9.0 MONITORING AND MITIGATION

This section provides information on monitoring and mitigation applicable to the proposed action. If the proposed action were selected, all mitigation and monitoring measures and actions described herein would become required conditions of approval for MMS' authorization of the project. Those measures and actions described in this section and adopted in the Record of Decision (ROD) would set forth the monitoring efforts the applicant would undertake during construction, operation and maintenance, and decommissioning. In addition, the ROD would contain mitigation measures for unavoidable adverse impacts that the MMS requires as a result of its consultation process with Native Americans and agencies, as well as the environmental review process occurring under NEPA. Additional mitigation measures may be implemented by the applicant as a condition of other permits and approvals that it receives.

Since neither MMS nor any other federal or state agency has past experience evaluating how projects such as the proposed action will interact with the marine environment, MMS had initially requested, and the applicant agreed to prepare and implement an EMS tailored to the proposed action. MMS has now decided that the substantive requirements for mitigation and monitoring can be met through this EIS and ROD in a substantially similar manner, along with contributions and terms and conditions that are anticipated to be attached to several forthcoming pre-construction permits required by other federal and state agencies identified in Sections 1 and 7, and therefore has decided that putting the applicant to the expense and level of detail required by a formal EMS is unnecessary for this project. However, MMS encourages the applicant (and the applicant has agreed) to implement a proactive approach for managing and implementing the mitigation and monitoring required for the proposed action.

The discussion below focuses first on an overview of an EMS, then lessons learned from existing offshore wind energy projects, followed by required monitoring and mitigation associated with the major categories of resources and includes state mitigation, mitigation included in the USCG's Terms and Conditions, mitigation associated with the FWS and NOAA Fisheries Biological Opinions and mitigation developed by MMS.

9.1 OVERVIEW OF ENVIRONMENTAL MANAGEMENT SYSTEMS

One widely recognized international EMS is the International Organization of Standards ISO 14001, used to systematically identify, manage, control, and monitor environmental impacts. An EMS is a system that sets up a structure for continuous improvement in the area of managing and minimizing potential environmental impacts. As a continuous improvement process, an EMS is expected to be reviewed and updated periodically to reflect changing circumstances with respect to environmental policies, construction, operation and decommissioning technologies, actual environmental impacts and their effects, and the effectiveness and viability of mitigation and monitoring programs.

An EMS requires:

1. considering policies and regulations applicable to an action;
2. planning how to undertake the action in compliance with the applicable regulations;
3. implementing the action according to a plan;
4. monitoring and measuring the effects of the action;
5. reviewing the effectiveness of the plan with respect to applicable requirements;
6. where warranted, revising plans to reflect the reality of what is occurring during the implementation of the action; and

7. documenting the applicant's environmental policy, key responsibilities, and procedures to carry out and report the results of numbers 1 - 6 above.

In the event that the applicant wishes to model its own compliance plan upon an EMS structure, the following information has been retained to explain such systems. An EMS should focus on three key commitments: complying with environmental legislation, preventing impacts to local resources, and continually striving to improve environmental performance. There are a number of resources within the proposed action location that would be impacted during construction, operation and maintenance, and decommissioning. The EMS would be designed to address each activity within each phase, and identify the approximate severity of the impacts to each resource associated with that activity. The applicant would use the EMS as a tool in ensuring that it meets its post-decision mitigation and monitoring obligations. Mitigation and monitoring commitments made in a ROD may be incorporated into the EMS, and carried through the system. The ROD states what the decision is, identifies the alternatives considered, including the environmentally preferred alternative, and discusses mitigation plans, including any enforcement and monitoring commitments (40 C.F.R. § 1505.2, [2005]).

As commitments and mitigation measures established in the ROD are implemented, tracked and monitored, the applicant would document the implementation, tracking and monitoring of commitments and mitigation measures. This documentation can facilitate their internal training, internal auditing, identification of appropriate corrective actions and communication with interested parties. The documentation should be effective and sufficient to provide details of how well the applicant conforms to its plan, information on compliance with legal standards and requirements, permits, and authorizations, results of internal audits and reviews, and details of deficiencies and corrective and preventative actions.

9.2 LESSONS LEARNED FROM EUROPEAN WIND FARMS

In order to identify possible lessons learned from other offshore wind energy projects, MMS reviewed the monitoring results from a recent study on two demonstration wind farms in Denmark (Horns Rev and Nysted), which have been the subject of research and monitoring programs to examine the potential environmental impacts of offshore wind farm projects. Horns Rev, constructed during the summer of 2002, is sited 8.7 to 12.4 miles (14 to 20 km) off the coast of Denmark in the North Sea, and consists of 80 turbines totaling 160 MW. Nysted was constructed between 2002 and 2003 approximately 6.2 miles (10 km) offshore in the Baltic Sea, and incorporates 72 wind turbines placed in 8 rows of 9 turbines each, with a total installed capacity of 165.5 MW. The monitoring data at both sites consist of three years of baseline monitoring, monitoring during construction, and three years of monitoring during operation.

The environmental monitoring program focused primarily on the effects of construction and operation of the offshore wind farms on the infauna, epifauna, and vegetation of the benthic community; on fish, marine mammals and birds; and on peoples' attitudes towards offshore wind farms locally and nationally. Overall, the results from the Danish wind farms suggest that with proper siting and placement of turbines, offshore wind farms can be engineered and operated without significant damage to the marine environment and vulnerable species. In general, the monitoring results show that the wind farms seem to pose a low risk to birds, mammals, and fish. The studies stress that appropriate siting is an essential precondition for ensuring limited impact on nature and the environment, and that careful spatial planning is necessary to avoid damaging cumulative impacts. Important differences between the two sites were observed in the results of some studies, suggesting that environmental impacts are likely to vary by location even with careful site planning. Therefore, it is difficult to generalize the results of this monitoring program to potential environmental impacts at other offshore wind sites including the proposed action.

Research on the benthic communities at Horns Rev and Nysted focused on the effects of the introduction of hard foundation structures. Changes observed include increased abundance and biomass in the benthic community at the turbine sites associated with increased habitat heterogeneity and structural complexity, and a change in community composition. This may have a positive environmental impact if the increased biomass provides additional food resources for fish and birds. There was no clear evidence of impacts associated with changes in the hydrodynamic regime on the surrounding native benthic communities, seabed sediment structure, or established fouling communities. Many of these results are dependent on the particular benthic community and substrate types present, the level of natural scouring action, the salinity, and the species in the water column available for colonization. However, the rapid colonization and long-term establishment of a hard-surface community on turbine foundations was similar to what is observed on other artificial reefs, and may be representative of what would occur in other locations, including the proposed action.

Potential long-term impacts of offshore wind farms on fish may likewise be associated with the creation of artificial reefs and the establishment of the new hard-surface benthic communities at wind turbine sites. It was expected that fish would be attracted to these areas at the Danish wind farms, resulting in a positive effect on fish abundance and diversity, since artificial reefs may provide additional food, shelter, spawning areas, and a refuge from fishing activities that occur outside the wind farm area. To date, no effect has been observed on fish species composition, distribution and abundance at the Danish wind farm sites; however, it has been suggested that because it can take years for the full reef community to become established, sufficient time may not yet have passed to observe long-term effects on fish distribution or abundance.

The study at Nysted also looked for effects on fish and fish behavior that might be caused by the EMFs created by submarine cables during the operation phase of the wind farm. The Nysted study was not conclusive on this point, but suggests that there is no strong effect. There was some evidence of either avoidance or attraction to the magnetic fields depending on the fish species. The data, however, did not rule out the possibility that physical conditions, not EMFs, along the cables might have caused the observations. Only one species, flounder, showed a correlation between the inferred strength of the EMF and increased avoidance of the cable. It may be invalid, however, to assume that other species do not feel an effect of the EMFs; a weakness of this study was that the EMFs around the cables were not measured directly, and the strength of the fields was inferred from turbine output only, which may not be sensitive enough to produce a correlation.

Construction activity did seem to have an effect on marine mammal behavior and abundance. Other than a reaction to pile-driving and ramming activities, construction and operation of the wind farms had no noticeable effect on seals. Decreases in porpoise abundance were found at both sites during construction, only a slight decrease at Horns Rev, and a much stronger decrease at Nysted, with clear effects from the pile driving and ramming activities. At Horns Rev, there was no observed effect of wind farm operation, while at Nysted; the decrease in porpoises observed during construction has persisted during the first two years of operation, with indications of a slow recovery. The conclusions in these studies are that most effects of the wind farms on mammals are temporary and related to construction noise, but the reasons behind the slow recovery at Nysted are unclear.

Radar, infra-red video monitoring, and visual observations confirmed that at the Danish offshore wind farms most of the more numerous species of birds showed avoidance of wind farm areas, although responses were highly species specific. Birds tended to avoid the vicinity of the turbines and move along the periphery of the wind farm. Slightly extended migration distances for seasonal migrations are unlikely to have negative consequences for any species. The energetic costs of avoidance behavior could be much higher for wind farms located near nesting sites, which the Danish projects are not, if the avoidance interferes with daily foraging trips, affecting breeding success.

Post-construction studies showed an almost complete absence of loons and scoters within the Horns Rev wind farm, and reductions in long-tailed duck densities within the Nysted wind farm. This suggests displacement of these birds from feeding areas, probably due to avoidance of the turbines rather than a decrease in food resources. A few species such as cormorants and gulls may have increased their use of the wind farm areas, mostly as resting ground.

Low collision rates of migrating birds with turbines were predicted by computer simulation. Comparing model predictions for common eider to observed levels from one of the turbines using an infra-red monitoring system, collision rates for this species' migration through the Danish wind farm areas appear to be very low. It should be noted, however, that the assessments from this study were primarily focused on waterbird behavior and collision, and potential effects on other kinds of migrating birds were not addressed. This study also made no attempt to quantify the effects of weather conditions, such as areas with fog, on potential collision rates.

