that will not jeopardize the continued existence of listed species or destroy or adversely modify critical habitat, at the individual project level or in the aggregate from all projects implemented under a programmatic Biological Opinion (formal consultation). Programmatic consultations allow for streamlined project-specific consultations because the effects analysis is completed up front in the programmatic consultation document. At the project-specific consultation stage, a proposed project is reviewed to determine if it can be implemented according to the criteria or standards under the programmatic consultation. Consistent with the 2003 memo referenced above, the following elements should be included in a programmatic consultation to ensure its consistency with ESA section 7 and its implementing regulations.

1. Project design criteria (PDC) to prevent or limit future adverse effects on listed species and critical habitat;

2. Description of the manner in which projects to be implemented under the programmatic consultation may affect listed species and critical habitat and evaluation of expected level of effects from covered projects;

3. Process for evaluating expected, and tracking actual aggregate or net additive effects of all projects expected to be implemented under the programmatic consultation. The programmatic consultation document must demonstrate that when the PDCs or standards are applied to each project, the aggregate effect of all projects will not adversely affect listed species or their critical habitat;

4. Procedures for streamlined project-specific consultation. As discussed above, if an approved programmatic consultation document is sufficiently detailed, project-specific consultations ideally will consist of certifications between action agency biologists and consulting agency biologists, respectively. An action agency biologist or team will provide a description of a proposed project, or batched projects, and a certification that the project(s) will be implemented in accordance with the criteria or standards. The consulting agency biologist reviews the submission and provides certification, or adjustments to the project(s) necessary to bring it (them) into compliance with the programmatic consultation document.

5. Procedures for monitoring projects and validating effects predictions; and,

6. Comprehensive review of the program, generally conducted annually.

Proposed Action

The action to be considered in this consultation is the issuance of alternative energy leases, established under BOEMRE's Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf final rule (74 FR 19638, April 29, 2009) and authorization of certain activities by BOEMRE and the implementation of those activities in a manner that is consistent with the conditions outlined herein. All activities considered in this consultation would occur in the mid-Atlantic WEAs. It is the effect of authorizing these activities on listed species that is the subject of this informal ESA consultation. As explained in BOEMRE's draft Environmental Assessment (EA) and BA, the issuance of the lease does not constitute an irreversible commitment of the resources toward full development of the lease area. Thus BOEMRE's 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. For example, if a lessee obtains a lease, there is no authorization to build a wind energy facility. Thus, this consultation does not consider the effects of any future potential construction or operation of any wind energy facility, as any future construction and operation of a wind energy facility would be the subject of a separate ESA Section 7 consultation between BOEMRE and NMFS.

NMFS has determined that all effects of the activities proposed are insignificant and/or discountable; therefore, NMFS concurs with BOEMRE's determination that the authorization of activities is not likely to adversely affect whales and sea turtles. NMFS' analysis supporting this determination is provided below and is based on the best scientific information available.

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

- Geophysical and geotechnical (G&G) assessment: Includes 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). As BOEMRE has determined that the use of airguns is not likely to be necessary for site assessment activities in the Mid-Atlantic WEAs, the use of airguns is not being considered as a part of this consultation.
- Geotechnical sub-bottom sampling (includes CPTs, geologic borings, vibracores, etc).
- Wind resource assessment, including the construction of a meteorological towers and the installation of a LIDAR buoys.
- Biological resource assessment, including presence/absence of threatened and endangered species and presence/absence of sensitive biological resources/habitats.
- Archaeological resource assessment.
- Assessment of coastal and marine use.

Below, NMFS describes in detail these activities. Later, NMFS considers the effects of the proposed activities on listed whales and sea turtles. BOEMRE has developed a leasing and site assessment scenario, described fully below, that is the best estimate of the amount and type of activity likely to result from the proposed action. This scenario is summarized in Table 1, below.

Wind Energy Area (WEA)	High Resolution Geophysical (HRG) Surveys (max nautical miles and hours)	Sub-bottom Sampling locations (min-max)	Met Towers (max)	Met Buoys (max)
New Jersey	31,000 nm; 6,900 hours	900-2,500	7	14
Delaware	9,300 nm; 2,100 hours	300-700	0	1
Maryland	7,100 nm; 1,600 hours	200-600	2	4
Virginia	12,600 nm; 2,800 hours	400-1,000	3	6

Table 1. Scenario Considered in this Consultation

Description of Wind Energy Areas

On November 23, 2010, Secretary of the Interior Ken Salazar announced the "Smart from the Start" renewable energy initiative to accelerate responsible renewable wind energy development on the Atlantic Outer Continental Shelf (OCS). In the Notice of Intent (NOI) published on February 9, 2011, BOEMRE, in consultation with other Federal agencies and State Renewable Energy Task Forces, identified WEAs offshore New Jersey, Delaware, Maryland, and Virginia. The areas in which BOEMRE is proposing to begin the commercial lease issuance process and subsequent SAP approval process are described below. Any issuance of renewable energy leases or approval of SAPs in any area outside of the Mid-Atlantic WEAs is considered to be outside the scope of this consultation.

- *New Jersey*: The proposed area offshore New Jersey begins 7 nautical miles from the shore and extending roughly 23 nautical miles seaward (or the approximate 100 ft depth contour) and extends 72 nautical miles along the Federal/state boundary form Seaside Park south to Hereford Inlet. The entire area is approximately 418 square nautical miles; 356,104 acres, or 144,110 hectares, and contains approximately 43 whole OCS blocks and 26 partial blocks.
- *Delaware*: The proposed area offshore Delaware rests between the incoming and outgoing shipping routes for Delaware Bay, and is made up of 11 whole OCS blocks and 16 partial blocks. The closest point to shore is approximately 11 miles due east from Rehoboth Beach, Delaware. The entire area is approximately 122 square nautical miles, 103,323 acres, or 41,813 hectares.
- *Maryland*: The proposed area offshore Maryland is made up of 9 whole OCS blocks and 11 partial blocks. The western edge is approximately 10 nautical miles from the Ocean City, Maryland coast, and the eastern edge is approximately 27 nautical miles from the Ocean City, Maryland coast. The entire area is approximately 94 square nautical miles; 79,706 acres; or 32,256 hectares.
- *Virginia*: The proposed area offshore Virginia is made up of 22 whole OCS blocks and 41 partial blocks. The Western edge of the area is approximately 18 nautical miles from

Virginia Beach, and the Eastern edge is approximately 37 nautical miles from Virginia Beach. The entire area is approximately 164 square nautical miles; 138,788 acres; or 56,165 hectares. Areas proposed by the State of Virginia for research activities within the scope of this assessment are included this scenario.

Based on the estimated sizes, the total for the mid-Atlantic WEAs is 798 square nautical miles.

Site Characterization Surveys

Site characterization surveys include a variety of activities that assess of construction hazards and characterization of the physical, biological, cultural environment in which the project may take place. These activities would likely occur in spring and summer months when weather is usually calmer, however, surveys could potentially occur at any time of year when weather permits. These activities are described below.

High-resolution Geophysical (HRG) Survey

The HRG data will provide information on all sub-seafloor conditions, shallow hazards, archaeological and cultural resources; and biological resources including sensitive benthic habitats. This information is used in the design construction and operations of met 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 maximum Area of Potential Effect (APE) encompassing all seafloor/bottom-disturbing activities. The maximum APE 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, maintenance, removal of structures and/or transmission cables.

The geophysical survey grid(s) for project structures and the surrounding area would be oriented with respect to the bathymetry, shallow geologic structure, and renewable energy structure locations. The grid pattern for each survey would cover the maximum APE for all anticipated physical disturbances from construction and operation of a wind facility. Line spacing for all geophysical data for shallow hazards assessments (on side scan sonar/all sub-bottom profilers) will not likely exceed 150 meters throughout the APE. Line spacing for all geophysical data for archaeological resources assessments (on magnetometer, side scan sonar, chirp sub-bottom profiler) will not likely exceed 30 meters throughout the APE. Line spacing for bathymetric charting using multi-beam technique or side scan sonar mosaic construction may vary based on the water depths encountered but will provide both full-coverage of the seabed plus suitable overlap and resolution of small discrete targets of 0.5m - 1.0m in diameter. All track lines would run generally parallel to each other. Tie-lines running perpendicular to the track lines should not exceed a line spacing of 150 meters throughout the APE.

In addition, the geophysical survey grid for proposed transmission cable route(s) would include a minimum 300 meter-wide corridor centered on the transmission cable location(s). Line spacing would be identical to that noted above. These surveys would be conducted between the WEAs and shore.

HRG Survey Instrumentation

Table 2 gives an overview of the type of instrumentation that would be utilized during HRG Survey work in the mid-Atlantic WEAs.

Survey Task	**Example Equipment Model Type**	**Frequency (kilohertz)**	**Estimated Sound Pressure Levels at Source (dB re 1uPa RMS at 1 m)**
Singlebeam Depth Sounder	Innerspace Model 448	200 kHz	202 to 215 dB
Multibeam Depth Sounder	Reson 7101	240 kHz	207 dB
Side Scan Sonar	Klein Dual 3900	445 and 900 kHz	220 dB
Shallow-Penetration Subbottom Profiler (chirper)	EdgeTech chirper	2-16 kHz	201 dB
Medium-Penetration Subbottom Profiler (boomer)	Applied Acoustics boomer	0.5 – 20 kHz	205 dB

Table 2. Typical Equipment to be used during HRG surveys.

Bathymetry/Depth Sounder: The depth sounder system would record with a sweep appropriate to the range of water depths expected in the survey area. BOEMRE encourages developers to use of a multi-beam bathymetry system particularly in areas characterized by complex topography or fragile habitats.

Magnetometer: Magnetometer survey techniques would be capable of detecting and aiding the identification of ferrous, ferric, or other objects having a distinct magnetic signature. The magnetometer sensor would be towed as near as possible to the seafloor but not exceed an altitude of greater than 6 meters above the seafloor. The sensor would be towed in a manner that minimizes interference from the vessel hull and the other survey instruments. The magnetometer sensitivity would be 1 gamma or less and that the background noise level would not exceed a total of 3 gammas peak to peak.

Sea Floor Imagery/Side Scan Sonar: Recording would be of optimal quality (good resolution, minimal distortion) resulting in displays automatically corrected for slant range, lay-back and vessel speed. Developers would likely use a digital dual-frequency side scan sonar system with preferred frequencies of 445 and 900 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 to provide a true plan view that provides 100 percent coverage of the APE. 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. The line spacing and display range would be appropriate for the water depth and the data obtained would be of such quality as to permit detection and evaluation of seafloor objects and features 0.5m – 1m in diameter within the survey area.

Shallow & Medium (Seismic) Penetration Sub-bottom Profilers: A high-resolution "chirp" sub-bottom profiler would be used to delineate near-surface geologic strata and features. The sub-bottom profiler system would be capable of achieving a vertical bed separation resolution of at least 0.3 meters in the uppermost 15 meters below the mud-line.

For deeper seabed penetration a boomer profiler system may be necessary. It would be capable of penetrating greater than 10 meters beyond any potential foundation depth and the vertical resolution would be less than 6 meters. The seismic source would deliver a simple, stable, and repeatable signature that is near to minimum phase output with usable frequency content.

Proposed HRG Survey Action Scenario

It is assumed that the HRG survey would use the finer line spacing required for archaeological resource assessment (30 meters). Tie-lines would be run perpendicular to the track lines at a line spacing of 150 meters. This results in 500 nautical miles of HRG surveys per lease block (lease block is 3statue miles x 3 statute miles). At 4.5 knots, it would take approximately 150 hours to survey one lease block. Surveying a 300 meter-wide corridor along a potential cable route located outside of a WEA would result in about 5 nm or 1 hour of surveys per mile of cable. In order to survey the entire WEAs and potential cables, HRG surveys would have to be conducted by multiple vessels and/or over multiple years and potential cable routes. Based on these assumptions and one cable route per potential commercial wind facility, the proposed action would result in a total of approximately 60,100 nm or 13,300 hours of HRG surveys.

Biological Resource Survey

The sub-marine biological survey will primarily be limited to the delineation of bottom features such as submerged aquatic vegetation and other live bottom features. These features will likely be detected with side scan sonar equipment and then groundtruthed with camera equipped remotely operated vehicles (ROVs) and/or human divers. Shipboard observers would monitor and document sitings of marine mammals and sea turtles when at the surface. The various remote sensing activity used in the biological resource survey will likely occur simultaneously with the HRG survey activity and is thus not repeated here. Surface and aerial biological resources (e.g. birds and bats) would likely be assessed via shipboard observers during the HRG survey and via monitoring equipment affixed to the met buoys or towers.

Cultural Resource Survey

To locate archaeological and cultural resources, and other metallic debris a magnetometer survey would be conducted using one of three types of sensors: An Overhauser effect sensor, a proton precession sensor, or a cesium vapor sensor. An archaeological survey is required by the National Historic Preservation Act of 1966, as amended, when bottom-disturbing activities are proposed in areas that the BOEMRE has identified as having a potential for containing historic or prehistoric archaeological resources. If an archaeological survey is required, survey lane spacing of no more than 30 m (100 ft) shall be used according to the lease. The various remote sensing activity used in the cultural resource survey will likely occur simultaneously with the G&G activity and is thus not repeated here.

Sub-Bottom Sampling

Sub-bottom sampling refers to site specific geologic profiles. Typically these use cone penetrometer tests (CPT) or sediment borings/drillings taken at the proposed foundations of wind turbines and met towers. The principal purpose of this work is to: (1) assess the suitability of shallow foundation soils to support the renewable energy structure or associated transmission cable under extreme operational and environmental conditions that might be encountered, and (2) document soil characteristics necessary for design and installation of all structures and transmission cables. 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 advanced from a small (less than 45 feet) gasoline powered vessel. The diameter of a typical vibracore barrel is approximately 4 inches and the cores are advanced up to a maximum of 15 feet. 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 in diameter, with a pad approximately 10 feet 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) 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 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 in diameter, with connecting rods less than 6 inches in diameter. It is envisioned that the majority of work will accomplished via CPT which does not require deep borehole drilling. However, some geologic conditions may prevent sufficient data from CPTs and require obtaining a geologic profile via a borehole. Previous estimates submitted to BOEMRE for geotechnical drilling have source sound levels at around 118-145dB at a frequency of 120Hz (NMFS 2009).

