OCS EIS/EA
BOEM 2013-1131

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

Revised Environmental Assessment

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

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FINDING OF NO SIGNIFICANT IMPACT

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

INTRODUCTION

The United States Department of the Interior (USDOI), Bureau of Ocean Energy Management (BOEM) prepared an environmental assessment (EA) to determine whether issuance of leases and approval of site assessment plans (SAPs) within an area identified offshore Rhode Island and Massachusetts would have a significant effect on the environment and whether an environmental impact statement (EIS) must be prepared. BOEM conducted its analysis to comply with the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) §§ 4321-4370f, the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) 1501.3(b) and 1508.9, USDOI regulations implementing NEPA at 43 CFR 46, and USDOI Manual (DM) Chapter 15 (516 DM 15).

BOEM conducted its environmental analysis after the identification of an area potentially suitable for commercial wind development, called a Wind Energy Area (WEA), was completed. BOEM identified the WEA through input from the BOEM-lead joint Rhode Island/Massachusetts Intergovernmental Task Force (Task Force), comments on the Notice of Intent to Prepare an Environmental Assessment (76 *Federal Register* [FR] 51391), comments on the Call for Information and Nominations for Commercial Leasing for Wind Power on the Outer Continental Shelf (OCS) Offshore Rhode Island and Massachusetts (76 FR 51383), and input received during public outreach efforts. The environmental analysis was limited to the effects of lease issuance, site characterization activities (i.e., surveys of the lease area and potential cable routes), and site assessment activities (i.e., construction and operation of meteorological towers and/or buoys on the leases to be issued) within the WEA offshore of Rhode Island and Massachusetts (referred to herein as the Rhode Island and Massachusetts WEA).

On July 2, 2012, BOEM published a Notice of Availability for the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts Environmental Assessment* (2012 EA) (77 FR 39508) for a 30-day comment period. Public information meetings were held in Rhode Island and Massachusetts on July 16 and 17, 2012, to provide stakeholders an additional opportunity to offer comments on the 2012 EA. To address comments received during the public comment period, public information meetings, stakeholder outreach, required consultations, and the Task Force meetings, BOEM has revised the 2012 EA. The revised EA includes a summary of the comments and questions received (see Section 5.1.4). This finding of no significant impact is accompanied by the revised EA and sections and figures in the EA are cited herein.

PURPOSE AND NEED

The purpose of the proposed action is to issue leases and approve SAPs in the previously identified Rhode Island and Massachusetts WEA (Figure 1-1). The need is to adequately assess wind and environmental resources of the WEA to determine the suitability of all or portions of the WEA for commercial-scale wind energy production.

DESCRIPTION OF THE PROPOSED ACTION

The proposed action that is the subject of the revised EA is the issuance of wind energy leases covering the entirety of the Rhode Island and Massachusetts WEA and the approval of site assessment activities within those lease blocks. During the identification phase (Area Identification [Area ID]) of the WEA, BOEM identified Alternative A as the proposed action. Alternative A analyzes issuing leases in the largest geographic area (i.e., the entire WEA). BOEM has identified Alternative A as the proposed action and the preferred alternative. In addition to the proposed action, BOEM considered five other alternatives, including no action (see Sections 2.1 through 2.6).

The area offshore Rhode Island and Massachusetts considered in this EA is approximately 164,750 acres and contains 13 whole OCS lease blocks and 29 partial OCS lease blocks.

BOEM AUTHORITY AND REGULATORY PROCESS

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

The regulations require that a lessee provide the results of surveys with its SAP and construction and operation plan (COP), including a shallow hazards survey (30 CFR 585.626 (a)(1)), a geological survey (30 CFR 585.616(a)(2)), a geotechnical survey (30 CFR 585.626(a)(4)), and an archaeological resource survey (30 CFR 585.626(a)(5)). BOEM refers to these surveys as "site characterization" activities. BOEM will not consider approving a lessee's SAP or COP without these site characterization results.

NATURE OF THE ANALYSIS IN THE EA

BOEM prepared the EA to inform decisions to issue leases within the Rhode Island and Massachusetts WEA and to subsequently approve SAPs on those leases. As discussed above, BOEM regulations require that a lessee include the results of shallow hazards, geological, geotechnical, or archaeological resource surveys in its application for COP approval. Therefore, the EA treated the environmental consequences of these surveys as reasonably foreseeable consequences of issuing a lease.

Thus, the EA analyzes the reasonably foreseeable consequences associated with two distinct BOEM actions in the WEA:

(1) Lease issuance (including reasonably foreseeable consequences associated with shallow hazards, geological, geotechnical, and archaeological resource surveys); and
(2) SAP approval (including reasonably foreseeable consequences associated with the installation and operation of meteorological towers and meteorological buoys).

BOEM's primary strategy for minimizing impacts to offshore cultural resources and biologically sensitive habitats has been and will continue to be avoidance. Based on the analysis in the EA, BOEM developed several Standard Operating Conditions (SOCs) to reduce or eliminate the potential environmental risks to or conflicts with individual environmental and socioeconomic resources (Appendix B). These SOCs were developed through the analyses presented in Section 4.1 and through consultation with other federal and state agencies. This EA considers the SOCs to be part of the proposed action.