The final study conducted on Nysted and Horns Rev looked at the attitudes of neighboring local populations and the national population towards offshore wind farms. Results suggested the national population was favorably inclined to offshore wind farms, with this sentiment represented in the local Horns Rev population. The Nysted population was more critical of offshore wind farms, suggesting there may be substantial differences in local attitudes. Results of the study clearly showed that people expressed a willingness to pay for future wind farms to be located at distances from the shore where their visual impact is reduced. Willingness to pay to place wind farms completely out of sight was limited, but the local population at Nysted had a higher willingness to pay for this than Horns Rev or the national population.

Conclusions reached from the Danish offshore wind farms, therefore, showed generally minimal environmental impacts over the long term at these sites, but enough differences between sites to recommend caution in generalizing too much from these limited studies. New benthic habitats were colonized fairly rapidly, without strong observed effects on the surrounding soft bottom communities. The effects of the offshore wind farms were neutral with regard to fish density, species composition and abundance, showing neither positive nor negative effects. Results from the study on the potential effects of EMFs were inconclusive. Marine mammals, in general, were affected during construction temporarily, but their use of wind farm areas recovered during the operation phase, with the exception of the porpoises at Nysted, which exhibited long-term avoidance of the area. Bird studies showed general avoidance of wind farm areas for migration in most species, as well as avoidance by some species that otherwise use the area as a feeding ground. Collision rates with turbines for a large diving duck, the common eider, during migration, were predicted and observed to be very low.

9.3 PHYSICAL RESOURCES MITIGATION

Various types of mitigation have been developed to minimize the impacts of the proposed action. This section describes this mitigation which includes state mitigation via MEPA and EFSB requirements, mitigation required in the FWS and NOAA biological opinions, mitigation via the USCG terms and conditions, and mitigation requirements from the MMS.

9.3.1 State Mitigation (MEPA)

The applicant has committed to mitigation as part of the MEPA process to address concerns of regulatory agencies and to minimize impacts on the environment. This mitigation is included in the MEPA FEIR Certificate (refer to the Certificate on the Final EIR in Appendix B) but the commitments are presented below using the language of the FEIR Certificate. This State mitigation is independent of any MMS mitigation proposed.

The MEPA certificate on the FEIR requires conservation measures as part of the MEPA process (see page 5 of the MEPA Certificate on Final EIR in Appendix B). Details are presented below.

9.3.1.1 Bird Island

The proponent would provide $780,000 towards the restoration of Bird Island, off the town of Marion in Buzzards Bay, with funds to be managed by the Department of Fish and Game, Natural Heritage and Endangered Species Program.

At 1.5 acres in size, Bird Island supports an average of 750 pairs of Roseate Terns, and is the second or third largest Roseate Tern colony in North America, supporting an average of 22 percent of the North American population. It is also the third largest Common Tern colony in Massachusetts, and supports an average of 1,900 pairs of Common Terns. Bird Island is conservation land owned by the Town of Marion and managed by the Harbormaster and Conservation Commission.

While Bird Island provides prime nesting habitat, the island is subject to significant and accelerating erosion. As a result, former Common Tern nesting areas adjacent to the seawall have turned into salt marsh, which is unsuitable for nesting. Common Terns have moved into interior nesting areas, forcing Roseate Terns out. The objective of the local, state, and federal partnership that is managing the restoration is to restore tern nesting habitat and protect the historic lighthouse by rebuilding the revetment to reduce erosion, fill eroded areas, and revegetate appropriate areas to provide suitable nesting habitat. Based on consultation with the Natural Heritage and Endangered Species Program, the enhancement of tern nesting habitat on Bird Island would directly benefit the same tern population that is subject to potential impacts from the WTG array. The project has a total cost of $3.775 million, the balance of which would be borne by the US Army Corps of Engineers, who is also providing planning, design, and construction services. If the proposed restoration project does not go forward, for whatever reason, the proponent shall coordinate with EOEA and state agencies and develop an alternative vehicle of equal value for offsetting avian impacts.

9.3.1.2 Natural Resource Preservation, Marine Habitat Restoration, and Coastal Recreation Enhancement Projects

The proponent would provide $4.22 million in annual payments prorated over the life of the project towards natural resource preservation, marine habitat restoration, and coastal recreation enhancement projects in the area of Cape Cod, Nantucket, and Martha's Vineyard, with funds to be managed by the Coastal Zone Management Office, in consultation with state agencies and the Cape Cod Commission.

Massachusetts Office of Coastal Zone management provided details of its recommendations for allocation of the compensatory mitigation and Massachusetts's portion of the lease revenue. MA CZM's consultation with other state agencies and the Cape Cod Commission is ongoing and the recommendations may still be amended due to these consultations or public comment, but the currently the recommended allocations consist of three programs summarized below (see EOEA letter of August 1, 2008 in Appendix B for details).

9.3.1.3 Avifauna Program

The Avifauna program, administered by the Department of Fish and Game's Natural Heritage and Endangered Species Program, has the goal of effective conservation of the roseate tern and piping plover and the habitat for these species. The program will include increased monitoring and protection of tern and piper populations, breeding sites, and post-breeding staging sites and migratory stopover areas. Threat to the roseate tern and piping plover by mammalian and avian predators will be assessed and

selected predators will be removed from nesting sites to increase reproductive success rate and adult survival.

9.3.1.4 Marine Fisheries Resources and Habitat Program

The intent of the Marine Fisheries Resources and Habitat Program, administered by Department of Fish and Game's Division of Marine Fisheries, is the protection of valuable fisheries resources that support the commercial and recreational fishing that are an integral part of Cape Cod and the Islands' socioeconomic and cultural fabric. Under the program, a comprehensive eelgrass monitoring plan to supplement MA DEP's eelgrass mapping and inventory activities will be developed. The dynamics of fish stocks that are not currently well understood will be investigated. The program calls for a five year study of the socioeconomic impact of the proposed action on the fishermen and fisheries of Nantucket Sound. The program will also allow for the implementation of a quahog management plan.

9.3.1.5 Grants Program

The Grants Program, administered by the Office of Coastal Zone Management, will provide grants for various projects that will include conservation efforts for the habitat of threatened and endangered species, restoration of tidal and sub-tidal habitats, and improvement to public access and public education. The Grants Program may also provided funding for research in areas such as ocean planning, fishing and fisheries, habitat mapping, and renewable energy.

9.3.1.6 Other Environmental Mitigation Proposed Under the MEPA FEIR Certificate

Other mitigation the applicant would be committed to under the MEPA FEIR certificate to avoid and minimize impacts to environmental resources are described in the following subsections.

9.3.1.6.1 Marine Resources

- Vessels transporting construction materials to the project site in Nantucket Sound would travel at slow speeds, usually at 10 knots or below.
- Potential vessel impacts (collisions and harassment) to marine mammals and sea turtles would be minimized by requiring that project vessels follow National Oceanic & Atmospheric Administration (NOAA) Fisheries Regional Viewing Guidelines -Northeast Region (NMFS and NOS, 2006) while in transit to and from the site so as not to disturb any individuals that may be in the area.
- The use of state-of-the-art hydraulic jet plow technology for cable installation to minimize sediment transport and suspended sediments.
- The use of monopile foundations for the WTGs.
- Implementing post-construction monitoring to document habitat disturbance and recovery. The applicant will undertake a seafloor habitat and benthic community monitoring program to measure impacts and the recovery of the benthic community levels comparable to control areas outside of the area of potential impact. A proposed plan, Seafloor Habitat/Benthic Community Monitoring, is for the area within the Massachusetts 3.5-mile (5.6 km) jurisdictional limit (3.5-mile [5.6 km] limit) and may need to be modified with a monitoring or adaptive management program for the area outside the Massachusetts 3-mile (5.6 km) jurisdictional limit.
- Potential impacts to marine mammals and sea turtles associated with underwater sound levels created by pile driving would be minimized by conducting a "soft-start" to each piling event.

- Underwater sound monitoring would be performed during initial monopile construction (the first three monopiles).
- A NMFS approved observer would be posted on-site during all pile driving activities to monitor the area during construction. If protected marine species are observed within the 500 m (1,640 ft) Safety Zone by the NMFS approved observer, the observer would ensure that work would cease until the animal is clear of the work area and safety zone.

9.3.1.6.2 Fisheries

- Utilization of a state-of-the-art hydraulic jet plow for cable installation, monopile foundations for WTG towers, HDD installation at the nearshore area, and post-construction monitoring to document habitat disturbance and recovery.
- The pile driving hammer and jet plow technology that would be used to install the monopile foundations and the submarine cables, respectively, were selected specifically for their ability to keep sediment disturbance to a minimum.
- The proponent has agreed to work with commercial/recreational fishing agencies and interests to ensure that the construction and operation of the project would minimize potential impacts to commercial and recreational fishing interests.
- Measures proposed to minimize or avoid potential impacts to the commercial fishing industry include: no restrictions on fishing activities within the site; marking the WTGs with USCG-approved lighting to ensure safe vessel operation; and burying the inner-array cables and two submarine cable circuits to a minimum of 6 ft (1.8 m) below the seabed to avoid the potential for conflicts with fishing vessels and gear operation.
- Notification of fishermen well in advance of mobilization as to the location and timeframe of project construction activities, as well as a daily broadcast on VHS marine channel 16 as to the construction activities for that and upcoming days.
- Cable burial depth would be inspected periodically during project operation to ensure adequate coverage is maintained so as not to interfere with fishing gear/activity or with the safe operation of the cable.
- To protect the earliest life stages of sensitive fish species such as winter flounder, the proponent has committed to avoid in-water construction in Lewis Bay between January 1 and May 31 of any year, except for the installation of the cofferdam for the HDD. This temporary cofferdam would be constructed in May and would include drive sheet piling, installation of a silt curtain and sheet piles. Most of the sediment should be contained by the silt curtain and sheet piles, thus avoiding impacts to fish and shellfish.