Sub-bottom Sampling Scenario

BOEMRE has considered the likely spacing of turbines, the size of OCS blocks and the likelihood that a sub-bottom sample (vibracore, CPT and/or deep boring) would be conducted at every potential turbine location to calculate the number of ground penetrating surveys could occur (assuming 100% coverage of WEA with 14 – 45 turbines per block). Based on this assumption, a rotor diameter range of 110 – 130 meters, and the WEA size, the proposed action would result in the number of sub-bottom sampling surveys detailed below. The following number of ground penetrating surveys could occur as a result of the proposed action: New Jersey: 650 – 2,050 sub-bottom sample; Delaware: 245-780 sub-bottom samples; Maryland: About 430-1,385 sub-bottom samples; and, Virginia: About 345-1,105 sub-bottom samples.

Site Assessment

"Site assessment" describes the assessment of the wind resource via the installation of permanent to semi-permanent meteorological towers and buoys. Prior to submitting a construction and operation plan (COP), data would need to be collected on wind resource characteristics and

potential. To determine whether a site is appropriate for a wind turbine facility, a meteorological tower or buoy would be installed in the area of the proposed facility to measure wind speeds and to collect other relevant data necessary to assess the viability a potential commercial wind facility.

The following scenario is intended to be broad enough to cover the range of data collection devices that would be submitted under SAPs and is based upon applications received under interim policy leases for site assessments. The actual tower and foundation type and/or buoy type and anchoring system would be included in a detailed SAP submitted to BOEMRE after site characterization surveys of the immediate area are conducted and prior to installation of device(s). In addition to LIDAR (light detecting and ranging) technology for collecting wind resource data, buoys and/or bottom-founded structures could use SoDAR (Sonic Detecting and Ranging) and CODAR (Coastal Ocean Dynamic Applications Radar) technologies. Alternative platforms to buoys and met towers described in the sections below include: Gravity-base towers and various floating platforms (e.g. tension leg floating platforms, jack-up barges, anchored barges). The specific technologies described below captures the range of technologies and associated impacts. An environmental review will be performed by BOEMRE, in coordination with NMFS where necessary, on individual SAPs to determine if a supplemental NEPA analysis and to determine if the SAP is wholly consistent with the activities outlined below and considered in this consultation.

Proposed Action Scenario

It is assumed that each potential commercial wind facility would result in 0-1 meteorological towers, 0-2 buoys, or a combination. Based on the minimum size of a commercial wind facility and the layout of the WEAs, the following data collection facilities are projected as a result of the proposed action:

- New Jersey WEA: Up to seven meteorological towers and fourteen meteorological buoys. Three leases have already been issued under BOEMRE's interim policy. Those data collection facilities were not included in the proposed action scenario[1].
- Delaware WEA: Since only one qualified company has expressed interest in the WEA offshore Delaware and its interest was for the entire WEA, only one leasehold is anticipated for the WEA offshore Delaware. This company already holds an interim policy lease, so one additional met buoy and no additional met towers are anticipated.
- Maryland WEA: Up to two meteorological towers and four meteorological buoys.
- Virginia WEA: Up to three meteorological towers and six meteorological buoys.

Installation of met towers and buoys would likely occur in the spring and summer months with calmer weather, however, installation could potentially occur at any time of year when weather permits. Total installation time of one meteorological tower would take eight days to ten weeks. It is anticipated that the installation of a met buoy would likely take one to three days.

[1] NMFS has already completed ESA Section 7 consultation on the effects of the issuance of these interim policy leases and the site assessment activities.

Meteorological Tower

One type of component used for evaluating offshore wind resources is the meteorological tower (met tower). At a maximum, a single met tower would be installed per total lease area (it is estimated that a minimum viable lease area would include 6 lease blocks), approximately 54 square miles. The foundation structure and scour control system, if necessary, would occupy a very small portion of the lease area (less than two acres). Once installed the top of the met tower would be approximately 90 to 100 m (295 to 328 ft) above mean sea level, or the anticipated height of the wind turbines's nacelle for that specific area.

A met tower consists of a mast mounted on a foundation anchored to the seafloor. The mast may be either a monopole or a lattice (same as a radio tower). The mast and data collection devices would be mounted on a fixed or pile-supported platform. A deck would be supported by a single 10-foot-diameter monopole, tripod, or a steel jacket with three to four 36-inch-diameter piles. The monopole or piles would be driven about 7.6 to 13.7 m (25 to 45 ft) into the seafloor. The area of ocean bottom affected by the meteorological tower would range from about a couple hundred square feet if supported by a monopole to a couple thousand square feet if supported by a jacket foundation.

To obtain meteorological data, scientific measurement devices, consisting of anemometers, vanes, barometers, and temperature transmitters, would be mounted either directly on the tower, or on instrument support arms extending out approximately 3 m (10 ft). These devices may be located at three or four levels along the meteorological tower.

Scour Control Systems

Due to the potentially high energy oceanic environment of the mid-Atlantic WEAs, scour control systems may be necessary for met tower foundations. There are several methods for mitigating the effects of ocean sediment scour around met tower foundations, which include placement of rock armoring and mattresses of artificial (polypropylene) seagrass.

The most likely scour control system that would be used for the proposed met towers would be artificial seagrass mats, which have found to be effective in shallow and deep water (ESS Group, Inc. 2003). These mats are made of synthetic fronds that mimic seafloor vegetation to trap sediment and become buried over time. These mats would be installed by a diver or remotely operated vehicle (ROV). Each mat would be anchored at 8 to 16 locations, about one foot into the sand. Once installed the mats would not require future maintenance. Depending on the water depth, the buoyant fronds would be 0.625 to 1.25 m (2.0 to 4.1 ft) tall. The fronds would build up sand about 0.3 to 1 m (1 to 3 ft) in height within one year. Based on the manufacturer's information, the sand sediment bank would extend out 1.8 to 2.2 m (5.9 to 7.2 ft) (Seabed Scour Control Systems Ltd., 2008).

It is estimated for a pile-supported platform four mats each about 5 by 2.5 m (16.4 by 8.2 ft) would be placed around each pile. Including the extending sediment bank, a total area disturbance of about 1584.9 to 1798.3 square meters (5,200 to 5,900 square feet) for a three-pile structure and 1798.3 to 2377.4 square meters (5,900 to 7,800 square feet) for a four-pile structure is estimated. For a monopole, it is estimated that eight mats about 5 by 5 meters (16.4 by 16.4 feet) would be used, and there would be a total area disturbance of about 1127.8 to 1219.2 square meters (3,700 to 4,000 square feet). Removal of the scour control system is discussed below.

The armor stones used in a rock armor scour protection would be sized so that that they are large enough not to be removed by the effects of the waves and currents, while being small enough to prevent the stone fill material placed underneath it from being removed. Rock armor and filter layer material would be placed on the seabed using a clamshell bucket or a chute. In water depths less than 15 feet, the median stone size would be about 125 pounds with a stone layer thickness of about four feet. In water depths greater than 15 feet, the median stone size would be about 50 pounds with a stone layer thickness of about three feet. It is estimated that the rock armor would impact 16,000 square feet (0.37 acres) of the seabed.

Any installed scour control system would be monitored throughout the lease term. The foundation would be visually inspected monthly for the first year of installation, and then every year after that or after significant storm activity. Inspections would be carried out by divers or ROV's.

Installation of the Foundation Structure

If a fixed platform is used, the jacket foundation and deck would be fabricated onshore then transferred to barge(s) and towed to the offshore site. This equipment will 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 will be tended by appropriate tugs and workboats as needed.

The foundation pile(s) for the fixed platform could range from either a single 3.05 m (10 ft) diameter monopole to four 0.91 m (3 ft) diameter piles. These piles would be driven about 7.6 to 13.7 m (25 to 45 ft) below the seafloor with a pneumatic piledriving hammer typically used in marine construction operations. When the pile driving is complete after approximately three days, the pile driver barge will be removed. In its place a jack-up barge equipped with a crane may be utilized to assist in the mounting of the platform decking, tower and instrumentation. The in-water construction time of the foundation pilings and platform will be approximately six weeks and the total time of installation on site will be a few days to six weeks, with pile driving occurring for a total of three to eight hours.

The following information on pile driving was taken from Hanson et al. (2003). Piles are usually driven into the substrate using one of two types of hammer: impact hammers and vibratory hammers. Impact hammers consist of a heavy weight that is repeatedly dropped onto the top of the pile, driving it into the substrate. Vibratory hammers utilize a combination of a stationary, heavy weight and vibration, in the plane perpendicular to the long axis of the pile, to force the pile into the substrate. The type of hammer used depends on a variety of factors, including pile material and substrate type. Impact hammers can be used to drive all types of piles, while vibratory hammers are generally most efficient at driving piles with a cutting edge (e.g., hollow steel pipe) and are less efficient at driving "displacement" piles (those without a cutting edge that must displace the substrate). Displacement piles include solid concrete, wood, and closed-end steel pipe. While impact hammers are able to drive piles into most substrates (including hardpan, glacial till, etc.), vibratory hammers are limited to softer, unconsolidated substrates (e.g., sand, mud, gravel). Since vibratory hammers do not use force to drive the piles, the bearing capacity is not known and the piles must often be "proofed" with an impact hammer.

This involves striking the pile a number of times with the impact hammer to ensure that it meets the designed bearing capacity. Under certain circumstances, piles may be driven using a combination of vibratory and impact hammers. The vibratory hammer makes positioning and plumbing of the pile easier; therefore, it is often used to drive the pile through the soft, overlying material. Once the pile stops penetrating the sediment, the impact hammer is used to finish driving the pile to final depth. An additional advantage of this method is that the vibratory hammer can be used to extract and reposition the pile, while the impact hammer cannot. Overwater structures, such as the meteorological towers, must often meet seismic stability criteria, requiring that the supporting piles are attached to, or driven into, the underlying hard material. This requirement often means that at least some impact driving is necessary.

During installation, a radius of about 457.2 m (1,500 ft) around the site would be needed for the movement and anchoring of support vessels. A number of vessel trips to and from the onshore staging area would occur during installation. Depending on the foundation type used installation would take eight days to ten weeks.

Foundation Hammering Sounds

The type and intensity of the sounds produced during pile driving depend on a variety of factors, including, but not limited to, the type and size of the pile, the firmness of the substrate into which the pile is being driven, the depth of water, and the type and size of the pile-driving hammer. Sound pressure levels are positively correlated with the size of the pile, as more energy is required to drive larger piles. Wood and concrete piles appear to produce lower sound pressures than hollow steel piles of a similar size. Firmer substrates require more energy to drive piles, and produce more intense sound pressures. Sound attenuates more rapidly with distance from the source in shallow than in deep water (Rogers and Cox 1988).

Driving hollow steel piles with impact hammers produce intense, sharp spikes of sound, while vibratory hammers produce continuous sound of lower intensity. When compared to impact hammers, the sounds produced by vibratory hammers are of longer duration (minutes vs. msec) and have more energy in the lower frequencies (15 to 26 Hz vs 100 to 800 Hz) (Würsig, et al. 2000, Carlson et al. 2001). Impact hammers, however, produce such short spikes of sound with little energy in the infrasound range (Carlson et al. 2001). Impact hammers produce more intense pressure waves than vibratory hammers.

As noted in the BOEMRE BA, the type and intensity of the sounds produced during pile driving depend on a variety of factors, including, but not limited to, the type and size of the pile, the firmness of the substrate into which the pile is being driven, the depth of water, and the type and size of the pile driving hammer. Sound pressure levels are positively correlated with the size of the pile, as more energy is required to drive larger piles. Firmer substrates require more energy to drive piles, and produce more intense sound pressures. Sound attenuates more rapidly with distance from the source in shallow than in deep waters. According to information provided by BOEMRE, pile driving is expected to generate sound levels in excess of 200 dB and have a relatively broad band of 20 Hz to >20 kHz (Madsen et al. 2006; Thomsen et al. 2006). Sound attenuation modeling done during construction at Utgrunden Wind Park in the Baltic Sea in 2000 and adopted as the model for the Cape Wind Energy Project (Report 4.1.2-1 (Noise Report) of the FEIS) indicates that underwater noise levels may be greater than 160 dB re 1 uPa (within

approximately 3.4km of the pile being driven). At distances greater than 3.4km from the pile being driven, noise levels will have dissipated to below 160 dB re 1 uPa. It should be noted that these measurements are for a 1.7 MW turbine mounted upon a monopile of approximately 5m in diameter and not a meteorological tower. Generally, the larger the diameter of the monopole the greater the noise produced from pile driving (Nedwell 2007); therefore, underwater noise levels associated with pile driving for met tower installation can be expected to be smaller. Actual measured underwater sound levels during the construction of the Cape Wind met tower in 2003 were 145-167 dB at 500m with peak energy at around 500Hz.

Estimates of underwater noise associated with the installation of piles for met tower construction vary widely. Estimates provided to BOEMRE and NMFS during review of IP leases indicated that underwater sound levels at the source could range from 185 dB re 1uPa to 200 dB re 1uPa depending on the pile size with noise levels dissipating to below 160dB by a distance of 500 meters from the pile driving site. Some estimates indicate that noise levels will dissipate more rapidly, with noise dissipating to 156.5 dB at 150 m and 146.1dB at 500m. Newer modeling conducted by Bluewater Wind, LLC in for proposed met tower sites in New Jersey and Delaware under interim policy leases places the 160 dB isopleth at 7,230m for Delaware and 6,600m (NMFS 2010c). Generally, it is anticipated that actual pile driving time would last 3-8 hours per pile driven for sites in the mid-Atlantic WEAs.

Met Tower Operation and Maintenance Activities

Depending on the duration of HRG survey, BOEMRE's review of the SAP, and construction, the proposed structure would likely be present for 4 to 5 years. The developers must submit a COP no later than 5 years after the issuance of the lease. At that time, BOEMRE will evaluate the proposed extension of the met tower.

Met Tower Lighting

Aviation and navigation safety lighting would be installed and maintained on the structure in accordance with FAA and USCG requirements. 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. The project developers would also be required to follow Private Aids to Navigation (PATON) requirements of the USCG.

Met Tower Inspections

As would be required by the lease, the project developer must allow prompt access to any authorized Federal inspector to the site of any activities conducted pursuant to the lease. These inspections may include annual scheduled inspections and periodic unscheduled (unannounced) inspections to assure compliance with the lease and applicable regulations.