9.3.1.6.3 Benthic and Shellfish

- Utilizing state-of-the-art hydraulic jet plow for cable installation in order to minimize seabed disturbance and sediment dispersion during cable embedment.
- Utilizing monopile foundations for WTG towers which minimize the seabed footprint and sediment disturbance while also minimizing opportunities for benthic organism colonization or fish habitat creation.
- Post construction monitoring to document habitat disturbance and recovery.
- The use of mid-line buoys on anchor lines in order to minimize the impacts from anchor line sweep.

- The duration and sequencing of construction has been designed to minimize the period of disturbance.
- Impacts to benthos and benthic habitat in Lewis Bay within 200 ft (61 m) of shore would be minimized by using HDD methodology to transition the submarine cable system to the shore.
- The proponent has committed to working with the Town Shellfish Constable to appropriately avoid or minimize impacts to designated shellfish areas from installation of the submarine cable. The proponent would provide the Town of Yarmouth with funds to mitigate for the direct area of impact within the Town's designated recreational shellfish bed in accordance with the Town's mitigation policies.

9.3.1.6.4 Aquatic Vegetation

- The proponent would not anchor vessels or perform cable installation work in the area near Egg Island where eelgrass beds are located.
- A dive survey would be conducted to confirm the limits of the eelgrass bed near Egg Island (verifying the limits of submerged aquatic vegetation [SAV] previously surveyed in July 2003) prior to the commencement of cable installation in the same calendar year preceding construction, and divers would also be used to confirm correct placement of work vessel anchors.
- If during installation of the submarine cable the eelgrass beds are disturbed, the proponent has committed to replanting eelgrass.
- Pre and post-construction monitoring of the eelgrass bed would be performed and if it is determined that eelgrass has been lost as a result of project activities, replanting would occur.
- The proponent has committed to aerially photograph the entrance to Lewis Bay in the month of July immediately prior to jet-plowing, under conditions conducive to documenting the extent of eelgrass beds, to use the photographs in finalizing the exact location of jet-plowing, and to provide such photographs to the Energy Facilities Siting Board.
- The proponent would denote the edge of the eelgrass bed at the water surface with buoys near Egg Island. In addition, the proponent would implement a No Wake Zone for its construction vessels at a distance of 200 ft (61 m) from the edge of the eelgrass bed.
- An eelgrass survey would be performed for the two consecutive years following construction to document any changes in density and would be coordinated with the appropriate state and federal agencies.

9.3.1.6.5 Visual

- The proponent has removed daytime FAA lighting on the WTGs, formerly proposed in the DEIR.
- Potential nighttime visual impacts have been lessened by the reduction in FAA nighttime lighting (from the originally proposed 260 lights down to 57).
- Revisions to the layout have narrowed the breadth of the visual impact as seen from certain areas around the Sound.
- The WTGs would be an off-white color, to reduce contrast with the sea and sky.

- The upland transmission route would be located entirely below ground within paved roads and existing utility ROWs to avoid visual impacts and impacts to potential unidentified archaeological resources.
- If MMS determines there would be an adverse effect (due to visual impacts) MMS would direct a formal consultation process under the requirements of the NHPA, to develop measures to help mitigate these impacts on historic properties. (This process has already begun as part of the Section 106 consultations – Refer to discussion in Section 7).
- The proponent and MMS would continue to consult with MHC, the Wampanoag Tribe of Gay Head Aquinnah (WTGHA), the Mashpee Wampanoag and other consulting parties to address and resolve issues concerning potential visual effects of the project on historic properties.

9.3.1.6.6 Historical/Archaeological

- All submerged potentially archaeologically sensitive areas identified during marine archaeological investigations have been avoided, including relocation of eight WTGs and associated cable arrays.
- The interpreted limits of three submerged potential historic resources on the seafloor within the site would be extended by a 100 ft (30.5 m) perimeter that would constitute a no-activity buffer zone. Compliance would be overseen by an environmental inspector.
- In addition, Procedures Guiding the Unanticipated Discovery of Cultural Resources and Human Remains would be provided to construction contractors, outlining measures to be taken in the event that previously unidentified submerged and upland historic/archaeological resources are discovered during Project construction. Compliance with the procedures would be overseen by an environmental inspector.
- The proponent has reduced lighting on the WTGs and revised the layout such that the breadth of visual impact of the array as seen from certain areas is reduced. If the MMS determines that the offshore above water components of the project would result in adverse effects to certain onshore aboveground historic properties due to visual impacts, then the MMS would direct a formal consultation process under the National Historic Preservation Act (NHPA) to develop mitigation measures that would be detailed in a Programmatic Agreement.

9.3.1.6.7 Noise

- The proponent has selected state-of-the-art, very low noise wind turbines.
- Construction noise impacts would be temporary, unavoidable, and are primarily associated with the laying of the Onshore Transmission Line from the transition vault at the shore of Lewis Bay along existing roadways to the Barnstable Switching Station using standard roadway construction equipment. Noise mitigation for this onshore activity would consist of scheduling activities during normal working hours and ensuring that all equipment has properly functioning noise mufflers.
- Onshore construction activities (which include the HDD at the landfall), would be temporary, lasting 4 to 6 weeks, and would be audible to persons near the cable corridor. Sound levels would be similar to roadway construction equipment. Noise barrier walls would be constructed at the edge of the HDD pit to shield nearby residences at 32 and 49 New Hampshire Avenue.

9.3.1.6.8 Benthic Physical Environment

- Scour mats and or rock armoring (rip-rap) would be placed at the foundation of each WTG and each support pile of the ESP to minimize sediment scour.
- The use of state-of-the-art hydraulic jet plow for offshore cable embedment that minimizes sediment disturbance.
- Restoration of the dredged cofferdam area using originally dredged material supplemented with imported clean sandy backfill material if necessary to restore preconstruction contours.

9.3.1.6.9 Wetlands and Drainage Operations

- The proposed submarine and onshore transmission cable route would be designed to fully comply with all applicable local, state and federal wetland performance standards.
- Direct wetland impacts would be minimized through the use of hydraulic jet plowing, HDD, and installation of the upland transmission line within existing paved roadways or disturbed electric ROWs.
- The proponent has committed to coordinate with the Yarmouth and Barnstable Conservation Commissions, the DEP, and Natural Heritage Endangered Species Program (NHESP) to prevent impacts to state-listed species as part of the project.
- The project would use best management practices for sedimentation and erosion control and stormwater management.
- A pre-construction survey would be performed to document the occurrence of state-listed rare species along the NSTAR Electric ROW route. If a state-listed species is located within the proposed transmission line route, a Conservation Permit under Massachusetts Endangered Species Act (MESA) would be obtained and efforts would be made to eliminate, minimize, or mitigate for any potential impacts.
- Post-construction monitoring would document habitat disturbance and recovery.
- The upland transmission line system has been sited below grade within existing roadways and maintained ROW.
- Sediment and erosion controls would be installed prior to construction, and would be inspected and maintained throughout the construction activities.
- A Dewatering Plan would be prepared to address the procedures for handling of any water encountered during excavation.
- The transmission line would not contain any fluids, petroleums, oils, or lubricants.
- The project would not result in any direct discharge of untreated stormwater into wetlands and waterbodies. Once installed, the paved areas would be restored to preconstruction conditions and the NSTAR Electric ROW would be restored to pre-construction contours and revegetated using a suitable upland seed mixture. The existing stormwater collections and management systems for these roadways would remain intact.

9.3.1.6.10 Water Quality

- An Oil Spill Response Plan (OSRP) (Appendix D) would be in place and a Stormwater Pollution Prevention Plan (SWPPP) (Appendix C) and an Operation & Maintenance (O&M) Plan (ESS, 2007-Appendix 2.0-B) would be implemented during project

construction/decommissioning and operation to prevent potential impacts to water quality from spills and erosion/sedimentation.

- The proponent would work with the Yarmouth Shellfish Constable to mitigate for any short-term impacts to shel1fish productivity and would provide the Town with funds to mitigate for the direct area of impact.
- To minimize the release of bentonite drilling fluid into Lewis Bay during HDD, freshwater would be used as a drilling fluid to the extent practicable prior to the drill bit or the reamer emerging in the pre-excavation pit.
- Scour protection, in the form of scour control mats and/or rock armor, would be installed around monopiles and ESP piles in order to prevent scouring.

9.3.1.6.11 Construction

- Use of state-of-the-art low-impact hydraulic jet plow installation for the marine cables.
- Use of HDD cable installation techniques at the landfall to avoid impacts to the intertidal zone and shoreline in Lewis Bay.
- A temporary cofferdam would be used during construction to minimize sediment resuspension at the interface between the HDD conduit and submarine cable system.
- Use of hollow monopile foundations for WTG towers.
- Installation of scour protection mats and/or rock armor to reduce scour potential near the WTGs.
- Post-construction monitoring including regular visual inspection of inner array cable routes in areas of migrating sand waves, to ensure the cables remain properly buried.

9.3.1.6.12 Navigation and Transportation

- Direct communication would be established between Coast Guard Sector Southeastern New England command center personnel and the proponent's operation center (manned 24/7) in order to facilitate rapid remote WTG shut down, at the request of the USCG.
- The proponent would implement procedures outlined by the USCG to deconflict the areas around ongoing construction activities.
- The proponent has designed the WTG monopiles to withstand the forces of up to 6 inch (15 cm) thick ice floes impacting the monopile.
- The proponent has committed to initiate manual shutdown of WTG(s) experiencing icing conditions if conditions warrant such a shutdown.
- The proponent would use either Seabed Scour Control Mats or rock armor for scour protection to limit changes to bottom contours in the vicinity of the WTGs.
- The proponent would provide private aids-to-navigation (ATONs) (lights and sound signals) within the site to assist mariners.
- The proponent would mark each WTG with its alphanumeric designation to serve as a point of reference for mariners.
- The proponent would provide the USCG; other local, state, and federal agencies and commercial sailors with a plan showing the designations of each WTG.

- The proponent has committed to continue coordinating with the USCG and NOAA regarding inclusion of the project site on NOAA nautical charts covering the area.
- The proponent has committed to immediately shutting down all or a portion of the WTGs upon notification from the USCG.
- The proponent would work with the USCG to develop information that could be used to provide mariners to educate them regarding the potential effects of the WTGs on marine radar.
- The submarine cable system would be buried 6 feet below the present sea bottom. Installation of the upland cable system will occur outside of the height of the summer tourist season to minimize any vehicular disruption.
- Trenchless technologies would be used at major intersections and railroad crossings in order keep traffic disruptions to a minimum.
- Impacts to land-based transportation would be limited and temporary in nature. A Construction Traffic Management Plan would be prepared in consultation with local and state officials to ensure that safe access is maintained for vehicular traffic during onshore cable system installation, once the final route has been determined.

9.3.1.6.13 Telecommunication

- The potential does exist for interference to vessel mounted radar operating within or in close proximity to the proposed project site. The proponent would work with the USCG to develop information and training opportunities that could be provided to local mariners in order to raise awareness if interference does occur.

9.3.1.6.14 Details on Roseate Tern and Piping Plover Conservation Measures

In accordance with requirements in the Massachusetts Environmental Policy Act (MEPA) Certificate, issued by the State of Massachusetts (via MassWildlife) on March 29, 2007, a $10M fund was established to compensate for unavoidable impacts to affected wildlife and habitat. On March 20, 2008, the MassWildlife provided MMS with a listing of the roseate tern and piping plover projects that would be implemented through this state run fund. Details of these projects are described below:

- *Bird Island Restoration:* Under the Bird Island Restoration Project, funded in large part and carried out by the Army Corp of Engineers, approximately 2.2 acres of suitable roseate tern nesting habitat will be created or stabilized. This habitat restoration project will stabilize the shorefront and attenuate wave energy, provide new sand to renourish the eroded and scoured areas of the island, further protect the island from all but extreme storm waves and significantly reduce the rate of erosion. Ultimately, the project will create suitable nesting habitat for common tern thereby reducing the encroachment of this species into roseate tern nesting habitat. The restoration plan also provides mitigation for construction impacts to just over one-half acre of existing salt marsh resources on the island. The applicant, through the state administered fund, has committed to provide $780,000 toward the overall project cost.
- *Predator Management:* MassWildlife plans to assign portions of the fund for contracts with the USDA-Wildlife Services to assess mammalian and avian predators at a carefully selected subset of priority piping plover nesting sites and at the three island-nesting colonies of Roseate and Common Terns in Buzzards Bay and to remove selected predators from those sites during winter and spring in order to

improve plover and tern reproductive success and adult survival. Predator removal at priority plover nesting sites would likely benefit Least Terns as well. Predator removal work would be conducted pursuant to depredation permits issued by MassWildlife, and would occur only at sites where MassWildlife and USDA-Wildlife Services have secured permission from the landowner(s).

- *Population Monitoring, Site Protection, and Management (Breeding Season):* Funding would be used to sustain and augment current statewide efforts to monitor the abundance, distribution, and reproductive success of piping plovers and terns in Massachusetts and to protect the birds, their nests, unfledged chicks, and habitat from human recreational activities, dune-building and beach stabilization activities. Funding may be used to hire seasonal shorebird monitors directly through MassWildlife, or to contract with municipal or private conservation organizations (NGOs) to continue or augment current monitoring and protection activities as coordinated by MassWildlife and USFWS. Monitors will be expected to follow monitoring and management protocols as directed by MassWildlife, including reporting of abundance, reproductive success, and limiting factors using standard census forms; protection of nests, nesting habitat, and chick refuge areas with warning signs and string fencing; and protection of nests with wire predator exclosures. Priority locations where additional monitoring and protection for piping plovers is needed, and number of additional seasonal staff needed (in parentheses), are: Outer Cape (2), Upper Cape (1), Upper Cape / South Shore (1), Martha's Vineyard (1), Nantucket/Tuckernuck/Muskeget (1). Priority locations where additional tern monitoring and protection is needed, and number of additional seasonal staff needed (in parentheses), are: Buzzards Bay (1), Lower Cape (1).

- *Identification and Protection of Tern and Piping Plover Post-Breeding Staging and Migration Areas (e.g., Signage, Patrolling, Education):* Funding would be used to identify post-breeding staging and migratory stopover areas for terns and piping plovers, identify management needs, and then provide annual site management to protect the birds from human disturbance (purchase and install signage, patrol key staging sites, educate beach-goers, work with landowners and beach managers to reduce disturbance from dogs). An estimated four seasonal staff persons are needed to manage key sites statewide.

- *Coastal Waterbird Conservation Assistant:* Time dedicated to piping plover and tern conservation efforts by MassWildlife staff (now primarily the Senior Zoologist and Buzzards Bay Tern Restoration Coordinator) has actually declined over the past 6 years, at the same time that conservation needs have increased. Funding will be used to develop a new, year-round Costal Waterbird Conservation Assistant to oversee the scope and effectiveness of the statewide conservation efforts for piping plovers and terns.

9.3.2 State Mitigation (Massachusetts Energy Facility Siting Board)

In addition to the State mitigation required under MEPA, the Massachusetts Energy Facility Siting Board decision on the electric transmission cable has the following conditions related to mitigation.

- The applicant would not anchor vessels or perform cable installation work in the area near Egg Island where eelgrass beds are located.

- A dive survey would be conducted to confirm the limits of the eelgrass bed near Egg Island (verifying the limits of SAV previously surveyed in July 2003) prior to the

commencement of cable installation in the same calendar year preceding construction, and divers would also be used to confirm correct placement of work vessel anchors.

- If during installation of the submarine cable the eelgrass beds are disturbed, the applicant has committed to replanting eelgrass.
- The applicant has committed to aerially photograph the entrance to Lewis Bay in the month of July immediately prior to jet-plowing, under conditions conducive to documenting the extent of eelgrass beds, to use the photographs in finalizing the exact location of jet-plowing, and to provide such photographs to the EFSB.
- The applicant would denote the edge of the eelgrass bed at the water surface with buoys near Egg Island. In addition, the applicant would implement a No Wake Zone for its construction vessels at a distance of 200 ft (61 m) from the edge of the eelgrass bed.
- The scope of work to perform the dive survey at the eelgrass bed within Lewis Bay would be coordinated with the appropriate state and Federal agencies.
- Development of a BACI Plan for Eelgrass.
- Pre and post-construction monitoring of the eelgrass bed would be performed; if it is determined that eelgrass has been lost as a result of project activities, replanting would occur. The post-construction monitoring plan would be developed to document potential indirect impacts from cable embedment and subsequent habitat recovery. Habitat recovery would be considered successful, if it is found that SAV has migrated back to the site of disturbance. Should the habitat not recover naturally, the disturbance would be mitigated by replanting.
- An eelgrass survey would be performed, in the same timeframe as the pre-construction surveys, for the 2 consecutive years following construction to document the change in density.

9.3.3 Reasonable and Prudent Measures Required by NOAA and FWS

An outcome of the formal consultation under the ESA has been the issuance of Biological Opinions, containing reasonable and prudent measures.

9.3.3.1 NOAA

MMS initiated formal consultation under Section 7 of the ESA with NOAA Fisheries on May 20, 2008. NOAA Fisheries issued its Biological Opinion on November 13, 2008 (see Appendix J) which concluded that the proposed action would not jeopardize the continued existence of any threatened or endangered species. In particular, the NOAA Fisheries' Biological Opinion analyzed the proposed action construction activities and found that the hawksbill turtle and the sperm, blue and sei whales do not occur in the action area and needed no further analysis, yielding a determination that the proposed action will not affect these species. For the right, humpback and fin whales, NOAA Fisheries concluded that since "all effects to whales from the proposed project are likely to be insignificant or discountable, this action is not likely to adversely affect listed whales in the action area," and, therefore, is not likely to jeopardize the continued existence of these whale species. NOAA Fisheries concluded that the proposed action (e.g., pile driving noise, and potential for vessel strikes) may adversely affect but is not likely to jeopardize the continued existence of the loggerhead, Kemp's ridley, leatherback or green sea turtles. Lastly, because no critical habitat is designated in the action area, none will be affected by the proposed action.

The Reasonable and Prudent Measures designed to minimize impacts to sea turtles required by NOAA Fisheries are as follows:

- MMS must ensure that any endangered species monitors contracted by Cape Wind are approved by NMFS.
- During the conduct of pile driving activities related to turbine monopile and Electrical Service Platform (ESP) installation, the 750 meter exclusion zone must be monitored by a NMFS-approved endangered species monitor for at least 60 minutes prior to pile driving.
- During the conduct of the high resolution geophysical survey, the 500 meter exclusion zone must be monitored by a NMFS-approved endangered species monitor for at least 60 minutes prior to the survey.
- Acoustic measurement of the first pile being driven must be conducted to confirm the sound levels modeled by MMS and reported in the BA.
- Prior to decommissioning, MMS must provide to NMFS a complete plan for decommissioning activities.

In addition to these measures, the NOAA Fisheries BO contained specific terms and conditions for implementation of the reasonable and prudent measures, which can be found in the Appendix J BO.