Meteorological Buoys

Due to the construction costs of installing a met tower offshore, more developers are looking to lower cost alternatives to evaluate the wind resource in the lease areas. The primary alternative is meteorological buoys (met buoys). These met buoys, of varying designs, utilize Light Detection and Ranging (LIDAR) and/or Sonic Detection and Ranging (SODAR). These may be used instead of or in addition to anemometers to obtain metrological 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 operates via the transmission and detection of sound.

Spar Buoy Design

One buoy design that is under consideration by developers is called a spar buoy. 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. One such buoy is the Sea ZephIR™ buoy proposed for use by Deepwater Wind/Garden State Offshore Energy (GSOE) off the New Jersey coast. The following description of the buoy and installation is from GSOE's SAP submitted under their IP lease (GSOE 2010).

The Sea ZephIR™ is a floating spar buoy platform approximately 100 feet in total length and approximately 6 feet in diameter. The Sea ZephIR™ superstructure is designed for deployment in harsh marine conditions while offering maximum stability through the use of an on-board ballasting mechanism that will reach approximately 60 feet below the ocean surface. Approximately 30-40 feet of the Sea ZephIR™ will be above the ocean surface. This portion of the Sea ZephIR™ will house the LIDAR equipment, power sources (battery and wind micro-turbines), passive acoustic monitoring systems.

The buoy will be moored to the ocean floor via a single clump weight anchor that consists of a reinforced concrete pad approximately 22 feet x 22 feet x 3 feet in size and weighing approximately 100 tons. A main mooring line, safety line and yaw stabilizer line will be connected from the clump weight anchor to the base of the buoy.

The ballast system used by the Sea ZephIR™. The water capacity is 15.2 metric tons, roughly 4,000 gallons of seawater assuming 8.5lbs of seawater per gallon. The time to fill the ballast hold is approximately 4 hours. A barge mounted salt water pump with an industrial screen mesh would be used to fill the tank. The intake velocities of pump is estimated to be 0.6fps (assumed pumping rate of 16gpm). The intake to industrial pump would be via a 3" diameter suction hose located approximately 3 to 4 feet below mean sea level.

An analysis of the 100-year storm wind, tide, wave, and current characteristics and a structural analysis of the spar buoy design have been conducted to ensure that the Sea ZephIR™ can withstand the potential worst-case sea conditions at the site.

Sea ZephIR™ Installation

The concrete clump weight anchor would be loaded onto a work barge and sea fastened to the barge deck. The barge will then be towed to the deployment site. Once on site the barge will be anchored with the aid of an assist tug and the clump weight anchor will be lowered, under control, to the sea floor. Once on the seabed, the position of the anchor will be noted and a small marker buoy will remain in place connected to the anchor.

After the first phase is completed, the spar buoy will be towed in the horizontal plane by a tug to the deployment site. A work barge equipped with a 4-point mooring system, a crane, a sea water

pump system and a dive station will also be towed to the deployment site by a tug. Once at site the work barge will anchor over the clump weight position. Once the barge is fast to its mooring the spar buoy will be maneuvered alongside the barge. The water pump system will be used to fill a system of ballast tanks integral to the buoy assembly. The ballast operation will re-align the buoy from the horizontal plane to a vertical position. Once vertical the buoy will be held on station at the anchored barge while a dive team attaches the mooring chain to the clump weight anchor. Once moored in position the meteorological test equipment will be fitted to the buoy. With the buoy in the vertical position and the meteorological equipment in place the work barge anchors will be recovered and the barge and tugs will depart the site.

Other Met Buoy Designs

Another buoy design that could be utilized to mount a LIDAR wind assessment system is of the NOMAD (Navy Oceanographic Meteorological Automatic Device) hull. The NOMAD is a 6 x 3.1m aluminum hulled buoy with a draft of 3.2m. 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 (FERN 2011).

Primary electrical (DC) power for all equipment on this type of buoy could be provided by four deep cycle 12 volt batteries. Batteries will be charged by renewable sources which include (2) wind generators and (4) 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 (FERN 2011). Up to 500 gallons of diesel fuel could be stored on board the buoy to operate the generator.

The anchoring system for this type of buoy would be a via a standard ¾" steel chain to a 6000 lb steel block. The footprint of the anchor itself is conservatively estimated at 6 feet. Fishermen's Energy conservatively estimates the total bottom-disturbing footprint from the anchor and anchor chain sweep at low tide to be 371,000ft2 or 8.51 acres (approximately 100ft of slack chain at low tide).

Because of its size, a buoy of the NOMAD design would likely be towed by a single vessel to the site in the lease area at speeds of around 3 knots. Although U.S. Coast Guard buoy tending vessels greater than or equal to 180' are known to be able to transport and deploy a buoy of this size from its deck, a wind developer may not have access to a vessel of this size.

Other Ocean Monitoring Equipment

Additional buoys and/or other instrumentation will likely be installed on or near the primary met tower or met buoy to monitor oceanographic parameters and to collect baseline information on the presence of certain marine life. Environmental monitoring equipment such as avian monitoring equipment, sub-marine passive acoustic monitors, data logging computers, power supplies, communications equipment, material hoist, and storage containers may be included.

For some devices a tethered buoy would monitor ocean environmental parameters (sea surface and ocean profile) along with marine mammal activities (i.e., PAM monitoring). The buoy could be located near the met tower or buoys or moved throughout the lease area during the site assessment period. Buoy size is estimated to be up to 2.7 m by 2.7 m (9 ft by 9 ft) (Figures 8 and 9). The area of disturbance from a chain sweep would likely be similar to that described above, 8.51 acres per buoy.

To measure the speed and direction of ocean currents, one to two acoustic doppler current profilers (ADCPs) may be installed with each met tower or buoy as part of the mooring system or structure. The ADCP works by transmitting "pings" of highly pitched sound at a constant frequency into the water. As the sound waves travel, they ricochet off fine particles or zooplankton suspended in the water column and reflect back to the ADCP. The difference in frequency between the waves the ADCP sends out and the waves it receives is called the Doppler shift. The ADCPs may be mounted on the seafloor or to the legs of the platform. A seafloor-mounted ADCP would be located near the meteorological tower (within 150 m (500 ft)) and be connected by a wire that is hand buried into the ocean bottom. A typical ADCP has 3 to 4 acoustic transducers that emit and receive acoustical pulses from 3 to 4 different directions. Frequencies would range from 300 to 600 kHz with a sampling rate of 1 to 60 minutes. The width of the ADCP would be about 0.3 to 0.6 m (1 to 2 ft), and its mooring, platform or cage would be several feet wider.

Vessel Traffic

Vessel traffic, both by air and by sea, occurs during all phases of the site characterization and assessment activities.

On December 9, 2008, in an effort to reduce ship strikes to endangered right whales, NOAA issued regulations requiring ships 65 feet (19.8 meters) or longer to travel at 10 knots or less in certain areas and at certain times of year. The purpose of the regulations is to reduce the likelihood of deaths and serious injuries to endangered North Atlantic right whales that result from collisions with ships. This regulation is also likely to result in reductions in the likelihood of vessel strikes on other marine mammals. These speed restrictions extend out to 20 nautical miles around major mid-Atlantic ports, and partially overlap with the mid-Atlantic WEAs. Except for crew boats, which are typically smaller than 65 feet, these restrictions would be applicable to most vessels associated with the proposed action. While most site assessment surveys, and construction and decommissioning activities would occur in late spring and summer, speed restrictions would be in effect from November 1st to April 30th. The Dynamic Monitoring Area program (DMA) calls for temporary voluntary speed limits at other times when a group of three or more right whales is confirmed; BOEMRE will require lessees to abide by these otherwise voluntary restrictions (See Project Design Criteria, below). Even where SMAs do not fully overlap with the project (e.g., survey, construction activity) area all vessels 65 feet in length or greater operating in the November 1 – April 30 time frame will be required to operate at speeds less than 10 knots.

HRG Survey Traffic

As detailed above, it is assumed that geophysical surveys for shallow hazards and archaeological resources would be conducted at the same time using the finer line spacing required for

archaeological resource assessment (30 meters). Tie-lines would be run perpendicular to the track lines at a line spacing of 150 meters. This results in 767 miles of HRG surveys per OCS block. At 4.5 knots, it would take approximately 150 hours to survey one OCS block. Assuming eight hours of survey time per day during calm seas this would result in 19 vessel day-trips per lease block. Surveying a 300 meter-wide corridor along a potential cable route located outside of a WEA would result in about 5 miles or 1 hour of surveys per mile of cable. In order to survey the entire WEAs and potential cables, HRG surveys would have to be conducted by multiple vessels and/or over multiple years and potential cable routes. 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.

Sub-Bottom Sampling Vessel Traffic

As described in the action scenario for sub-bottom sampling, it is estimated that there would need to be about 1,700 to 5,350 sub-bottom samples taken for the entire mid-Atlantic WEA. The amount of effort and vessel trips vary greatly by the type of technology used to retrieve the sample. The following details the type of vessels and collection time per sample:

- *Vibracores*: Would be likely be advanced from a single small vessel (~45 ft), and collect 4-7 samples per day.
- *CPT*: Depending on the size of the CPT, it could be advanced from medium vessel (~65 ft), 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 between 4-7 locations 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 1-2 days.

Based on the above information and the number of sub-bottom samples given above, the following range of vessel trips for each mid-Atlantic WEA was derived for all sub-bottom sampling. It should be noted that these ranges vary greatly due to the different technologies and vessels that could be used. Additionally, once some of the necessary equipment is on site there would not be the need for transit vessel trips, other than those transporting crew. Furthermore, a day is defined as 8-10 hours on the work site.

- New Jersey: 92 – 2,050 vessel day trips;
- Delaware: 35 – 780 vessel day trips;
- Maryland: 61-1,385 vessel day trips; and,
- Virginia: 49-1,105 vessel day trips.

Meteorological Tower Construction and Operation Traffic

The proposed action scenario estimates a maximum of 12 meteorological towers to be constructed throughout all of the mid-Atlantic WEAs. During installation, a radius of about 457.2 m (1,500 ft) around each site would be needed for the movement and anchoring of support vessels. A maximum of 3 vessel trips to and from the onshore staging area would occur during each day during installation. Depending on the foundation type used, installation would take eight days to ten weeks. Given an average of 40 days per structure, there would be an estimated total of 120 vessel trips per structure.

During construction activities, especially during pile driving activities, it is estimated that 4 to 6 stationary or slow moving vessels would be present in the general vicinity of the pile installation. Vessels delivering construction materials or crews to the site will also be present in the area between the mainland and the construction sites. The barges, tugs and vessels delivering construction materials generally will travel at speeds below 10 knots (18.5 km/h) and may range in size from 90 to 400 ft (27.4 to 122 m), while the vessels carrying construction crews will be traveling at a maximum speed of 21 knots (39 km/h) and will typically be 50 ft (15 m) in length. The tower sections would be raised using a separate barge mounted crane or heavy lifting helicopter. All helicopters involved in these actions would abide by guidelines and regulations issued by NMFS under the authority of the Marine Mammal Protection Act (MMPA) including provisions specifying helicopter pilots to maintain an altitude of at least 1,000 ft within sight of marine mammals.

After installation, data would be monitored and processed remotely reliving the need of cables to shore. The structure and instrumentation would be accessed by boat for routine maintenance. Monthly vessel trips due to operation and maintenance over the 4 to 5 year life of the met tower are expected for a total of 48 to 60 round trips per installation. These vessel trips would not require any additional or expansion of onshore facilities. It is projected that crew boats 15.5 to 17.4 m (51 to 57 ft) in length with an 800 to 1,000 hp engines and 1,800 gallon fuel capacity would be used to service the structure. The use of helicopters to transport personnel or supplies during operation and maintenance is not anticipated.

Vessel usage during decommissioning will be similar to vessel usage during construction. Up to about 40 round trips by various vessels are expected during decommissioning of each meteorological tower. Similar to construction, this yields an average of 120 round trips for the decommissioning of each met towers.

Meteorological Buoy Deployment and Operation

The proposed action scenario estimates a maximum of 20 meteorological buoys to be deployed throughout all the mid-Atlantic WEAs. As described above, the installation of each buoy could utilize 1-3 vessel trips per 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 meteorological towers, it is expected that maintenance for the buoy would be required on a monthly basis resulting in maximum of 20 round-trips per month. Once again it should be noted that it is unlikely that all 20 met buoys would be in service at the same time over the entire period. For met buoys, the decommissioning is expected to be the reverse of the deployment, with 1-3 vessel trips required to retrieve each buoy.

Onshore Activity

Several mid-Atlantic 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. Expansion of these existing facilities is not anticipated in support of construction, operation or decommissioning activities. Several major ports exist near the wind energy areas that are suitable to support the fabrication and staging of met towers. These ports include the Port of New York and New Jersey,

Atlantic City, and industrial ports accessible via the Delaware Bay and Delaware River in New Jersey, Delaware, and Pennsylvania (Atlantic Renewable Energy Corporation and AWS Scientific, Inc., 2004). Hampton Roads marine terminals and shipyards would be likely ports for staging projects off of Virginia's coast.

For the construction of a met tower a platform would be constructed or fabricated onshore at a facility called a platform fabrication yard. Production operations at fabrication yards would include cutting, welding, and assembling of steel components. The yards occupy large areas with equipment including lifts and cranes, welding equipment, rolling mills, and sandblasting machinery. The location of these fabrication yards is directly tied to the availability of a large enough channel that will allow the towing of these bulky and long structures. The average bulkhead depth needed for water access to fabrication yards is 4.6 to 6.1 m (15 to 20 ft). A fabricator must also consider other physical limitations such as the ability to clear bridges and navigate tight corners within channels. Thus, platform fabrication yards must be located at deep-draft seaports or along the wider and deeper of the inland channels.

The met tower would be manufactured at a commercial facility in sections, and then shipped by truck, rail, or sea to the onshore staging area. The met tower would be partially assembled and loaded onto a barge for transport to the installation site. Final assembly of the tower would be completed offshore.

Decommissioning

Within a period of one year after cancellation, expiration, relinquishment or other termination of the lease, the lessee shall remove all devices, works and structures from the leased area and restore the leased area to its original condition before issuance of the lease. The current term for an offshore renewable energy lease is around 25 years in addition to the five years to complete site assessment activities. BOEMRE has indicated that failure to complete site assessment activities in the first five years of the lease could result in revocation of the lease.