9.3.3.2 FWS

MMS initiated formal consultation under Section 7 of the ESA with the FWS on May 20, 2008. The consultation ultimately covered the following endangered and threatened FWS trust species: (1) threatened Atlantic Coast piping plover (*Charadrius melodus*) population, (2) endangered northeastern population of the roseate tern (*Sterna dougallii dougallii*), and (3) threatened northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*). There is no habitat designated as critical pursuant to Section 4 of the ESA within the Horseshoe Shoal marine environment or elsewhere within the area of the proposed action for these species. Similarly, there are no species currently proposed for ESA listing as threatened or endangered that may be present in the area of the proposed action. Consultation with the FWS was completed on September 19, 2008, and the final BO was issued on November 21, 2008 by the FWS. See Appendix J.

The Reasonable and Prudent Measures designed to minimize impacts to the Atlantic Coast piping plover (*Charadrius melodus*) and the roseate tern (*Sterna dougallii dougallii*) are as follows:

1. Pre- and post-construction monitoring to assess the effects and incidental take of the Cape Wind Project.

   The MMS and CWA Monitoring Framework is a preliminary framework of methodologies for pre- and post-construction monitoring of the potential impacts of the Cape Wind Project on roseate terns and piping plovers. MMS, CWA and the Service will coordinate in the development of more detailed protocols to determine the extent of roseate tern and piping plover presence in the project area, the effects of the WTGs on roseate tern foraging and other use of Horseshoe Shoal and/or the level of incidental take as a result of the project.

2. Oil Spill Response Plan

   Although MMS requires an oil spill response plan in the event of a spill related to the Cape Wind Project, specific response measures shall be identified for roseate tern and

piping plover habitat in order to avoid or minimize take. Some adverse effects and possible take (primarily in the form of harm or harassment) may be unavoidable during an emergency response. These effects will be addressed in a post-spill emergency consultation as described in the BO.

3. Review of pre- and post-construction monitoring activities, perching deterrents and operational adjustments.

   The Service, MMS and CWA will review the efficiency and efficacy of pre- and postconstruction monitoring activities, and the implementation of perching deterrents to determine their effectiveness and/or make adjustments as needed, in order to continue or enhance avoidance and minimization of take.

4. Reporting requirements

   Post-construction monitoring may not be able to sufficiently document take of roseate terns and piping plovers resulting from collisions with WTGs or the ESP. Nevertheless, MMA and CWA must report roseate tern and piping plover injury or mortality associated with the Cape Wind Project to the Service within 24 hours.

In addition to these measures, the FWS BO contained specific terms and conditions for implementation of the reasonable and prudent measures, which can be found in the Appendix J BO.

9.3.4 USCG Conditions

The USCG has provided Terms and Conditions requiring that the design and construction of the proposed action shall not impede navigation and that the applicant shall ensure that maritime navigation safety is maintained. The Terms and Conditions require the WTGs and ESP to be marked with private aids to navigation such as clearly visible, unique, alpha-numeric identification characters, in accordance with guidelines set by the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA); and safety lines, mooring attachments and access ladders must be placed on each WTG and a plan for placement and design must be approved by the USCG. The Terms and Conditions also require the applicant to submit a research analysis before the start of construction, concerning whether or not the WTGs as designed would interfere with marine communication or navigation systems or produce any adverse impacts to navigational safety. In addition, the applicant is required under the Terms and Conditions to provide status reports to the USCG monthly throughout the construction activities, including information regarding the current status, any changes to the construction schedule, a description of any complaints received during construction, and copies of any correspondence between the applicant and federal, state, and local agencies. The full Terms and Conditions are provided in Appendix B.

In addition, as mentioned earlier in Section 5, the USCG 2008 Radar Impact Study (see Appendix M) identified sufficient radar interference caused by the WTGs that navigation safety within the wind turbine array was moderately impacted under certain conditions. To address these issues, the applicant in consultation with the USCG has proposed the mitigation measures described below to address navigation safety issues related to radar impacts.

A. *Aids-to-Navigation Measures:* the applicant will install Private Aids to Navigation (PATON) lighting and signals as proposed in Figure 4-17 of the Revised Navigation Risk Assessment dated November 16, 2006. Other ATON measures may be required

by the Coast Guard, after consultation with the Southeastern Massachusetts Port Safety and Security Forum, including but not limited to:

1. Day beacons
2. Signs/Signals/Lights at the perimeters of the wind farm
3. Sound signals

B. *Traffic Management Measures:* The applicant will adopt traffic management measures that may be prescribed by the Coast Guard, after consultation with the Southeastern Massachusetts Port Safety and Security Forum, including but not limited to:

1. Specially marked traffic lanes
2. Recommended vessel routes
3. Adoption of applicable specific navigation rules consistent with Collision Regulations (COLREGS) for vessel operations within the wind farm

C. *Operational Measures:* The applicant will establish a control center as required by the Coast Guard Terms and Conditions. The control center will include the following items sufficient to maintain Coast Guard-required monitoring capability:

1. Staffing
2. Equipment
3. Doctrine, to include Standard Operating Procedures (SOPs) and contingency plans consistent with local doctrine.

D. *Education Measures:* The applicant will work with the USCG, NOAA, the Southeastern Massachusetts Port Safety and Security Forum, and other appropriate entities to educate mariners on navigation safety issues related to the wind farm.

The USCG assessed potential impacts to marine radar from the proposed action and issued an Advanced Copy of Findings and Mitigation on December 30, 2008 (see Appendix M), presenting the USCG's assessment of mitigation requirements for the moderate impacts on navigation safety resulting from the WTG impacts on radar. The full presentation of mitigation measures can be found in Section 8 of the December 30th document. An underlying theme within the mitigation discussion is that an adaptive management approach needs to be followed, since there are user groups that may still need to be included in mitigation discussions, and until the proposed action is constructed and proposed mitigation implemented, effectiveness cannot be fully assessed. If proposed mitigation is found to be inadequate or insufficient, the USCG retains the ability to seek revised or additional mitigation measures to ensure that navigation safety is acceptable.

9.3.5 MMS Mitigation

9.3.5.1 Water Quality

MMS requires a draft O&M Plan that details standard operating and maintenance protocols to ensure proper operation of offshore facilities. The draft O&M Plan (ESS, 2007-Appendix 2.0-B) specifies operating guidelines, maintenance schedules, and materials approved for maintenance activities. The maintenance program would include preventive and emergency maintenance functions including shore-based predictive maintenance analysis of the WTGs and ESP. The applicant would be responsible for developing and implementing an OSRP (Appendix D) and a stormwater pollution prevention plan

(SWPPP) (Appendix C) covering all phases of the proposed action. The OSRP will cover all phases of the proposed action, and the SWPPP will cover on land components of the proposed action.

In the event of a release of oil to the ocean, the applicant's employees, its contractors, and its responders would refer to the OSRP to ensure that the appropriate spill response actions are taken in a timely manner to minimize impacts to sensitive receptors and the environment.

9.3.5.2 Emergency Response Plan

The applicant has prepared an Emergency Response Plan (ERP) (ESS, 2007-Appendix 2.0-D). The purpose of this ERP is to describe procedures to be followed by the applicant's personnel in responding to emergencies, including those involving releases of hazardous substances (see Section 5.2.2.1), fires, medical emergencies, severe weather, etc. Impacts to humans and the environment would be reduced through application of this plan. This facility would be subject to MMS and Occupational Safety and Health Administration (OSHA) regulations with respect to emergency response.

9.3.5.3 Electro Magnetic Fields

The proposed action design incorporates economically viable and prudent measures to reduce EMF. The use of three-conductor cables – rather than a flat arrangement of single conductor cables in separate trenches – minimizes the spacing between phases, which in turn, reduces the magnetic flux density. The cable is proposed to be buried at a depth of 6 ft (1.8 m) to reduce the magnetic flux density on the sea floor. Since all of the proposed transmission cables contain grounded metallic shields, no or minimal electric fields should exist beyond the cable itself.

9.3.5.4 Avifauna and Bats (ESA-listed and Non-Listed)

MMS, in cooperation with the applicant and the FWS, has developed a "Framework for the Avian and Bat Monitoring Plan for the Cape Wind Proposed Offshore Wind Facility" (see Appendix N) which identifies technology and methods for assessing impacts of the proposed action and then using monitoring results to drive changes in mitigation requirements and readjustments to monitoring as needed. The following information provides highlights of the main mitigation and monitoring requirements from this plan. The full plan can be viewed in Appendix N.

Pre-Construction (Post-Lease) Surveys

MMS will require that a minimum of one full year of data be collected, analyzed and reported to MMS prior to commencing construction activities, unless a change is agreed to in advance by MMS in consultation with the FWS. Data will be collected through the methods outlined below.

Radio Tracking

Twenty-five common terns, as surrogates for roseate terns, will be captured, tagged with radio transmitters, and located at least 12 times between July 1 and August 31 to determine their movements and proximity to Horseshoe Shoal during the staging period at Monomoy Island prior to fall migration in late August, and to determine if they pass over Horseshoe Shoal when leaving Monomoy Island in large numbers at the initiation of fall migration. Any radio tagging of Common Terns will require implementation by and approval from agencies such as United States Fish and Wildlife Service (USFWS) and Massachusetts Natural Heritage and Endangered Species Program (NHESP). The goal of a pre-construction telemetry study would be to assess tern movements in/around the project area. A pre-construction assessment would be compared with a post-construction assessment to evaluate any changes in tern use of the project area. Similarly, 25 semi-palmated plovers, as surrogates for the piping plover, would be tagged to determine their locations at least twice weekly in August. Telemetry tracking will occur from ground, boats, and aircraft and there would also be experimenting with up to three yagi

antennas with operators on the ground, in boats, and with an antenna attached to an aircraft. Data collected during the surveys could be analyzed using GIS and Ranges (www.anatrack.com), a software program specifically created to identify habitat use, home ranges, dispersal and other metrics related to species distribution.