Decommissioning activities for a met tower would begin with the removal of all meteorological instrumentation from the tower. A derrick barge would be transport to the offshore site and anchored adjacent to the structure. The mast would be removed from the deck and loading onto the transport barge. The deck would be cut from the foundation structure and loaded on the transport barge. It is estimated that the entire removal process for a met tower would take one week or less.

Decommissioning activities for a met buoy would begin with the removal of the buoy from the anchoring system. The buoy would then be towed or transported to shore or redeployed under a separate assessment activity. The anchoring system (chain and weights) would be retrieved in the reverse manner it was deployed. In the case of a large clump weight anchor there is the possibility that the weight will remain in place on the seafloor in accordance with an artificial reef program or similar disposal as detailed in Section 4.6.4 of BOEMRE's EA. It is estimated that the decommissioning of a met buoy will take one to three vessel trips over one to three days.

Cutting and Removing Piles

The lessee would sever bottom-founded structures and their related components at least 4.6 m (15 ft) below the mudline to ensure that nothing would be exposed that could interfere with future lessees and other activities in the area. BOEMRE prepared a programmatic EA, *Structure-Removal Operations on the Gulf of Mexico Outer Continental Shelf* (MMS 2005), to evaluate the full range of potential environmental impacts of structure-removal activities in detail the various technologies that could be used.

The EA on structure-removal, which is incorporated by reference, discusses in detail the both explosive and nonexplosive severing methods. BOEMRE assumes non-explosive severing methods can be used to decommission the proposed met towers. The applicants would be required to submit a decommissioning methodology in the SAP.

Common nonexplosive 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 the oxyacetylene/oxyhydrogen torches), and diamond wire cutters. Of these the most likely would be an internal cutting tool, such as a high pressure water jet-cutting tool. In order 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 on to 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. No excavation around the outside of the monopole 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 the decommissioning site.

Issuance of a lease would not constitute the approval of explosive severing methods. If a lessee intends to use explosive severing methods then a detailed decommissioning plan must be submitted to BOEMRE for approval, in addition to any other requirements of the lease. The use of explosives is not considered in this consultation and any proposed use of explosives would require separate ESA Section 7 consultation.

Removal of Scour Control System

During decommissioning of a met tower, the scour control system would also be removed. 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 greater amounts of suspended sediments than levels associated with the original installation of the mats. It is anticipated that the sandy nature of the bottom material over most of the proposed lease blocks would result in rapid settling of the suspended sediment material. 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 a total of 0.5 to 2 days to remove the scour control system around a meteorological tower.

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 regulations.

Project Design Criteria

The following measures are part of the proposed action and are meant to minimize or eliminate the potential for adverse impacts to ESA-listed marine mammals and sea turtles. These measures are divided into the following sections: (A) those required during all phases of the project; (B) those required during pre-construction site assessment; and, (C) those required during construction. Any action that is considered to be covered by this programmatic consultation must implement all of these criteria and be wholly consistent with the type of activities described herein.

A. Project Design Criteria for All Phases of the Site Characterization and Site Assessment on a Lease

The following measures are meant to reduce the potential for vessel harassment or collision with listed marine mammals or sea turtles regardless of what activity that vessel is engaged in:

1. All vessels and aircraft whose operations are authorized under or regulated by the terms of a BOEMRE-issued renewable energy lease would be required to abide by the NOAA Fisheries Northeast Regional Viewing Guidelines, as updated through the life of the project. Guidelines are available at: (http://www.nmfs.noaa.gov/pr/pdfs/education/viewing_northeast.pdf).
2. Vessel operators and crews must maintain a vigilant watch for marine mammals and sea turtles and slow down or stop their vessel to avoid striking protected species.
3. When whales are sighted, maintain a distance of 100 yards (91 m) or greater from the whale. If the whale is believed to be a North Atlantic right whale, the lessee must maintain a minimum distance of 500 yards (457 m) from the animal (50 CFR 2224.103).
4. When sea turtles or small cetaceans are sighted, the lessee must maintain a distance of 50 yards (45 meters) or greater whenever possible.
5. When cetaceans are sighted while a vessel is underway, the lessee must remain parallel to the animal's course whenever possible. The lessee must avoid excessive speed or abrupt changes in direction until the cetacean has left the area.
6. Reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel when safety permits. A single cetacean at the surface may indicate the presence of submerged animals in the vicinity of the vessel; therefore, precautionary measures should always be exercised.
7. Whales may surface in unpredictable locations or approach slowly moving vessels. When you sight animals in the vessel's path or in close proximity to a moving vessel, reduce speed and shift the engine to neutral. Do not engage the engines until the animals are clear of the area.

8. All vessel operators must comply with vessel strike reduction measures for North Atlantic right whales implemented by NMFS, including Special Management Areas (SMAs) and Dynamic Management Areas (DMAs). Adherence to vessel restrictions in DMAs is not voluntary for vessels operating under authorizations or regulations under the terms of a BOEMRE-issued renewable energy lease; thus all vessels greater than 65 feet in length operating in a DMA must operate at speeds less than 10 knots. Compliance documents are located at: http://www.nero.noaa.gov/shipstrike/. Even where SMAs do not fully overlap with the project (e.g., survey, construction activity) area all vessels 65 feet in length or greater operating in the November 1 – April 30 time frame must operate at speeds less than 10 knots.

9. Because of noise concerns, FAA Circular 91-36D encourages pilots making flights near noise-sensitive areas to fly at altitudes higher than minimum altitudes near noise-sensitive areas (http://www.fs.fed.us/r10/tongass/districts/admiralty/packcreek/AC91-36d.pdf). The lessee must avoid noise-sensitive areas, unless doing so would be impractical or unsafe. Pilots operating noise producing aircraft over noise-sensitive areas must fly not less than 2,000 ft above ground level, weather permitting, unless doing so would be impractical or unsafe. Departure from or arrival to an airport, climb after take-off, and descent for landing must be made so as to avoid prolonged flight at low altitudes near noise-sensitive areas. In addition, guidelines and regulations issued by National Marine Fisheries Service (NMFS) include provisions specifying that pilots maintain an altitude of at least 1,000 ft within sight of marine mammals.

10. All vessel and aircraft (where applicable) operators must be briefed to ensure they are familiar with the above requirements.

11. All vessel operators, employees and contractors actively engaged in offshore operations must be briefed on marine trash and debris awareness elimination as described in the BOEMRE Gulf of Mexico Region's NTL No. 2007-G03 (http://www.gomr.mms.gov/homepg/regulate/regs/ntls/2007NTLs/07-g03.pdf), except that BOEMRE will not require the applicant to undergo formal training or post placards. The lessee must ensure that its employees and contractors are made aware of the environmental and socioeconomic impacts associated with marine trash and debris and their responsibilities for ensuring that trash and debris are not intentionally or accidentally discharged into the marine environment. The above referenced NTL provides information the applicant may use for this awareness training.

12. Vessel crews must report sightings of any injured or dead protected species (marine mammals and sea turtles) immediately, regardless of whether the injury or death is caused by your vessel. Report marine mammals and sea turtles to the NOAA Fisheries Northeast Region's Stranding Hotline at 800-900-3622. In addition, if the injury or death was caused by a collision with the lessee's vessel, the lessee must notify BOEMRE within 24 hours of the strike. The report should include the date and location (latitude/longitude) of the strike, the name of the vessel involved, and the species identification or a description of the animal, if possible. BOEMRE will transmit this information to NMFS as soon as possible.

B. Project Design Criteria for Pre-Construction Site Characterization Surveys

1. The following measures will be implemented for all high-resolution geophysical survey work.

   a. *Establishment of Exclusion Zone*: A 500 m (1640 ft) radius exclusion zone for listed marine mammals and sea turtles shall be established around the seismic survey source vessel in order to reduce the potential for serious injury or mortality of these species.

   b. *Visibility*: Continuous (day and night) seismic survey operations will be allowed only if sufficient lighting is provided to monitor the 500m exclusion zone. If sufficient lighting is not available, survey activity must be limited to daylight hours. No survey activity will occur at any time when lighting or weather conditions (darkness, rain, fog, sea state, etc.). The use of other technologies such a passive acoustic monitors (PAMs) are encouraged to supplement the visual observations. The developer/operator may request, and BOEMRE will consider in consultation with NMFS, the use of these technologies to facilitate survey activity when visual observation may be impaired.

   c. *Visual Monitoring of Exclusion Zone*: Monitoring of the zones shall be conducted by a qualified NMFS-approved observer. Visual observations will be made using binoculars or other suitable equipment during daylight hours. Data on all observations will be recorded based on standard marine mammal/sea turtle observer collection data. This will include: dates and locations of construction operations; time of observation, location and weather; details of marine mammal and sea turtle sightings (e.g., species, numbers, behavior); and details of any observed taking (behavioral disturbances or injury/mortality). Any significant observations concerning impacts on listed marine mammals or sea turtles will be transmitted to NMFS and BOEMRE within 48 hours. Any observed takes of listed marine mammals or sea turtles resulting in injury or mortality will be immediately (within 24 hours) reported to NMFS and BOEMRE.

   d. Visual monitoring will begin no less than 60 minutes prior to the beginning of ramp-up and continue until seismic operations cease or sighting conditions do not allow observation of the sea surface (e.g., fog, rain, darkness, sea state, etc.). If a marine mammal or sea turtle is observed, the observer should note and monitor the position (including lat./long. of vessel and relative bearing and estimated distance to the animal) until the animal dives or moves out of visual range of the observer. The lessee must continue to observe for additional animals that may surface in the area, as often there are numerous animals that may surface at varying time intervals. At any time a marine mammal or sea turtle is observed within an estimated 500 m (1,640 ft) of the sound source array ("exclusion zone"), whether due to the marine mammal or sea turtle's movement, the vessel's movement, or because the marine mammal or sea turtle surfaced inside the exclusion zone, the observer will call for the immediate shut-down of the seismic operation. The vessel operator must comply immediately with such a call by an on-watch visual observer. Any disagreement or discussion should occur only after shut-down. When no marine mammals or sea turtles are sighted for at least a 60-minute period, ramp-up of the sound source may begin. Ramp-up cannot begin unless conditions allow the sea surface to be visually

inspected for marine mammals and sea turtles for 60 minutes prior to commencement of ramp-up. Thus, ramp-up cannot begin after dark or in conditions that prohibit visual inspection (e.g., rain, fog, darkness, sea state, etc.) of the exclusion zone. Any shut-down due to a marine mammal or sea turtle(s) sighting within the exclusion zone must be followed by a 60-minute all-clear period and then a standard, full ramp-up. Any shut-down for other reasons, including, but not limited to, mechanical or electronic failure, resulting in the cessation of the sound source for a period greater than 20 minutes, must also be followed by full ramp-up procedures. In recognition of occasional, short periods of the cessation of survey equipment for a variety of reasons, periods of silence not exceeding 20 minutes in duration will not require ramp-up for the resumption of seismic operations if: (1) visual surveys are continued diligently throughout the silent period (requiring daylight and reasonable sighting conditions), and (2) no marine mammal or sea turtles are observed in the exclusion zone. If marine mammals or sea turtles are observed in the exclusion zone during the short silent period, resumption of seismic survey operations must be preceded by 60-minute all clear period followed by a ramp-up.

e. *Implementation of Ramp-Up*: A "ramp-up" (if allowable depending on specific sound source) will be required at the beginning of each seismic survey in order to allow marine mammals and sea turtles to vacate the area prior to the commencement of activities. Seismic surveys may not commence (i.e., ramp up) at night time or when the exclusion zone cannot be effectively monitored (i.e., reduced visibility).

f. *Shut Down*: If a listed marine mammal or sea turtle is spotted within or transiting towards the exclusion zone surrounding the sub-bottom profiler and the survey vessel, an immediate shutdown of the equipment will be required. Subsequent restart of the profiler may only occur following clearance of the exclusion zone and the implementation of ramp up procedures (if applicable).

g. *Compliance with Equipment Noise Standards*: All seismic surveying equipment must comply as much as possible with applicable equipment noise standards of the U.S. Environmental Protection Agency.

h. *Reporting for Seismic Surveys Activities*: The following reports must be submitted during the conduct of seismic surveys:

   (1) A report must be provided to BOEMRE and NMFS within 90 days of the commencement of seismic survey activities that includes a summary of the seismic surveying and monitoring activities and an estimate of the number of listed marine mammals and sea turtles observed during seismic survey activities. The report will include information, such as: dates and locations of operations, details of listed marine mammal or sea turtle sightings (dates, times, locations, activities, associated seismic activities), and estimates of the amount and nature of any listed marine mammal or sea turtle takings.

   (2) Any observed injury or mortality to a listed marine mammal or sea turtle must be reported to NMFS and BOEMRE immediately (within 24 hours). Any observations concerning impacts on listed marine mammals or sea turtles will be transmitted to NMFS and BOEMRE within 48 hours.

2. **Sub-bottom Sampling:** The following mitigation measures are proposed for all sub-bottom sampling work.

   a. *Establishment of Exclusion Zone*: A 200-m radius exclusion zone for listed marine mammals and sea turtles must be established around any vessel conducting the sub-bottom sampling in order to reduce the potential for serious injury or mortality of these species.

   b. *Visual Monitoring of Exclusion Zone*: The exclusion zone around the vessel must be monitored for the presence of listed marine mammals or sea turtles using the protocol detailed above for HRG survey work absent ramp-up procedures.

   c. *Reporting for Sub-bottom Sampling Activities*: The following reports must be submitted regarding the conduct of sub-bottom sampling activities:

      (1) A report must be provided to BOEMRE and NMFS within 90 days of the commencement of seismic survey activities that includes a summary of the sub-bottom sampling activities and an estimate of the number of listed marine mammals and sea turtles observed during sub-bottom sampling activities. The report will include information, such as: dates and locations of operations, details of listed marine mammal or sea turtle sightings (dates, times, locations, activities, associated seismic activities), and estimates of the amount and nature of any listed marine mammal or sea turtle takings.

      (2) Any observed injury or mortality to a listed marine mammal or sea turtle must be reported to NMFS and BOEMRE immediately (within 24 hours). Any observations concerning impacts on listed marine mammals or sea turtles will be transmitted to NMFS and BOEMRE within 48 hours.

C. Project Design Criteria for Construction of Meteorological Towers and Installation of Meteorological Buoys

1. *Pre-Construction Briefing*: Prior to the start of construction, the Lessee(s) must hold a briefing to establish responsibilities of each involved party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures. This briefing must include construction supervisors and crews, the marine mammal and sea turtle visual observer(s) (see further below). The Resident Engineer (or other authorized individual) will have the authority to stop or delay any construction activity, if deemed necessary. New personnel must be briefed as they join the work in progress.

2. *Requirements for Pile Driving*: The following measures will be implemented during the conduct of pile driving activities related to meteorological towers.

3. *Establishment of Exclusion Zone*: A preliminary 7 km radius exclusion zone for listed marine mammals and sea turtles must be established around each pile driving site in order to reduce the potential for impacts to these species. The 7 km exclusion zone is based upon the field of ensonification at the 160dB level. The 7 km exclusion zone must be monitored from two locations. One observer must be based at or near the sound source and responsible for monitoring the 180 dB field of ensonification out to 1000m from the sound source. An additional observer must be located on a

separate vessel navigating approximately 4-5 km around the pile hammer monitoring 360° out to 7km from the sound source. If this method (one observer near the source and one on a vessel) is not sufficient to allow the observers to adequately monitor the exclusion zone such that any whale or sea turtle in the exclusion zone would be detected, additional observers must be used to ensure complete coverage of the exclusion zone.

a) *Modification of Exclusion Zone*: If multiple piles are being driven, the field verification method may be used to modify the exclusion zone. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the 160 dB zone. This zone must be used for all subsequent pile driving and be periodically re-evaluated based on the regular sound monitoring described in the Field Verification of Exclusion Zone section described below. BOEMRE in consultation with NMFS must approve any new exclusion zone in order for it to be implemented.

b) *Field Verification of Exclusion Zone*: Field verification of the exclusion zone must take place during pile driving of the first pile if the meteorological tower design includes multiple piles. The results of the measurements from the first pile must be used to establish a new exclusion zone which may be greater than or less than the 7 km default exclusion zone depending on the results of the field tests. Acoustic measurements must take place during the driving of the last half (deepest pile segment) for any given open-water pile. Two reference locations must be established at a distance of 500 m and 5 km from the pile driving. Sound measurements must be taken at the reference locations at two depths (a depth at mid-water and a depth at approximately 1m above the seafloor). Sound pressure levels must be measured and reported in the field in dB re 1 μPa rms (impulse). An infrared range finder may be used to determine distance from the pile to the reference location.

4. *Visibility*: No pile-driving will occur at any time when lighting or weather conditions (darkness, rain, fog, sea state, etc.) prevent monitoring of the exclusion zone. The use of other technologies such a passive acoustic monitors (PAMs) are encouraged to supplement the visual observations. The developer/operator may request, and BOEMRE will consider in consultation with NMFS, the use of these technologies to facilitate survey activity when visual observation may be impaired.

5. *Visual Monitoring of Exclusion Zone*: Monitoring of the zones must be conducted by a qualified NMFS-approved observer. Visual observations must be made using binoculars or other suitable equipment during daylight hours. Data on all observations must be recorded based on standard marine mammal observer collection data. This must include: dates and locations of construction operations; time of observation, location and weather; details of marine mammal/sea turtle sightings (e.g., species, numbers, behavior); and details of any observed taking (behavioral disturbances or injury/mortality). Any observations concerning impacts on listed marine mammals or sea turtles must be transmitted to NMFS and BOEMRE within 48 hours. Any observed takes of listed marine mammals or sea turtles resulting in injury or mortality will be immediately (within 24 hours) reported to NMFS and BOEMRE.

a. Visual monitoring must begin no less than 60 minutes prior to the beginning of soft start and continue until pile driving operations cease or sighting conditions do not allow observation of the sea surface (e.g., fog, rain, darkness, sea state, etc.). If a marine mammal or sea turtle is observed, the observer must note and monitor the position, relative bearing and estimated distance to the animal until the animal dives or moves out of visual range of the observer. The observer must continue to observe for additional animals that may surface in the area, as often there are numerous animals that may surface at varying time intervals.

b. At any time a marine mammal or sea turtle is observed within the exclusion zone, whether due to the marine mammal or sea turtle's movement, the vessel's movement, or because the marine mammal or sea turtle surfaced inside the exclusion zone, the observer must notify the Resident Engineer (or other mutually agreed upon individual). BOEMRE and NMFS recognize that once the pile driving of a segment begins it may not be able to be stopped until that segment has reached its predetermined depth. If listed marine mammals or sea turtles enter the zone after pile driving of a segment has begun, and it is unsafe to stop pile driving, pile driving may continue and observers must monitor and record listed marine mammal and sea turtle numbers and behavior. However, if pile driving of a segment ceases for 30 minutes or more and a listed marine mammal or sea turtle is sighted within the designated zone prior to commencement of pile driving, the observer(s) must notify the Resident Engineer (or other mutually agreed upon individual) that an additional 60 minute visual and acoustic observation period will be completed, as described above, before restarting pile driving activities. In addition, pile driving may not begin during night hours or when the safety radius cannot be adequately monitored (i.e., obscured by fog, sea state, inclement weather, poor lighting conditions, etc.) unless the applicant implements an alternative monitoring method that is agreed to by BOEMRE and NMFS. However, if a soft start has been initiated before dark or the onset of inclement weather, the pile driving of that segment may continue through these periods. Once that pile has been driven, the pile driving of the next segment cannot begin until the exclusion zone can be visually or otherwise monitored (see *Visibility* above).

6. *Implementation of Soft Start*: A "soft start" must be implemented at the beginning of each pile installation in order to provide additional protection to listed marine mammals and sea turtles near the project area by allowing them to vacate the area prior to the commencement of pile driving activities. The soft start requires an initial set of 3 strikes from the impact hammer at 40-percent energy with a one minute waiting period between subsequent 3-strike sets. If listed marine mammals or sea turtles are sighted within the exclusion zone prior to pile-driving, or during the soft start, the Resident Engineer (or other mutually agreed upon individual) must delay pile-driving until the animal has moved outside the exclusion zone.

7. *Compliance with Equipment Noise Standards*: All construction equipment must comply as much as possible with applicable equipment noise standards of the U.S.

Environmental Protection Agency, and all construction equipment must have noise control devices no less effective than those provided on the original equipment.

8. *Reporting for Construction Activities*: The following reports must be submitted during construction:

   a) Data on all observations must be recorded based on standard marine mammal observer collection data. This must include: dates and locations of construction operations; time of observation, location and weather; details of marine mammal sightings (e.g., species, numbers, behavior); and details of any observed taking (behavioral disturbances or injury/mortality). Any observations concerning impacts on listed marine mammals or sea turtles will be transmitted to NMFS and BOEMRE within 48 hours. Any observed takes of listed marine mammals or sea turtles resulting in injury or mortality will be immediately (within 24 hours) reported to NMFS and BOEMRE.

   b) A final technical report within 120 days after completion of the pile driving and construction activities must be provided to BOEMRE and NMFS which provides full documentation of methods and monitoring protocols, summarizes the data recorded during monitoring, estimates the number of listed marine mammals and sea turtles that may have been taken during construction activities, and provides an interpretation of the results and effectiveness of all monitoring tasks.

Listed Species Considered in this Informal Programmatic Consultation

The 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 action area includes the Mid-Atlantic Wind Energy Areas (WEAs) (see Figure 1) as well as waters between the WEAs and shore. This area is expected to encompass all effects of the proposed actions. Several ESA-listed species occur seasonally 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. BOEMRE's EA and BA contain a complete description of the available information on the use of the WEAs by listed species and includes the results of shipboard and aerial surveys and passive acoustic monitoring (PAM) that occurred off the coast of New Jersey from 2008-2009. The Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf (MMS 2007b) gives greater detail of the life histories of the species outlined below. In the section below, NMFS summarizes the best available information on the use of the WEAs by listed whales and sea turtles.

Six species of endangered large whales occur seasonally off the Atlantic coast of the U.S.; the North Atlantic right whale, fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), and blue whale (*Balaenoptera musculus*). However, of these six species, only three – right, humpback, and fin whales – are likely to occur in the action area; sperm, blue and sei whales are typically found in waters further offshore. Right and humpback whales are most likely to occur in the action area between November and April and fin whales are most likely to occur in the action area between October and January. However acoustic monitoring data indicates that individuals may occur through the WEAs throughout the year (NJDEP 2010).

Four species of listed sea turtles including endangered leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempi*) and green *(Chelonia mydas)* sea turtles and threatened loggerhead (*Caretta caretta*) sea turtles occur seasonally in the action area. Sea turtles arrive in the mid-Atlantic, including the action area, in May and typically begin migrating southward by mid-November. Satellite tracking studies of sea turtles in New York waters found that foraging turtles mainly occurred in areas where the water depth was between approximately 16 and 49 ft (Ruben and Morreale 1999). This depth was interpreted not to be as much an upper physiological depth limit for turtles, as a natural limiting depth where light and food are most suitable for foraging turtles (Morreale and Standora 1990). Depths at the lease blocks range from 60-100 feet. Sea turtles are capable of dives to substantial depths (300-1000 m; Eckert et al. 1986 in Stabenau et al. 1991), and chelonid turtles have been found to make use of deeper, less productive channels as resting areas that afford protection from predators because of the low energy, deep water conditions. Leatherbacks have been shown to dive to great depths, often spending a considerable amount of time on the bottom (NMFS 1995).

Effects of the Actions Considered in this Programmatic Consultation

In order to assess the potential effects of BOEMRE's issuance of renewable energy leases in the mid-Atlantic WEAs and approval of SAPs and the carrying out of site assessment activities by lessees, NMFS assessed the likelihood that listed species or designated critical habitat, if present in the action area would be affected by the proposed actions considered in this consultation. NMFS has considered the scenarios outlined in BOEMRE's EA and BA which considers 100% coverage of the WEAs by leases, surveys sufficient to cover the lease areas, and the construction of up to 10 met towers and the installation of up to 21 met buoys. Any activities that exceed this amount would be considered to be outside the scope of this consultation. Additionally, any proposal to conduct activities that is not wholly consistent with the activities described herein or is not wholly consistent with the PDCs outlined above, would not be considered to be eligible for coverage under this consultation.

The proposed action involves several stages of activity. The sections below will outline potential effects from the following sources: (1) pre-construction geotechnical and geophysical surveys (2) installation of the met tower foundations and construction of the met tower, (3) operation of the met tower, and, (4) decommissioning. In addition to these categories of effects, BOEMRE provided information in the BA on non-routine and accidental events. These events include oil spills, vessel collisions with a met tower and destructive natural events. Effects of these non-routine and accidental events are also discussed below. Potential effects of the proposed action can be broadly categorized into the following categories: (1) acoustic effects, (2) effects to benthic habitat, (3) effects of an increase in vessel traffic, (4) effects of met tower and met buoy operation, (5) effects of non-routine and accidental events, and (5) effects of decommissioning. As explained above, BOEMRE's proposed action would not authorize the construction or operation of any electricity generating facility or transmission cables with the potential to export electricity; thus, this consultation does not consider the effects of any future potential construction or operation of a wind facility or associated transmission equipment.

NMFS has evaluated the effects of activities that are likely to be carried out by lessees issued renewable energy leases by BOEMRE and concurs that when these activities are conducted in

accordance with conditions and specifications outlined in BOEMRE's EA and the PDCs outlined above, these activities are not likely to result in adverse affects to listed species as all effects will be insignificant and discountable. As there is no critical habitat in the action area, no effects to critical habitat are likely. In addition, NMFS has considered any potential for cumulative effects of multiple activities being conducted over a short time period in areas occupied by listed species or designated as critical habitat and has determined that the likelihood of cumulative effects to be adverse to listed whales and sea turtles to be discountable. The potential for effects to listed species are addressed below.

Acoustic Effects

When anthropogenic disturbances elicit responses from sea turtles and marine mammals, it is not always clear whether they are responding to visual stimuli, the physical presence of humans or man-made structures, or acoustic stimuli. However, because sound travels well underwater, it is reasonable to assume that, in many conditions, marine organisms would be able to detect sounds from anthropogenic activities before receiving visual stimuli. As such, exploring the acoustic effects of the proposed project provides a reasonable and conservative estimate of the magnitude of disturbance caused by the general presence of a manmade, industrial structure in the marine environment, as well as the specific effects of sound on marine mammal and sea turtle behavior.

Marine organisms rely on sound to communicate with conspecifics and derive information about their environment. There is growing concern about the effect of increasing ocean noise levels due to anthropogenic sources on marine organisms, particularly marine mammals. Effects of noise exposure on marine organisms can be characterized by the following range of physical and behavioral responses (Richardson et al. 1995):

1. Behavioral reactions – Range from brief startle responses, to changes or interruptions in feeding, diving, or respiratory patterns, to cessation of vocalizations, to temporary or permanent displacement from habitat.
2. Masking – Reduction in ability to detect communication or other relevant sound signals due to elevated levels of background noise.
3. Temporary threshold shift (TTS) – Temporary, fully recoverable reduction in hearing sensitivity caused by exposure to sound.
4. Permanent threshold shift (PTS) – Permanent, irreversible reduction in hearing sensitivity due to damage or injury to ear structures caused by prolonged exposure to sound or temporary exposure to very intense sound.
5. Non-auditory physiological effects – Effects of sound exposure on tissues in non-auditory systems either through direct exposure or as a consequence of changes in behavior, e.g., resonance of respiratory cavities or growth of gas bubbles in body fluids.

Several components of the proposed action will produce sound that may affect listed sea turtles and whales. NMFS is in the process of developing a comprehensive acoustic policy that will provide guidance on managing sources of anthropogenic sound based on each species' sensitivity to different frequency ranges and intensities of sound. The available information on the hearing capabilities of cetaceans and the mechanisms they use for receiving and interpreting sounds remains limited due to the difficulties associated with conducting field studies on these animals. However, current thresholds for determining impacts to marine mammals typically center around root-mean-square (RMS) received levels of 180 dB re 1μPa for potential injury, 160 dB re 1μPa

for behavioral disturbance/harassment from a non-continuous noise source, and 120 dB re 1μPa for behavioral disturbance/harassment from a continuous noise source. These thresholds are based on a limited number of experimental studies on captive odontocetes, a limited number of controlled field studies on wild marine mammals, observations of marine mammal behavior in the wild, and inferences from studies of hearing in terrestrial mammals. In addition, marine mammal responses to sound can be highly variable, depending on the individual hearing sensitivity of the animal, the behavioral or motivational state at the time of exposure, past exposure to the noise which may have caused habituation or sensitization, demographic factors, habitat characteristics, environmental factors that affect sound transmission, and non-acoustic characteristics of the sound source, such as whether it is stationary or moving (NRC 2003). Nonetheless, the threshold levels referred to above are considered conservative based on the best available scientific information at this time and will be used in the analysis of effects for this consultation.