Avian Acoustic Monitoring

An acoustic microphone(s) will be attached to the meteorological tower and data recorded automatically for later analysis from May through October and at least three days/month from November through April. Another microphone will be placed in/near the breeding area for roseate terns and piping plovers to verify the effectiveness of acoustic microphones for detection of these species and discrimination among tern species. Playbacks may also be used to test equipment effectiveness.

Anti-Perching Monitoring

Section 5.1 of the Biological Assessment prepared for the Cape Wind proposed (see Appendix G) action outlines the specific proposal by CWA for installation of anti-perching structures on the MET tower, ESP and wind turbines (post construction) and monitoring the effectiveness of these perch deterrents. Pre-construction, remotely operated video cameras or still photo camera with motion detectors would be used to collect observations on bird perching rates and the effectiveness of the proposed perching deterrents on the MET tower. The cameras would have motion-detecting capabilities so that observations are only recorded when they are triggered by a target passing within the field of view (See More Wildlife Systems, 2008). The cameras will also be fitted with anti-perching deterrents if necessary. If cameras fail to work, observers would monitor the effectiveness of anti-perching devices. Based on the results of this monitoring, MMS and CWA, in coordination with the FWS, would determine whether any changes in anti-perching structures would be required prior to construction.

The level of monitoring will be determined by the selection of the best available and economically feasible camera technology. If the camera cannot be downloaded remotely the camera will need to be actively managed to retrieve the data. The cameras will function for a length of time that provides sufficient data on anti-perching devices. Selection of the camera and level of monitoring effort will be determined by CWA and MMS in coordination with the FWS.

Bat Surveys

To develop a more thorough characterization of existing bat use of the project area, Cape Wind will deploy bat detection equipment on the MET tower from April to October. The proposed detection equipment includes an Anabat SD1 Bat Detector with built-in data storage and associated software. Further investigation will be needed to determine whether Anabat detectors will function as effectively with ambient ocean background noise. Multiple detectors may be set up on the MET tower at varying elevations to maximize the area surveyed. The detection equipment is used to identify bat species by detecting, recording and displaying bat ultrasonic echolocation calls (Titley Electronics, 2006). The detection equipment converts ultrasonic bat calls into a signal that is audible to humans. In addition, this audible signal is converted to a visual form through a sound analysis. Following the completion of a survey, these data are reviewed and analyzed to determine bat species.

If determined to be feasible, a long-term, passive monitoring station will be established on the MET tower for data collection. The station will include the Anabat SD1 Bat Detector unit, long-term power source such as a solar panel, and weather protection equipment. Unlike active monitoring, there will be no observer present on the tower to record visual observations, which for logistical reasons, is not feasible. The monitoring station will serve as a long-term data logger of bat activity in the area. The station would operate all night for an extended period of time which allows for a greater sampling effort

than active monitoring. The range at which a bat call is detected varies depending on a number of factors including air temperature, pressure, humidity and the bat call frequency. On land, calls of bats which pass within roughly 100 to 200 feet (30 to 60 meters) of the detector unit are recorded and stored for future analysis (Titley Electronics, 2006). The effective detection range of the detector on the ocean will be determined based on further consultation with Titley Electronics. The use of bat detectors will permit the collection of a continuous set of data which can be used to gain insights into the temporal aspects of bat occurrence within the project area monopile platforms.

Post-Construction Surveys

The following monitoring techniques, which employ recent technology, will be implemented for the purpose of documenting movements and locations of avian and bat species, especially the roseate tern and piping plover, around and over Nantucket Sound. MMS will require that a minimum of four full years of data be collected, analyzed and reported to MMS subsequent to commencement of construction activities, unless a change is agreed to in advance by MMS in consultation with the FWS. At least three years of that monitoring must be after construction is complete and the facility is operating. According to the reporting structure provided in the MMS BA, MMS will regularly evaluate the results of the monitoring in coordination with the FWS and make adjustments to the monitoring plan where appropriate and needed.

Anti-Perching Monitoring

Each WTG and the ESP will be equipped with an avian deterrent system to discourage terns and other avian species from perching on the railings and deck areas. Based on the effectiveness of using cameras on the met tower during pre-construction, cameras may be used on some turbines to monitor the effectiveness of the anti-perching devices. Video cameras would be set up on up to six turbine monopoles selected from throughout the wind farm (one at each corner, and two internal turbines) to monitor the effectiveness of the existing perching deterrents. Any changes to the perching deterrent system in use will be made based on the results of the video monitoring.

On the ESP, a camera would be installed so that the structure could be remotely viewed from the Cape Wind Control Station. The structure would be observed first thing every morning and for five minutes at the top of each hour when the Control Station is manned during daylight hours (up to one year). Results of monitoring the ESP and turbine deterrent systems will be reported initially to MMS in bimonthly reports during the first year of project operation. Frequency of reporting will then change to annual cycle unless MMS determines data indicate a need for more frequent reporting.

If perching remains an issue based on the monitoring, Cape Wind will screen and evaluate additional anti-perching/roosting devices and mechanisms for potential use on both the WTG and the ESP. For each device or mechanism that advances through the screening process, Cape Wind will provide a visual detailing of the proposal and a narrative describing its expected action. To enable efficient testing, these devices may be tested in an appropriate environment where terns are more consistently present.

In addition to monitoring for tern presence in the project area, field biologists will also monitor for avoidance or attraction behaviors at the ESP and select WTGs. Avoidance or attraction behaviors of terns will be made from a vantage point on the ESP. Cape Wind will deploy field biologists during the breeding season from mid-May to late July and the staging season from mid-August to late September to observe tern behavior around the ESP and adjacent WTGs. Observers will collect 32 hours of observations (staggered during day light hours) in field journals and photo document birds where possible. Observers will monitor tern behavior for avoidance or attraction to the WTGs or ESP for two years.

Abundance and Spatial Distribution Surveys

Cape Wind will conduct aerial surveys using the same methodology employed during the studies conducted for the DEIR and FEIR to document avian species abundance, and spatial distribution within the project area and Nantucket Sound. This will allow comparisons with pre-construction data to see if/how bird use of the area has changed due to the presence of the wind energy facility. Flight paths during the tern breeding and staging period will shift to include a transect near Monomoy Island. Cape Wind will fly five aerial surveys from May to late July (tern breeding period), four aerial surveys during the tern fall staging period from mid-August to late September, and ten surveys during the winter (mid October to mid-April) to monitor sea ducks and waterbirds.

Cape Wind will fly surveys at an altitude of 250 ft (76 m), which was chosen as the lowest possible altitude in order to observe individuals clearly down to sea level with minimal disturbance to bird behavior. The surveys will be flown in a floatplane (or equivalent) which will maintain an air speed of approximately 90 knots, or the slowest speed the aircraft can safely fly. The 76-meter altitude corresponds approximately to the rotor hub height 257.5 ft (78.5 m) of the proposed wind turbines. The flight lines will be slightly adjusted from pre-construction flight paths so that they are in between turbine strings.

Birds will be counted and identified along 16 transects spaced approximately 7,500 ft (2,286 meters) apart. Surveys will be flown at different times of the day, at different tides, and in somewhat varying weather conditions, but only when visibility is either good or excellent to ensure that birds can be seen. No observations will be made when sea states are greater than three to ensure birds on the water can be seen. Flights will not take place during inclement weather when the safety of the pilot and survey crew would be compromised.

The survey team will consist of the pilot, a data recorder, and two observers. The pilot will maintain the plane on transect, at the correct altitude and speed, and at the proper wing level attitude. Two observers will be seated on either side of the plane. An aluminum rod will be attached perpendicular to the wing strut on each side of the plane to delineate the transect boundaries. A clinometer will be used to measure the calculated angle for the placement of these aluminum rods. The distances between the plane's float and the aluminum rods will be initially verified by flying over the airport at 250 ft (76 m) using pre-measured 656 ft (200 m) markers on the ground. The area visible between the float on the plane and the aluminum rod will provide each observer with a 656 ft (200 m) transect width within which all birds shall be counted. The observers will not be able to see the area directly below the airplane.

The data recorder and observers will maintain direct communication using aviation headsets. The observers will identify species, number of species, activity of bird (i.e., foraging or flying), and time of sighting. The data recorder will be responsible for entering the data identified by the observers and record a Global Positioning System (GPS) point of the location at the beginning and end of each transect in addition to a GPS point every minute during each transect. Each observer's sightings shall be independently recorded on an audiotape linked directly to each headset.

Results of the surveys will be transferred to a geographic information systems map to show abundance and spatial distribution of key bird species during specific times of year (tern breeding season, tern fall staging, winter sea ducks, and winter waterbirds). Sea duck species include Common Eider, Long-tailed Duck, Surf Scoter, Black Scoter, and White-winged Scoter. Winter waterbird species include loon, grebe, Northern Gannet, American Black Duck, American Goldeneye, mergansers, Alcids, Dovekie, and Razorbill. The results of the post construction monitoring will be compared with pre-construction aerial surveys.

Avian Acoustic Monitoring

Acoustic microphones will be placed on 10 monopiles or the ESP, one on each of the 4 corners of the project, one in the approximate middle of the western and northern sides, and 4 placed at random in the interior of the project array. These will record flight calls of birds over/near the project 24/7 from May through October and during three 24-hour intervals per month from November through April, weather permitting, to determine bird presence/absence in the airspace in/around the proposed project site.

Telemetry Surveys

If the first year radio tracking of common terns and semipalmated plovers proves to be effective and safe for the birds, then radio transmitters will be attached each year to 25 adult roseate terns and 25 adult piping plovers exactly as described for pre-construction radio tracking of common terns and semipalmated plovers and as approved in any permits from the FWS and other regulatory agencies. CWA will also test the effectiveness of using the turbines and/or ESP as receiving stations. Attempts will be made to locate tagged birds at least 12 times between July 1 and August 31. One consideration in the selection of test subjects is the geographic source of the population. For example, plovers captured around Nantucket Sound may not be as vulnerable to collision with turbines as plovers which nested farther north and are migrating down the Atlantic Coast. Such plovers conceivably could be less familiar with the area and with wind turbines and could during migration be further offshore.

Monitoring Collision — Thermal Animal Detection Systems (TADS)

CWA will install a Thermal Animal Detection System (TADS) or similar system. Thermal imaging cameras will be positioned near the base of the wind turbine monopole. The camera model, lens type and set-up will be refined after further consultation with experts. The cameras and weather-proof housing will be mounted on pan/tilt heads which will enable a change in field of view. To reduce impacts of vibration from the turbine operation on the camera, rubber vibration absorbers will be placed between the housing and the base plate of the mount and between the mounting and the turbine. The number of cameras and the orientation necessary to monitor the turbine will be designed depending on the system used. In addition, the nacelles proposed for the Cape Wind project, to which the rotor and blades are attached, can rotate 360 degrees. Movement of the nacelles will then need to be considered in the design of the monitoring for optimized viewing of the rotor swept zone.

It is anticipated that each thermal imaging camera would be connected to a data logging device at the turbine. To limit data collection to just those times when a target passes within the camera's field of view, the computers would be loaded with thermal trigger software with operator defined settings. Typically, video sequences from the thermal camera would be downloaded and stored on the data logger when at least one pixel in the field of view exceeds the operator-defined threshold temperature. The threshold would be tested and adjusted to help to eliminate non-avian targets.

Reporting

Cape Wind will submit a monitoring report at the end of construction and then annually by December 15 that contains the following information.

- A summary of results from the previous year's studies, including information that specifically addresses the research objectives outlined in this ABMP and an evaluation of the effectiveness of these monitoring techniques in achieving these objectives.

- Details of research plans and objectives for the coming year and how these will logically advance the research objectives outlined in this ABMP as well as address any refinements needed to increase effectiveness of techniques for the coming year.

For the first year of operation of the project, MMS will require bimonthly reports on the results of the anti-perching monitoring when listed avian species are potentially present in the action area (April-October). Frequency of monitoring for the second year will depend on the level of perching that was detected in the first year and will be determined by MMS in coordination with the FWS.

In addition, all collisions (with vessels, aircraft, turbines or structures) involving bird and bat species listed under federal or state endangered species laws, will be documented and reported within 24 hours to MMS (Jill Lewandowski, 703-787-1703) and FWS (Michael Amaral, 603-223-2541). With respect to state-only listed species, the applicant will be required to notify an appropriate contact (to be determined) at the Massachusetts Division of Fisheries and Wildlife. For these species, and to the extent necessary, the responsible agencies will coordinate with their respective law enforcement offices to arrange for the proper chain of custody, handling and disposition of any injured or dead specimens. Fatalities of non-listed species would be reported at least annually to MMS and the FWS, or as otherwise stipulated or conditioned by any subsequently issued salvage, collection or scientific permits. In addition to any information that may be required under other permits, minimum data collection includes standard data collected during bird and bat fatality studies at wind plants including: name of person who found carcass or witnessed incident, species, date/time, location, weather, identification of the vessel, aircraft, turbine (turbine number), or structure involved and its operational status when the strike occurred, and known or suspected cause of death (if possible) and status of carcass (complete, incomplete, scavenged, time since death [approximate], etc.). Bird/carcass photographs should also be provided when necessary to document species identification or other relevant attributes. Carcasses of non-listed species shall be retained (for examination and documentation) in a freezer in zip-lock or similar bags with the above listed information included on non-degradable paper. For any banded or marked birds, record the presence and nature of the band (number on band should be recorded) or marking and include in reports. In addition for Federal or research bands and marking, information (band or other identification number) must be reported to the USGS Bird Banding Laboratory
(see http://www.pwrc.usgs.gov/BBL/homepage/call800.htm).

Finally, all raw data will be stored according to accepted archiving practices. In addition, all reports submitted to MMS and the FWS will be made publicly available.

9.3.5.5 Subtidal Offshore Resources

The applicant has proposed the use of midline buoys on anchor cables to reduce the amount of area that would be impacted by anchor cable sweep; and use of a cofferdam when constructing the HDD to minimize the dispersal of disturbed sediments and any released drilling fluid. A drilling fluid fracture or overburden breakout monitoring program would be part of the overall HHD operation in Lewis Bay. This monitoring program would serve to minimize the potential for significant impacts associated with a drilling fluid breakout in Lewis Bay since a breakout would be detected and measures taken to minimize the release of drilling fluid.

9.3.5.6 Marine Mammals and Sea Turtles

This section outlines the specific mitigation, monitoring and reporting measures built into the proposed action, as part of MMS or other federal or state required conservation measures, to minimize or eliminate potential impacts to ESA-listed as well as non-ESA species of marine mammals and sea turtles.

These measures are divided into the five sections: (1) those required during all phases of the project; (2) those required during pre-construction site assessment: (3) those required during construction; (4) those required during operation/maintenance; and (5) those required during decommissioning.

Requirements for All Phases of Project

The following specific measures are meant to reduce the potential for vessel harassments or collisions with listed whales or sea turtles during all phases of the project:

- All vessels and aircraft associated with the construction, operation/maintenance and/or decommissioning of the project will be required to abide by the: (1) NOAA Fisheries Northeast Regional Viewing Guidelines, as updated through the life of the project (http://www.nmfs.noaa.gov/pr/pdfs/education/viewing_northeast.pdf); and (2) MMS Gulf of Mexico Region's Notice to Lessee (NTL) No. 2007-G04 (http://www.gomr.mms.gov/homepg/regulate/regs/ntls/2007NTLs/07-g04.pdf).

- All vessel and aircraft operators must undergo training to ensure they are familiar with the above requirements. These training requirements must be written into any contractor agreements.

- 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 MMS Gulf of Mexico Region's NTL No. 2007-G03 (http://www.gomr.mms.gov/homepg/regulate/regs/ntls/2007NTLs/07-g03.pdf). MMS will not require the applicant to undergo formal training or post placards, as described under this NTL. The applicant will be required to 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.

Requirements during Pre-Construction Site Assessment Geophysical Surveys

The following mitigation, monitoring and reporting requirements will be implemented during the conduct of all high-resolution seismic surveying work proposed by the applicant. Additional detail on how these measures will be implemented is described in the MMS Gulf of Mexico (GOM) Notice to Lessee (NTL) No. 2007-G02 (see http://www.gomr.mms.gov/homepg/regulate/regs/ntls/2007NTLs/07-g02.pdf). Although this NTL focuses on seismic surveying with air guns in the GOM, the methodologies described in the NTL for exclusion zone monitoring, ramp up and shut down are the same as those that will be required under this proposed action.

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

- *Visual Monitoring of Exclusion Zone*: The exclusion zone around the seismic survey source vessel must be monitored for the presence of listed whales or sea turtles before, during and after any pile driving activity. The exclusion zone will be monitored for 30 minutes prior to the ramp up (if applicable) of the seismic survey sound source. If the exclusion zone is obscured by fog or poor lighting conditions, surveying will not be initiated until the entire exclusion zone is visible for the 30

minute period. If listed whales or sea turtles are observed within the zone during the 30 minute period and before the ramp up begins, surveying will be delayed until they move out of the area and until at least an additional 30 minutes have passed without a listed whale or sea turtle sighting. Monitoring of the zone will continue for 30 minutes following completion of the seismic surveying. Monitoring of the zones will be conducted by one 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 observer collection data. This will 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 significant observations concerning impacts on listed whales or sea turtles will be transmitted to NMFS and MMS within 48 hours. Any observed takes of listed whales or sea turtles resulting in injury or mortality will be immediately reported to NMFS and MMS.

- *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 by allowing them 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).

- *Shut Down*: Continuous (day and night) seismic survey operations will be allowed. However, if a listed whale 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 will only be allowed following clearance of the exclusion zone and the implementation of ramp up procedures (if applicable).

- *Compliance with Equipment Noise Standards*: All seismic surveying equipment will comply as much as possible with applicable equipment noise standards of the U.S.

- *Reporting for Seismic Surveys Activities*: The following reports must be submitted during the conduct of seismic surveys: (1) A report will be provided to MMS 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 whales and sea turtles that may have been taken as a result of seismic survey activities. The report will include information, such as: dates and locations of operations, details of listed whale or sea turtle sightings (dates, times, locations, activities, associated seismic activities), and estimates of the amount and nature of listed whale or sea turtle takings; and (2) Any observed injury or mortality to a listed whale or sea turtle must be reported to NMFS and MMS within 24 hours of observation. Any significant observations concerning impacts on listed whales or sea turtles will be transmitted to NMFS and MMS within 48 hours.

Requirements during Construction

MMS has included the following specific measures as part of the proposed action and are meant to reduce or eliminate the potential for adverse impacts on listed whales or sea turtles during the construction phase of the project:

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

- *Requirements for Pile Driving*: The following measures will be implemented during the conduct of pile driving activities related to turbine monopile and Electrical Service Platform (ESP) installation:

  - Establishment of Exclusion Zone: A preliminary 2,461 ft (750 m) radius exclusion zone for listed whales and sea turtles will be established around each pile driving site in order to reduce the potential for serious injury or mortality of these species. Once pile driving begins, the actual generated sound levels will be measured (see requirements below for *Field Verification of Zone*) and a new exclusion zone will be established based on the results of these field-verified measurements. This new exclusion zone will be based on the field inputs calculating the actual distance from the pile driving source where underwater sound levels are anticipated to equal or exceed 180 dB re 1 microPa rms (impulse). Based on the outcome of the field-verified sound levels and the calculated or measured distances as noted above, the applicant can either: (1) retain the 750 m zone or (2) establish a new zone based on field-verified measurements demonstrating the distance from the pile driving source where underwater SPLs are anticipated to equal or exceed the received the 180 dB re 1 microPa rms (impulse). Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration), include an additional 'buffer' area extending out of the 180 dB zone and be approved by MMS and NMFS before implementing. Once approved, this zone will be used for all subsequent pile driving and will be periodically re-evaluated based on the regular sound monitoring described in the *Field Verification of Exclusion Zone* section described below.