The acoustic effects analysis will:

- characterize the various sources of noise attributed to the proposed action;
- determine which species are likely to be exposed to each type of noise;
- characterize the range of expected or possible responses of sea turtles and marine mammals exposed to the noise; and,
- determine the significance of those effects to individuals and populations.

Characterization of Noise Sources

Sources of construction noise associated with the proposed project include pile driving and construction and maintenance vessel transits. Other noise sources include the geotechnical and geophysical survey equipment.

Right, Humpback, and Fin Whale Hearing

In order for right, humpback, and fin whales to be adversely affected by construction noise, they must be able to perceive the noises produced by the activities. If a species cannot hear a sound, or hears it poorly, then the sound is unlikely to have a significant effect (Ketten 1998). Baleen whale hearing has not been studied directly, and there are no specific data on sensitivity, frequency or intensity discrimination, or localization (Richardson et al. 1995) for these whales. Thus, predictions about probable impact on baleen whales are based on assumptions about their hearing rather than actual studies of their hearing (Richardson et al. 1995; Ketten 1998).

Ketten (1998) summarized that the vocalizations of most animals are tightly linked to their peak hearing sensitivity. Hence, it is generally assumed that baleen whales hear in the same range as their typical vocalizations, even though there are no direct data from hearing tests on any baleen whale. Most baleen whale sounds are concentrated at frequencies less than 1 kHz (Richardson et al. 1995), although humpback whales can produce songs up to 8 kHz (Payne and Payne 1985). Based on indirect evidence, at least some baleen whales are quite sensitive to frequencies below 1 kHz but can hear sounds up to a considerably higher but unknown frequency. Most of the manmade sounds that elicited reactions by baleen whales were at frequencies below 1 kHz (Richardson et al. 1995). Some or all baleen whales may hear infrasounds, sounds at frequencies well below those detectable by humans. Functional models indicate that the functional hearing of baleen whales extends to 20 Hz, with an upper range of 30 Hz. Even if the range of sensitive

hearing does not extend below 20-50 Hz, whales may hear strong infrasounds at considerably lower frequencies. Based on work with other marine mammals, if hearing sensitivity is good at 50 Hz, strong infrasounds at 5 Hz might be detected (Richardson et al. 1995). Fin whales are predicted to hear at frequencies as low as 10-15 Hz. The right whale uses tonal signals in the frequency range from roughly 20 to 1000 Hz, with broadband source levels ranging from 137 to 162 dB (RMS) re 1 μPa at 1 m (Parks & Tyack 2005). One of the more common sounds made by right whales is the "up call," a frequency-modulated upsweep in the 50–200 Hz range (Mellinger 2004). The following table summarizes the range of sounds produced by right, humpback, and fin whales (from Au et al. 2000):

Table 1. Summary of known right, humpback, and fin whale vocalizations

Species	Signal type	Frequency Limits (Hz)	Dominant Frequencies (Hz)	Source Level (dB re 1μPa RMS)	References
North Atlantic Right	Moans	< 400	--	--	Watkins and Schevill (1972)
	Tonal	20-1000	100-2500	137-162	Parks and Tyack (2005)
	Gunshots		50-2000	174-192	Parks et al. (2005)
Humpback	Grunts	25-1900	25-1900	--	Thompson, Cummings, and Ha (1986)
	Pulses	25-89	25-80	176	Thompson, Cummings, and Ha (1986)
	Songs	30-8000	120-4000	144-174	Payne and Payne (1985)
Fin	FM moans	14-118	20	160-186	Watkins (1981), Edds (1988), Cummings and Thompson (1994)
	Tonal	34-150	34-150		Edds (1988)
	Songs	17-25	17-25	186	Watkins (1981)

Most species also have the ability to hear beyond their region of best sensitivity. This broader range of hearing probably is related to their need to detect other important environmental phenomena, such as the locations of predators or prey. Considerable variation exists among marine mammals in hearing sensitivity and absolute hearing range (Richardson et al. 1995; Ketten 1998); however, from what is known of right, humpback, and fin whale hearing and the source levels and dominant frequencies of the construction noise sources, it is evident that right, humpback, and fin whales are capable of perceiving construction noises, and have hearing ranges that are likely to have peak sensitivities in low frequency ranges that overlap the dominant frequencies of pile driving and vessel noise.

Sea Turtle Hearing

The hearing capabilities of sea turtles are poorly known. Few experimental data exist, and since sea turtles do not vocalize, inferences cannot be made from their vocalizations as is the case with baleen whales. Direct hearing measurements have been made in only a few species. An early experiment measured cochlear potential in three Pacific green turtles and suggested a best hearing sensitivity in air of 300–500 Hz and an effective hearing range of 60–1,000 Hz (Ridgway et al. 1969). Sea turtle underwater hearing is believed to be about 10 dB less sensitive than their in-air hearing (Lenhardt 1994). Lenhardt et al. (1996) used a behavioral "acoustic startle response" to measure the underwater hearing sensitivity of a juvenile Kemp's ridley and a juvenile loggerhead turtle to a 430-Hz tone. Their results suggest that those species have a hearing sensitivity at a frequency similar to those of the green turtles studied by Ridgway et al. (1969). Lenhardt (1994) was also able to induce startle responses in loggerhead turtles to low frequency (20–80 Hz) sounds projected into their tank. He suggested that sea turtles have a range of best hearing from 100–800 Hz, an upper limit of about 2,000 Hz, and serviceable hearing abilities below 80 Hz. More recently, the hearing abilities of loggerhead sea turtles were measured using auditory evoked potentials in 35 juvenile animals caught in tributaries of Chesapeake Bay (Bartol et al. 1999). Those experiments suggest that the effective hearing range of the loggerhead sea turtle is 250–750 Hz and that its most sensitive hearing is at 250 Hz. In general, however, these experiments indicate that sea turtles generally hear best at low frequencies and that the upper frequency limit of their hearing is likely about 1 kHz. As such, sea turtles are capable of hearing in low frequency ranges that overlap with the dominant frequencies of pile driving and vessel noise, and are therefore likely to be exposed to construction-related noise.

Geotechnical Surveys – Drilling

As explained above, geotechnical drilling will take place in each lease block. Estimates of noise levels at the source range from 145-118 dB; estimates indicate that noise levels will attenuate to below 120 dB by 150 meters. As noted above, a 200 meter exclusion zone around the geotechnical survey vessel will be maintained such that no drilling will occur should a whale or sea turtle occur within 200 meters of the survey vessel. As no whales or sea turtles will occur within 150 meters of any geotechnical drilling, no whales or sea turtles will be exposed to sound levels greater than 120 dB and no whales or sea turtles will be exposed to sound levels at which harassment (i.e., 120 dB re 1uPa for a continuous noise source such as drilling) could occur.

Geophysical Surveys

It is anticipated that all lessees will conduct a high resolution geophysical survey. The survey would investigate the shallow subsurface for geohazards and sediment conditions, as well as to identify potential benthic biological communities (or habitats) and archaeological resources. In general, the survey ship travels at less than 4.5knots (8.3 km/hour), and the source is activated every 7-8 seconds (or about every 12.5 m). All involved ships are designed to reduce self-noise, as the higher frequencies used in high-resolution work are easily masked by the vessel noise if special attention is not paid to keeping the ships quiet. While the towed gear has the potential to result in interaction with listed species, the speed of towing (typically about 3 knots) minimizes the potential for entanglement or vessel strikes during the survey as sea turtles and whales would be able to avoid the slow moving gear and survey vessel.

The sound levels at the source (i.e., the survey vessel) will depend on the type of equipment used for the survey. As outlined above several types of equipment will be used including fathometers, sub-bottom profilers (chirp or boomer) as well as side scan and multibeam sonar. Noise levels at the source are expected to range from 220 – 201 dB re 1uPa (see Table 2 above). All estimates provided to NMFS indicate that by a distance of 400 m from the source, noise levels will be at or below 160 dB. As noted above, a 500 meter exclusion zone around the geotechnical survey vessel will be maintained such that the survey equipment will not be activated should a whale or sea turtle occur within 500 meters of the survey vessel. If a whale or sea turtle enters the 500 m exclusion zone while the survey is operating, the equipment will immediately be shut down. As no whales or sea turtles will occur within 500 meters of the survey equipment, no whales or sea turtles will be exposed to sound levels greater than 160 dB and no whales or sea turtles will be exposed to sound levels at which injury (i.e., 180 dB re 1uPa) or harassment (i.e., 160 dB re 1uPa for a non-continuous noise source such as the survey equipment) could occur.

Installation of the Meteorological Towers

Sound levels associated with the driving of piles have been modeled and presented by BOEMRE. BOEMRE has estimated that up to 10 met towers could be constructed in the Mid-Atlantic WEAs. Any additional construction of met towers would be considered to be outside the scope of this programmatic consultation. Estimates of pile driving noise associated with the installation of met towers are varied. The majority of estimates indicate that, depending on the size of the pile being driven, underwater sound levels at the source could range from 185 dB re 1uPa to 200 dB re 1uPa with noise levels dissipating to below 160dB by a distance of 150-500 meters from the pile driving site. However, one estimate indicates that noise levels may not dissipate to below 160 dB for a distance of approximately 7km from the source. As noted above, to accommodate the most conservative estimate of underwater noise associated with pile driving for met tower installation, an initial exclusion zone around the pile driving equipment of 7km will be established such that piles will not be driven if a whale or sea turtle is observed within 7km of the pile to be driven. If multiple piles are being driven (i.e., for a tripod or lattice design rather than a monopole), the applicant can then either maintain the 7km exclusion zone or reset it to a distance where underwater noise will be less than 160dB re 1uPa outside the zone.

It is important to note that pile driving will only occur for 3-8 hours for each pile to be installed. Thus, in order for a whale or sea turtle to have the potential to be exposed to pile driving noise that may result in injury (180dB) or harassment (160dB), a whale or sea turtle would have to be within 7 km of the pile to be driven during the 3-8 hour period when pile driving will occur. Given the intermittent distribution of whales and sea turtles throughout the action area, any occurrence of a whale or sea turtle in such a small area of space and time is unlikely. As only 10 met towers will be constructed, the likelihood of co-occurrence remains small even when all pile driving events are considered. As explained above, the 7 km exclusion zone will be monitored by at least two trained endangered species observer for at least 60 minutes prior to the start of pile driving. It is expected that the observer will be able to detect the presence of any whales or sea turtle at the surface within the 7 km exclusion zone and that additional observers will be utilized if two observers are not enough to effectively monitor this area. The normal duration of sea turtle dives ranges from 5-40 minutes depending on species, with a maximum duration of 45-66 minutes depending on species (Spotila 2004). As sea turtles can stay submerged for longer than 30 minutes, but typically surface at least every 60 minutes, it is reasonable to expect that

monitoring for at least 60 minutes will allow the endangered species observer to detect any sea turtles that may be submerged in the exclusion zone.

Sound levels will have dissipated to below the 160 dB threshold within a distance of 7 km. As no pile driving will occur if a whale or sea turtle is within 7 km of the pile, no whales sea turtles are likely to be exposed to potentially injurious or harassing levels of sound. Thus, whales or sea turtles are not likely to be exposed to levels of construction-related noise that will result in injury or harassment.

Based on the analysis presented herein, no whales or sea turtles are likely to be exposed to any noise greater than 160dB. Thus, listed species are not likely to be exposed to levels of underwater noise that will result in injury or disturbance and any acoustic effects of the proposed action will be insignificant and discountable.

Vessel Noise

Support and vessel transits will occur regularly throughout the lease period. Vessels transmit noise through water and cumulatively are a significant contributor to increases in ambient noise levels in many areas. The dominant source of vessel noise from the proposed action is propeller cavitation, although other ancillary noises may be produced. The intensity of noise from service vessels is roughly related to ship size and speed. Large ships tend to be noisier than small ones, and ships underway with a full load (or towing or pushing a load) produce more noise than unladen vessels. Vessel traffic associated with the proposed action would produce levels of noise of 150 to 170 dB re 1 μPa-m at frequencies below 1,000 Hz. A tug pulling a barge generates 164 dB re 1 μPa-m when empty and 170 dB re 1 μPa-m loaded. A tug and barge underway at 18 km/h can generate broadband source levels of 171 dB re 1 μPa-m. A small crew boat produces 156 dB re 1 μPa-m at 90 Hz.

Vessel noises are within the range of frequencies that whales can detect. The noise produced by smaller crew support vessels is below the threshold of harassment from a non-continuous noise source (160 dB; while the vessel noise is continuous, whales will not be exposed continuously as the vessels will be transiting and only a small area will be esonified at a given time). As such, any effects from noise associated with crew support vessels will be discountable. Project related vessel traffic traveling between the construction staging areas and the project site will consist of tugs and barges. As noted above, the source level for these vessels is approximately 164-171 dB re 1 μPa-m. However, operational noise sources are expected to diminish to below the 160 dB re 1uPa threshold within short distances. Based on the operating procedures which limit vessels from approaching within 100 meters of any whale and 500 meters of a right whale, it is extremely unlikely that any project vessel would come close enough to a whale in a manner that would result in exposure to harassing levels of noise. As such, no whales are expected to be exposed to injurious or harassing levels of sound. As no avoidance behaviors are anticipated, the distribution, abundance and behavior of whales in the action area is not likely to be affected by noise associated with construction or maintenance vessels and any effects will be insignificant or discountable.

As noted previously in relation to construction noise, sea turtles are thought to be far less sensitive to sound than marine mammals. Although vessel noises are within the limited range of

frequencies they can detect, evidence suggests that sound levels of 110-126 dB re 1μPa are required before sea turtles can detect a sound (Ridgway 1969; Streeter, in press). McCauley (2000) noted that dB levels of 166 dB re 1μPa were required before any behavioral reaction was observed. As all operational noise sources are expected to diminish to below this threshold within very short distances, no sea turtles are expected to be exposed to injurious or harassing levels of sound. As no avoidance behaviors are anticipated, the distribution, abundance and behavior of sea turtles in the action area is not likely to be affected by noise associated with construction or maintenance vessels and any effects will be insignificant or discountable.