  - Field Verification of Exclusion Zone: Field verification of the exclusion zone will take during pile driving of the first three piles. The results of the measurements from the first three piles can then be used to establish a new exclusion zone which is greater than or less than the 2460 ft (750 m) depending on the results of the field tests. Acoustic measurements will take place during the driving of the last half (deepest pile segment) for any given open-water pile. One reference location will be established at a distance of 328 ft (100 m) from the pile driving. Sound measurements will be taken at the reference location at two depths (a depth near the mid-water column and a depth near the bottom of the water column but at least 3 ft [1 m] above the bottom) during the driving of the

last half (deepest pile segment) for any given pile. Two additional in-water spot measurements will be conducted at appropriate depths (near mid water column), generally 1,640 ft (500 m) and 2,461 ft (750 m) in two directions either west, east, south or north of the pile driving site. These will be conducted at the same two depths as the reference location measurements. In cases where such measurements cannot be obtained due to obstruction by land mass, structures or navigational hazards, measurements will be conducted at alternate spot measurement locations. Measurements will be made at other locations either nearer or farther as necessary to establish the approximate distance for the zones. Each measuring system shall consist of a hydrophone with an appropriate signal conditioning connected to a sound level meter and an instrument grade digital audiotape recorder (DAT). Overall SPLs shall be measured and reported in the field in dB re 1 micro-Pa rms (impulse). An infrared range finder will be used to determine distance from the monitoring location to the pile. The recorded data will be analyzed to determine the amplitude, time history and frequency content of the impulse.

- Visual Monitoring of Exclusion Zone: Visual monitoring of the exclusion zone will be conducted during driving of all piles. Monitoring of the zones will be conducted by one qualified NMFS approved observer. Multiple monitors will be required if pile driving is occurring at multiple locations at the same time. Observer(s) will begin monitoring at least 30 minutes prior to soft start of the pile driving. Pile driving will not begin until the zone is clear of all listed whales and sea turtles for at least 60 minutes. Monitoring will continue through the pile driving period and end approximately 30 minutes after pile driving is completed. 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 observer collection data. This will 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 significant observations concerning impacts on listed whales or sea turtles will be transmitted to NMFS and MMS within 48 hours. Any observed takes of listed whales or sea turtles resulting in injury or mortality will be immediately reported to NMFS and MMS.

- Required Mitigation Should Listed Whales or Sea Turtles Enter the Exclusion Zone: The exclusion zone around the pile driving activity must be monitored for the presence of listed whales or sea turtles before, during and after any pile driving activity. The exclusion zone will be monitored for 60 minutes prior to the soft start of pile driving. If the safety radius is obscured by fog or poor lighting conditions, pile driving will not be initiated until the entire safety radius is visible for the 60 minute period. If listed whales or sea turtles are observed within the zone during the 60 minute period and before the soft start begins, pile driving of the segment will be delayed until they move out of the area and until at least an additional 30 minutes have passed without a listed whale or sea turtle sighting. Monitoring of the zone will continue for 30 minutes following completion of the pile driving activity. MMS recognizes that once the pile driving of a segment begins it cannot be stopped until that segment has reached its predetermined depth due to the nature of the sediments underlying the Sound. If pile driving stops and then resumes, it would potentially have to occur for a

longer time and at increased energy levels. In sum, this would simply amplify impacts to listed whales and sea turtles, as they would endure potentially higher SPLs for longer periods of time. Pile segment lengths and wall thickness have been specially designed so that when work is stopped between segments (but not during a single segment), the pile tip is never resting in highly resistant sediment layers. Therefore, because of this operational situation, if listed whales or sea turtles enter the zone after pile driving of a segment has begun, pile driving will continue and observers will monitor and record listed whale and sea turtle numbers and behavior. However, if pile driving of a segment ceases for 30 minutes or more and a listed whale 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 authorized individual) that an additional 30 minute visual and acoustic observation period will be completed, as described above, before restarting pile driving activities. In addition, pile driving may not be started during night hours or when the safety radius can not be adequately monitored (i.e., obscured by fog, inclement weather, poor lighting conditions) unless the applicant implements an alternative monitoring method that is agreed to by MMS 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.

- Implementation of Soft Start: A "soft start" will be required at the beginning of each pile installation in order to provide additional protection to listed whales 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 whales or sea turtles are sighted within the exclusion zone prior to pile driving, or during the soft start, the Resident Engineer (or other authorized individual) will delay pile-driving until the animal has moved outside the exclusion zone.

- Compliance with Equipment Noise Standards: All construction equipment will comply as much as possible with applicable equipment noise standards of the U.S. Environmental Protection Agency, and all construction equipment will have noise control devices no less effective than those provided on the original equipment.

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

  - Prior to any re-establishment of the exclusion zone, a report must be provided to MMS and NMFS detailing the field verification measurements and proposal for the new exclusion zone. This includes information, such as: a fuller account of the levels, durations, and spectral characteristics of the impact and vibratory pile driving sounds; and the peak, rms, and energy levels of the sound pulses and their durations as a function of distance, water depth, and tidal cycle. Any new zone may not be implemented until MMS and NMFS have reviewed and approved any changes.

- Weekly status reports will be provided to MMS and NMFS that include a summary of the previous week's monitoring activities and an estimate of the number of listed whales and sea turtles that may have been taken as a result of pile driving activities. These reports will include information, such as: dates and locations of construction operations, details of listed whale or sea turtle sightings (dates, times, locations, activities, associated construction activities), and estimates of the amount and nature of listed whale or sea turtle takings. NMFS and MMS may reduce or increase the frequency of this reporting throughout the time period of pile driving activities dependent upon the outcome of these initial weekly reports.

- Any observed injury or mortality to a listed whale or sea turtle must be reported to NMFS and MMS within 24 hours of observation. Any significant observations concerning impacts on listed whales or sea turtles will be transmitted to NMFS and MMS within 48 hours.

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

- *Requirements for Cable Laying*: The following measures will be implemented during the conduct of cable laying activities:

  - The applicant must contact NMFS and MMS within 24-hours of the commencement of jet plowing activities and again within 24-hours of the completion of the activity.

  - All interactions with listed whales or sea turtles during cable laying activities must be reported to NMFS and MMS within 24 hours.

  - A final report must be submitted to NMFS and MMS within 60 days of completing cable laying activities which summarizes the results and any takes of listed species.

Requirements during Operation/Maintenance

Nedwell et al. (In press) measured and assessed the underwater noise and potential impacts to marine life during the construction and operations/maintenance phases of four offshore wind parks located in U.K. waters. For the operations/maintenance phase, they concluded that in general the level of underwater noise from the operation of a wind facility was very low and not above ambient levels even in close proximity to the turbines. Therefore, the underwater noise from the operation of offshore wind farms was unlikely to result in any behavioral response for the marine mammals and fish assessed in this study.

Given these results, the main mitigation required for the operations/maintenance phase of the proposed project will include the vessel and aircraft measures outlined previously. A yearly status report will also be provided to MMS that includes a summary of the year's operation and maintenance activities. In addition, any observed injury or mortality to a listed whale or sea turtle must be reported to NMFS and

MMS within 24 hours of observation. Any significant observations concerning impacts on listed whales or sea turtles will be transmitted to NMFS and MMS within 48 hours.

Requirements during Decommissioning

The applicant would be required to remove all project components once operations have ceased and must provide a financial instrument or other assurances which secure this obligation. As discussed in Section 2.5 the applicant is required to submit a decommissioning plan to MMS for approval which satisfactorily demonstrates the removal and recycling of equipment and associated materials thereby returning the area to pre-existing conditions. MMS will consult with NOAA Fisheries prior to approval of this plan to ensure the plan's components are covered under any ESA biological opinion issued on this project and that any additional mitigation and monitoring measures are identified and implemented.

Authorization under the Marine Mammal Protection Act

The applicant has informed MMS that it intends to seek authorization from NOAA Fisheries under the Marine Mammal Protection Act (MMPA). Therefore, MMS will require that the MMPA authorization be completed and a copy provided to MMS before activities are allowed to commence under any MMS issued lease or other authority that may result in the taking of marine mammals. This also includes any amended ESA incidental take statement, if issued, to include marine mammals. Any measures contained within any MMPA authorization, if issued, that are more conservative than those measures built into this proposed action will take precedence.

9.3.5.7 Port Facilities

The applicant has proposed mitigation measures specific to navigation including the notification of registered fishermen regarding the timeframe and location of construction activities in advance of mobilization; and daily broadcasted updates providing information on marine channel 16 to provide current information on construction activities as well as information for following days; the lighting of monopoles and construction vessels; and the spacing and placement of monopoles to allow for safe navigation. Since jurisdiction over navigation and port safety as well as rules and regulations for navigation of vessels in U.S. waters lies with the USCG, ultimate decisions about the adequacy of these measures, the ability to implement them, or the requirement for different procedures or design features lies with the USCG, not MMS. Refer also to USCG Terms and Conditions in Appendix B.

9.3.5.8 Communications: Electromagnetic Fields, Signals and Beacons

The applicant proposes the following mitigation to minimize impacts to communications: construction crews would be required to avoid the frequencies listed in Table 5.3.4-1. VHF radios used for construction should be tested for output to ensure that they are not inadvertently tuned to any of these frequencies, and to ensure that they have no spurious emission within +/-50 KHz.

As a precaution, watercraft would be advised by the applicant or its contractors to respect a two-wavelength distance from the cranes at the lowest frequency of interest, which would be approximately 4,000 ft (1,219.5 m) on 500 KHz.