Effects to Benthic Habitat

Activities that disturb the sea floor will also affect benthic communities, and can cause effects to listed species by reducing the numbers or altering the composition of the species upon which these species prey. Activities that may affect the sea floor and result in the loss of foraging resources for listed species include pile installation, geotechnical drilling, and, scour protection (scour mats and rock armoring). The proposed activities to be carried out will result in both the temporary disturbance and permanent loss of benthic habitat. Effects to benthic resources and habitat will be restricted to the area within the project footprint where sediment disturbing activities will occur.

The geotechnical drilling will affect an extremely small area at each sampling location. While there will be some loss of benthic species, including potential forage items, at the site of the drill holes, the amount of habitat affected represents an extremely small percentage of the available foraging habitat in the lease blocks and in the mid-Atlantic. As such, any effects to whales and sea turtles resulting from benthic disturbance during the geotechnical drilling will be insignificant and discountable.

BOEMRE has estimated that if the artificial seagrass mats are used, a total area of 5200 to 5900 square feet would be affected for a three-pile structure, 5900 to 7800 square feet for a four-pile structure and 3700 to 4000 square feet for a monopole. If a rock armor system was used, BOEMRE has estimated that 16,000 square feet of seabed could be affected. Using these estimates, and considering that up to 10 met towers could be installed, the installation of the piles and the scour protection will result in the permanent loss of 2.0 to 3.6 acres of benthic habitat total (approximately 0.0006% of the action area). Although these impacts would result in permanent loss of this benthic habitat, loss of this habitat is not likely to have a measurable adverse impact on normal sea turtle foraging activity or any other marine mammal or sea turtle activity. As such, any effects to whales and sea turtles resulting from loss of benthic habitat resulting from the installation of piles and associated scour protection will be insignificant and discountable.

Vessel Traffic

The proposed action will result in an increase in vessel traffic in the action area. Tugs and barges will be used to transport materials from the staging areas to the project site and smaller vessels will also be used to deliver crew to the project site. These vessels will represent an increase in vessel traffic in the action area. The barges, tugs and vessels delivering the buoy and anchor generally will travel at speeds below 10 knots and may range in size from 90 to 150 feet.

While on site, vessels will be slow moving or stationary. Crew vessels, typically less than 65 feet in length, may travel at higher speeds as they travel to and from the project sites.

Collision with vessels remains a source of anthropogenic mortality for both sea turtles and whales. The proposed project will lead to increased vessel traffic in the action area that would not exist but for the proposed action. This increase in vessel traffic will result in some increased risk of vessel strike of listed species. However, due to the limited information available regarding the incidence of ship strike and the factors contributing to ship strike events, it is difficult to determine how a particular number of vessel transits or a percentage increase in vessel traffic will translate into a number of likely ship strike events or percentage increase in collision risk. In spite of being one of the primary known sources of direct anthropogenic mortality to whales, and to a lesser degree, sea turtles, ship strikes remain relatively rare, stochastic events, and an increase in vessel traffic in the action area would not necessarily translate into an increase in ship strike events. As outlined in the Project Design Criteria above, several measures will be implemented to further reduce the likelihood of a project vessel interacting with a whale or sea turtle. These include mandatory adherence to any DMA associated speed restrictions, a requirement to post a dedicated lookout for marine mammals and sea turtles during all transits, and mandatory adherence to vessel speed restrictions for all vessels greater than 65 feet in length during the November 1 – April 30 time period even in those areas of the WEA that do not overlap with the SMAs.

Although little is known about sea turtle and whale reactions to vessel traffic, these species are thought to be able to avoid injury from slower-moving vessels since the animal has more time to maneuver and avoid the vessel. Vessels will only travel between 0-4.5 knots while actually engaged in construction activities. At these speeds, vessel movements during construction are not likely to pose a vessel strike risk to whales or sea turtles.

The risk of collision is greatest when vessels are moving at higher speeds when transiting between the staging areas and the project site. As such, the 10 knot maximum speed of the construction vessels is likely to reduce the chance for collision. Lookouts will be posted on all vessel transits. All vessels would follow the vessel strike avoidance procedures discussed above. The presence of an experienced endangered species observer at the construction site who can advise the vessel operator to slow the vessel or maneuver safely when listed species are spotted will further reduce the potential for interaction with vessels.

Large whales, particularly right whales, are vulnerable to injury and mortality from ship strikes. Although the threat of vessel collision exists anywhere listed species and vessel activity overlap, ship strike is more likely to occur in areas where high vessel traffic coincides with high species density. In addition, ship strikes are more likely to occur and more likely to result in serious injury or mortality when vessels are traveling at speeds greater than ten knots. Based on the number of vessels involved, the project location outside of any whale or sea turtle concentration area, the slow speed at which vessels will be operating, and the implementation of measures designed to minimize the potential for vessel strikes, NMFS has determined that the increased risk of vessel collision posed by project vessel operation in the action area is insignificant.

Operation of the Met Towers and Buoys

Met Towers

As noted above, the met towers are designed to collect meteorological data for a period of four-five years. During this time, data will be collected and transmitted to onshore facilities. The operation of the meteorological data collection instrumentation will have no effect on listed species.

Per the USCG and the FAA, lighting will be required to operate on the towers at all times. Sea turtle hatchlings are known to be attracted to lights and adversely affected by artificial beach lighting, which disrupts proper orientation towards the sea. However, nesting does not occur in Massachusetts, and hatchlings are not known to be present in Massachusetts waters. If this lighting resulted in the attraction of sea turtles or marine mammals or their prey, no effects to sea turtles or marine mammals would occur as they are not likely to collide with the stationary met tower. As such, any effects of project lighting on sea turtles or whales will be discountable.

Habitat Shift

The presence of 12 pile foundations in the WEAs and their associated scour control mats has the potential to shift the area immediately surrounding each met tower from soft sediment, open water habitat to a structure-oriented system. This may create localized changes, namely the establishment of "fouling communities" within the immediate area surrounding each met tower and an increased availability of shelter among the pile structure. The met tower foundations will represent a source of new substrate with vertical orientation in an area that has a limited amount of such habitat, and as such may attract finfish and benthic organisms, potentially affecting sea turtles by causing changes to prey distribution and/or abundance. While the aggregation of finfish around the piles will not attract sea turtles, some sea turtle species may be attracted to the met tower foundations for the fouling community and epifauna that may colonize the underwater structure as an additional food source for certain sea turtle species, especially loggerhead and Kemp's ridley turtles. All four sea turtle species may be attracted to the underwater structure for shelter, especially loggerheads that have been reported to commonly occupy areas around oil platforms (NRC 1996) which also offer similar underwater vertical structure.

More specifically, loggerheads and Kemp's ridleys could be attracted to the piles to feed on attached organisms since they feed on mollusks and crustaceans. Loggerheads are frequently observed around wrecks, underwater structures and reefs where they forage on a variety of mollusks and crustaceans (USFWS 2005). Leatherback turtles and green turtles however should are less likely to be attracted to the met tower foundations for feeding since leatherbacks are strictly pelagic and feed from the water column primarily on jellyfish and green turtles are primarily herbivores feeding on seagrasses and algae. However, if either of these forage items occur in higher concentrations near the piles, these species of sea turtles could also be attracted to the piles.

As explained above, right whales feed on copepods while humpback and fin whales feed on schooling fish. If the met tower foundations led to an increase in schooling fish around the piles, it is possible that individual whales could be attracted to the met tower foundations. However, the small number and low density of met tower foundations (i.e., 10 over a 915 square mile area)

makes it extremely unlikely that the distribution of forage species in the action area would be altered in a way that would affect the distribution of humpback or fin whales. As such, any effects to the distribution of fin or humpback whale forage species will be insignificant and discountable.

Although the met tower foundations would create additional attachment sites for benthic organisms that require fixed (non-sand) substrates and additional structure that may attract certain finfish species, the additional amount of surface area being introduced (i.e., only one met tower foundation per each nine square mile lease block) would be a minor addition to the hard substrate that is already present. Due to the small amount of additional surface area in relation to the total area of the proposed action and the mid-Atlantic as a whole and the spacing between met towers (at least 10 miles apart), the new additional structure is not expected to alter the species composition in the action area. While the increase in structure and localized alteration of species distribution in the action area around the met tower foundations may affect the localized movements of sea turtles in the action area and provide additional sheltering and foraging opportunities in the action area for these species, any effects will be beneficial or insignificant.

Deployment and Operation of Buoy and Monitoring System
As noted above, a met buoy is designed to collect meteorological data for a period of four-five years. During this time, data will be collected and transmitted to onshore facilities. The operation of the meteorological data collection instrumentation (i.e., LIDAR and ADCP) will have no effect on listed species.

As explained above, buoys are likely to be anchored to a clump weight anchor and attached to the anchor with heavy chain. NMFS has considered the potential for whales and/or sea turtles to interact with the buoy and to become entangled in the buoy or mooring system and has determined that this is extremely unlikely to occur for the reasons outlined below.

In order for an entanglement to occur, an animal must first encounter the gear. Since there will only be a total of no more than 25 buoys deployed in a 798 square mile area where listed species are not known to concentrate, the likelihood of a whale or sea turtle encountering the gear is extremely low. The buoy will be attached to the anchor with chains. The use of heavy chain further reduces the risk of entanglement. The risk of entanglement is even further reduced by the tension that the buoy will be under which reduces the potential for loose chains in which an animal could become entangled. Based on the analysis herein, it is extremely unlikely that a whale or sea turtle will interact with the buoy and anchor system and become entangled. As such the effect of the deployment of any buoy and anchoring system on these species is discountable.

Decommissioning
As required by MMS, within a year from the expiration of the lease, met tower and buoy components would be retrieved and removed from the site. Removal activities are expected to have impacts similar to those discussed above in relation to construction activities, including temporary seafloor disturbance and turbidity. However, all impacts would be of less magnitude than those resulting from construction activities. As such, effects of decommissioning activities will be insignificant or discountable.

Unexpected Events

Vessel Collision with Met Tower or Damage Resulting from Natural Events

The extent of potential impacts that could result from a vessel collision with a met tower largely depends on the extent of damage to the tower, its foundation and the vessel. Some smaller vessels would merely strike a glancing blow and possibly suffer some hull damage but not sink. Other vessels may suffer enough damage to sink, causing a small release of fuel and debris. A larger vessel may cause a collapse of the tower. Similarly, a large storm could cause damage to the met tower and/or its foundation. Repair of a damaged or collapsed tower or its foundation would create short term and localized disturbances to the benthos, water column, and pelagic organisms similar to the construction and decommissioning of a single met tower, albeit in reverse order and combined in a single event. The effects of a vessel collision or destructive natural event are difficult to predict. However, effects to sea turtles and whales from such an event are more likely to be attributable to the debris that enters the water and effects of any repair activities. As any effects are likely to be on a small scale and temporary, any effects, if adverse, will be insignificant.

Fuel Spill

A fuel spill could result from a diesel generator and would be an unintended, unpredictable event. Marine animals, including whales and sea turtles, are known to be negatively impacted by exposure to oil and other petroleum products. Without an estimate of the amount of fuel released it is difficult to predict the likely effects on listed species. As the effects of a spill are likely to be localized and temporary, sea turtles and whales are not likely to be exposed to fuel and any effects would be discountable. Additionally, should a response be required by the US EPA or the USCG, there would be an opportunity for NMFS to conduct a consultation with the lead Federal agency on the spill response.

Cumulative Effects

The ESA requires the evaluation of cumulative effects from future state, tribal, and local actions that are reasonably likely to occur in the action area and that would not be subject to Section 7 consultation. Given the large geographic area encompassed by this informal programmatic consultation, it is difficult to predict the number, types, and locations of future non-federal actions. Given the nature of the action area (i.e., nearshore and offshore areas off the coast of the U.S. mid-Atlantic), few activities that may affect listed whales or sea turtles are likely to occur that do not require some Federal authorization or permitting. Therefore, Section 7 consultations with NMFS are anticipated to be necessary for the majority of activities that could affect listed whales or sea turtles in the action area.

Although not a traditional cumulative effects analysis in the context of Section 7 consultation, NMFS has evaluated the net additive effects of the full suite of anticipated activities that could occur under the terms of this programmatic consultation. Effects from the activities considered in this informal programmatic consultation may be both temporary and permanent. Permanent, long-term effects associated with activities authorized under Category 1-Navigable Waters and analyzed in this programmatic consultation are anticipated to be insignificant in the marine environment (e.g., loss of small amounts of benthic habitat due to the installation of met towers). The majority of impacts associated with these activities are expected to be temporary (e.g.,

increases in underwater noise associated with survey activities or pile driving and effects to the benthic environment resulting from geotechnical sampling, etc.). Therefore, NMFS does not anticipate, as a result of the issuance of leases by BOEMRE or the carrying out of site assessment activities, any negative cumulative effects that will persist in the long-term leading to permanent effects to the environment that would affect listed whales or sea turtles.

Any negative effects to listed species and their habitats as a result of the activities to be carried out under the terms of this programmatic consultation are anticipated to be temporary in duration and small in scope and, therefore, discountable and/or insignificant. Temporary, negative effects are only anticipated to occur during project construction or implementation and are only anticipated to occur over short durations on the order of minutes, hours or intermittently over a few days.

Predicting the spatial and temporal occurrences of activities to be carried out is difficult; however, using the leasing scenario established by BOEMRE, NMFS believes that the likelihood of multiple activities resulting in temporary negative effects that overlap spatially and temporally to the extent that the cumulative effects would result in an adverse effect is discountable. Thus, despite the potential for temporary negative effects, NMFS does not believe the cumulative effects of these activities will have any significant adverse effects to any species of listed whales or sea turtles.

The initial step prior to any activity in the mid-Atlantic WEAs is for an applicant to obtain a lease from BOEMRE. BOEMRE will provide NMFS with notification of any proposed issuance of a lease that contains information on the location of the lease blocks. BOEMRE will also need to approve any lessees' SAP. BOEMRE will review each SAP and associated data collection plan to determine if it is consistent with the activities considered in this consultation. Prior to approval of the SAP, BOEMRE will provide NMFS with written notification of its determination that the site assessment and data collection activities are wholly consistent with the activities and conditions outlined in this consultation and, if the activities are not wholly consistent, how the activities will be modified to be consistent. NMFS will review this determination and provide BOEMRE written confirmation that NMFS agrees that the activities to be carried out are wholly consistent with the activities considered in this consultation. If the lessees plan is not wholly consistent with the activities considered in this consultation, the plan must be modified or BOEMRE must request a separate ESA Section 7 consultation to consider the activities to be carried out by the lessee. Submission of the notifications will allow NMFS to monitor and track individual and cumulative effects of activities subject to this programmatic consultation. Furthermore, if at any time BOEMRE or NMFS obtain information that indicates that the proposed activities considered in this consultation are likely to result in impacts to listed species that were not considered herein, this consultation must be reinitiated. Thus, if information obtained through monitoring or other sources indicates that activities are resulting, individually or cumulatively, in adverse effects to listed species or critical habitat, this would represent new information and NMFS would request re-initiation of this consultation.

As indicated above in this programmatic consultation, this programmatic concurrence does not apply to any activities that individually, additively, or cumulatively are likely to adversely affect a listed species through direct or indirect effects to either the species or its habitat. To ensure

individual actions undertaken under Category 1 are consistent with this programmatic consultation, the review procedures noted above will be carried out. If NMFS determines that a proposed activity is not deemed to fit under this programmatic consultation, NMFS will notify BOEMRE within 1 week of receipt.

Conclusions

NMFS has reviewed BOEMRE's proposed action and agrees that activities to be carried out as described herein are not likely to adversely affect listed whales or sea turtles when implemented according to the project design criteria outlined above and the special conditions outlined in BOEMRE's DEA and BA. This programmatic concurrence is expressly limited to those activities outlined herein (as well as in the DEA and BA) where the effects to listed species are insignificant or discountable, based on site specific information and analysis. In no case does this programmatic concurrence apply to any project or action that, based on site specific information and analysis, has the potential to cause "take" of any listed whale or sea turtle, as defined in Section 9 of the ESA regulations. This programmatic concurrence does not apply to activities authorized by BOEMRE that individually, additively, or cumulatively are likely to adversely affect any species of listed whale or sea turtle. This informal programmatic concurrence subject to re-initiation should new information indicate that adverse effects (individually or cumulatively) are likely to occur to any listed species of whale or sea turtle. Concurrence for specific projects may be invalidated as a consequence of any changes to the basis for which concurrence was issued.

This concludes consultation pursuant to Section 7 of the ESA for this proposed action by BOEMRE. Re-initiation of consultation is required and shall be requested by BOEMRE or by NFMS where discretionary federal involvement or control over the action has been retained or is authorized by law and (a) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or, (c) if a new species is listed or critical habitat designated that may be affected by the identified action.

Technical Assistance for Proposed Species

On October 6, 2010, NMFS published two rules proposing to list 5 Distinct Population Segments (DPS) of Atlantic sturgeon. NMFS is proposing to list four DPSs as endangered (New York Bight, Chesapeake Bay, Carolina and South Atlantic) and one DPS of Atlantic sturgeon as threatened (Gulf of Maine DPS). As you know, once a species is proposed for listing, as either endangered or threatened, the conference provisions of the ESA may apply (see 50 CFR 402.10 and ESA Section 7(a)(4)). As stated at 50 CFR 402.10, "Federal agencies are required to confer with NMFS on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat."

NMFS has reviewed the proposed action in order to provide guidance to BOEMRE as to whether a conference is required in this case. Atlantic sturgeon are known to occur in the waters off the U.S. Mid-Atlantic. Outside of the Gulf of Maine, Atlantic sturgeon are most likely to occur in

water depths of less than 40 meters. Similar to the analysis for whales and sea turtles above, as the majority of the disturbance to the benthic environment is expected to be minor and temporary and any permanent impacts are extremely small, any effects to Atlantic sturgeon resulting from impacts to the benthic environment are likely to be insignificant and discountable. NMFS has also considered the potential for acoustic impacts of the proposed activities to affect Atlantic sturgeon.

Pile driving affects fish through underwater noise and pressure which can cause effects to hearing and air containing organs, such as the swim bladder. Effects to fish can range from temporary avoidance of an area to death due to injury of internal organs. The type and size of pile, type of installation method (i.e., vibratory vs. hammer), type and size of fish (smaller fish are more often impacted), and distance from the sound source (i.e., sound dissipates over distance so noise levels are greater closer to the source) all contribute to the likelihood of effects to an individual fish. The available literature on effects of pile driving on aquatic species is difficult to summarize due to inconsistent methods of measuring underwater sound, the diversity of pile driving methods and receiving substrates, and the differing tolerances of aquatic species to underwater noise. Generally, however, the larger the pile and the closer a fish is to the pile, the greater the likelihood of effects.

Popper *et al.* (2006) have proposed a set of criteria for injury to fish exposed to pile driving. They propose that pile strikes which result in a sound exposure level (SEL) of driving. They propose that pile strikes which result in a sound exposure level (SEL) of 187 dB re 1 μPa as measured 10 meters from the source are expected to produce injuries to fish. These criteria are similar to those adopted by NMFS Northwest Regional Office, the US Fish and Wildlife Service, and the Federal Highway Administration, who determined that based on the best available scientific information, that pile driving resulting in an SEL level of 187 dB re: 1 μPa^2 •sec *and* a peak sound pressure level of 206 dB re: 1 μPa_{peak} in any single strike has no potential to cause injury or mortality to fish weighing more than 2 grams. All Atlantic sturgeon likely to occur in the action area will weigh considerably more than 2 grams.

As different fish species demonstrate differing sensitivities to sound levels and there is little information on the effects of underwater noise on Atlantic sturgeon, it is difficult to determine whether this criterion is appropriate for Atlantic sturgeon. The NMFS Northwest Region criteria noted above, considered effects to green sturgeon which are biologically similar to Atlantic sturgeon. Thus, it is reasonable to consider that acoustic thresholds designed to be protective of green sturgeon would also be protective of Atlantic sturgeon.

While no studies have been conducted on the effects of pile driving on Atlantic sturgeon, two studies have been conducted on the effects of blasting on shortnose sturgeon, which are biologically similar to Atlantic sturgeon. Moser (1999) studied the effects of rock blasting in Wilmington Harbor on caged hatchery reared shortnose sturgeon. A study done in the Cooper River, South Carolina, by Collins and Post (2001) tested the use of blasting caps to possibly repel shortnose sturgeon from a blasting site. These studies indicate that mortality of shortnose sturgeon only occurred when recorded sound levels were 234 dB. At sound levels between 196-229 dB, some shortnose sturgeon were temporarily stunned. These studies suggest that, consistent with the recommendations by Popper *et al.* 2006, exposure of shortnose sturgeon to

sound levels below 187dB is unlikely to result in effects to this species. Sound levels resulting from the pile driving associated with the proposed action may be higher than this threshold at the source. However, noise levels are expected to dissipate below 180dB within 500-1,000 meters from the source. Given the large area over which Atlantic sturgeon are found, the limited number of piles to be driven (10 met towers), and the short duration of pile driving activities (3-8 hours per pile), it is unlikely that any Atlantic sturgeon would be in proximity of any pile while it was being driven. To be injured or killed as a result of exposure to pile driving noise, an Atlantic sturgeon would likely have to be within several meters of the pile, which is extremely unlikely. Given this, it is unlikely that any Atlantic sturgeon would be exposed to pile driving noise that would result in injury or mortality.

Noise associated with the geotechnical surveys is below the thresholds which are likely to affect Atlantic sturgeon. Similar to the analysis for pile driving noise above, in order for an Atlantic sturgeon to be exposed to noise associated with the geophysical surveys that could result in injuries, an individual fish would have to be extremely close to the sound source at the time it was operating. Effects on fish are generally expected to be limited to avoidance of the area around the HRG Survey activities and short-term changes in behavior. Fish are not expected to be exposed to sound pressure levels that could cause hearing damage. Side-scan sonar, which uses a low-energy, high-frequency signal, is not expected to affect fish, based on fish hearing data. Based on this analysis, NMFS does not anticipate any injury to Atlantic sturgeon to result from exposure to underwater noise associated with the geophysical surveys.

As all effects of the proposed action on Atlantic sturgeon are likely to be insignificant and discountable and the proposed action is not likely to result in the injury or mortality of any Atlantic sturgeon, the action is not likely to appreciably reduce the survival and recovery of any DPS of Atlantic sturgeon and therefore it is not reasonable to anticipate that this action would be likely to jeopardize the continued existence of any DPS of Atlantic sturgeon. As such, no conference is necessary for Atlantic sturgeon.

On March 16, 2010, NMFS published a proposed rule to list two distinct population segments (DPS) of loggerhead sea turtles as threatened and seven distinct population segments of loggerhead sea turtles as endangered, including the Northwest Atlantic DPS. This rule, when finalized, would replace the existing listing for loggerhead sea turtles. Currently, the species is listed as threatened range-wide. In the analysis above, NMFS has considered effects to the current global listing of loggerhead sea turtles. Sea turtles in the action area are likely to be from the Northwest Atlantic DPS. As explained above, all effects to loggerhead sea turtles will be insignificant and discountable and the proposed action is not likely to result in the injury or mortality of any loggerhead sea turtles; as this determination was based on the potential effects to individuals, the change in status for these sea turtles (i.e., from threatened to endangered) would not change these determinations. As all effects of the proposed action are likely to be insignificant and discountable and the proposed action is not likely to result in the injury or mortality of any loggerhead sea turtles, the action is not likely to appreciably reduce the survival and recovery of any DPS of loggerhead sea turtles, including the Northwest Atlantic DPS and therefore it is not reasonable to anticipate that this action would be likely to jeopardize the continued existence of any DPS of loggerhead sea turtles. As such, no conference is necessary for loggerhead sea turtles.

NMFS looks forward to continuing to work cooperatively with BOEMRE on the development of alternative energy on the OCS. Should you have any questions regarding this consultation, please contact Julie Crocker of my staff at (978)282-8480 or by e-mail (Julie.Crocker@Noaa.gov).

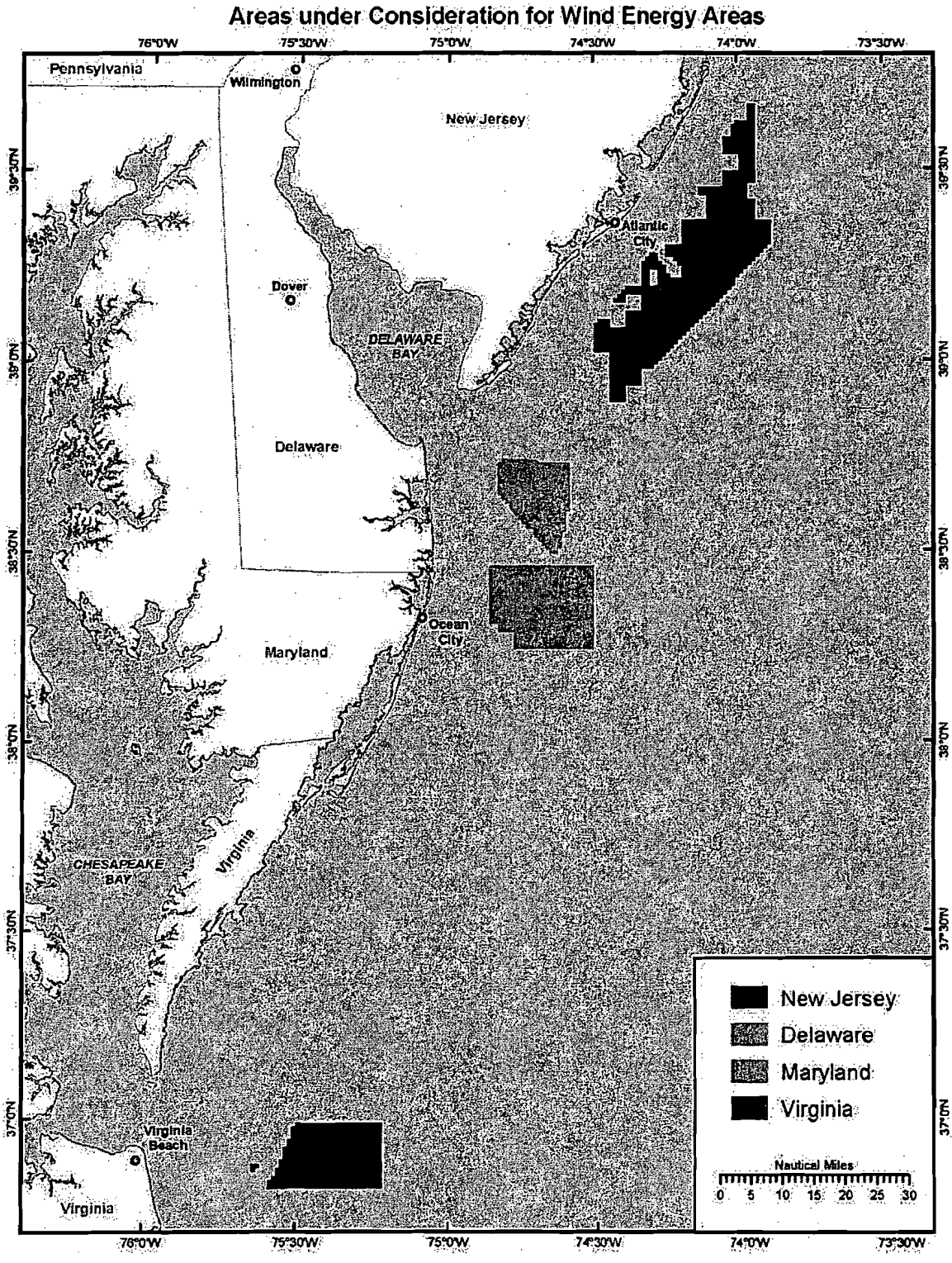
Sincerely,

Patricia A. Kurkul
Regional Administrator

CC: Hooker, BOEMRE
Boelke, Greene, O'Brien - F/NER4

File Code: Sec 7 BOEMRE MidAtlantic WEA leases and SAPs
PCTS: P/NER/2011/04291

Figure 1


Areas under Consideration for Wind Energy Areas
76°0'W
75°30'W
75°0'W
74°30'W
74°0'W
73°30'W
39°30'N
39°0'N
38°30'N
38°0'N
37°30'N
37°0'N
Pennsylvania
Wilmington
New Jersey
Atlantic City
Dover
DELAWARE BAY
Delaware
Ocean City
Maryland
CHESAPEAKE BAY
Virginia
Virginia Beach
Virginia
New Jersey
Delaware
Maryland
Virginia
Nautical Miles
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