Endangered Species Act Consultations – BOEM initiated consultations in July 2012 with the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) concerning the Endangered Species Act (ESA). During these consultations, the NMFS evaluated new modeled sound information that BOEM provided which was based on methodology from BOEM's March 2012 *Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas: Draft Programmatic Environmental Impact Statement* (G&G DPEIS). The calculations from this methodology indicated the sound from equipment such as boomers and other sub-bottom profilers travels a greater distance than indicated in the 2012 EA. Specifically, the modeled area of ensonification for some HRG survey equipment constituting level B harassment of marine mammals under the Marine Mammal Protection Act was beyond what BOEM considered could be effectively visually monitored for the presence of marine mammals. In light of the information from the sound propagation model, BOEM requested formal ESA consultation with the NMFS on October 19, 2012 (Morin, personal communication, 2012). As part of the incidental take statement, the NMFS required reasonable and prudent measures (RPMs) to be implemented to help minimize the potential impacts (ESA Section 7 Consultation Biological Opinion, April 10, 2013). BOEM revised the SOCs in this EA to reflect the RPMs and the new acoustic impact model found in the G&G DPEIS. The NMFS determined that, with the SOCs and the RPMs, the proposed action may adversely affect but is not likely to jeopardize the continued existence of Kemp's ridley, green, or leatherback sea turtles; the Northwest Atlantic distinct population segment (DPS) of loggerhead sea turtles; North Atlantic right, humpback, fin, sei, or sperm whales, or the Gulf of Mexico, New York Bight, Chesapeake Bay, or South Atlantic DPSs of Atlantic sturgeon. Because no critical habitat is designated in the action area, none would be affected by the action.

BOEM and the U.S. Fish and Wildlife Service (USFWS) concluded informal ESA consultation on November 1, 2012. The USFWS concurred with BOEM's Biological Assessment dated October 19, 2012, that determined that the site assessment activities described were "not likely to adversely affect" federally endangered roseate terns, threatened piping plovers, and the candidate red knot (Chapman, personal communication, 2012).

ALTERNATIVES

BOEM considered the proposed action (Alternative A) and five alternatives including a no action alternative. Alternative A is the alternative that contemplates the issuance of wind energy leases within the maximum area of the Rhode Island and Massachusetts WEA (see Figure 1-2), associated site characterization surveys, and subsequent approval of site assessment activities on those leases (Section 2.1). Alternatives B, C, D, and E (Sections 2.2 through 2.5, respectively) contemplated issuing leases and approving SAPs in smaller areas offshore these states.

Alternative F contemplated taking no action (Section 2.6). Alternative A is generally anticipated to have the greatest environmental consequences of the action alternatives. As a result, Alternative A is the focus of the environmental analysis in the EA, and is the alternative against which the generally lesser impacts of the other alternatives are compared (Sections 4.2 through 4.6).

Environmental and Socioeconomic Consequences of Alternative A (Preferred Alternative): The Proposed Action

Alternative A presumes the reasonably foreseeable scenarios for leasing, site characterization, and site assessment (Section 3). Alternative A contemplates leasing of the maximum area of the WEA, resulting in up to four total leases. It should be noted that BOEM may not offer four leases. If BOEM elects to offer fewer than four leases, the impacts related to the construction/installation, operation and maintenance, or decommissioning of meteorological towers and meteorological buoys would be proportionally less based on the number of leases offered. Similarly, if less than the entire WEA is leased, survey coverages would be proportionally less based on the area leased.

Alternative A assumes that lessees would undertake the maximum amount of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological and biological surveys) in their leased areas, which, under Alternative A, would constitute the full area of the WEA. Under Alternative A, assuming that all lessees choose to install meteorological facilities, BOEM anticipates that up to four meteorological towers or eight meteorological buoys, or some combination of meteorological towers and buoys, would be installed within the WEA. These site characterization and assessment activities are projected to result in approximately 1,500 to 4,000 round-trips by vessels over a five-and-a-half-year period, which would be divided among major and smaller ports in Massachusetts and Rhode Island. Under Alternative A, BOEM would require lessees to undertake activities on their leases in a particular fashion for the purpose of ensuring that potential impacts to the environment are minimized or eliminated. These requirements will be imposed as SOCs in the lease instrument and/or as conditions of approval of a SAP. The reasonably foreseeable impacts of Alternative A (full leasing of the WEA) on environmental resources and socioeconomic conditions based on the scenario above are described in detail in Section 4.1 of the revised EA.

The reasonably foreseeable impacts for the proposed action scenario described in the EA could result in impacts ranging from negligible to minor except in the case of the species identified in the NMFS Biological Opinion of April 10, 2013. These species are likely to be adversely affected by the proposed action; however, it is not likely to jeopardize the continued existence of any of these species. The potential effects on individual Kemp's ridley, green, leatherback sea turtles; the Northwest Atlantic DPS of loggerhead sea turtles; North Atlantic right, humpback, fin, sei, or sperm whales, or the Gulf of Mexico, New York Bight, Chesapeake Bay, or South Atlantic DPSs of Atlantic sturgeon from noise or the risk of vessel collisions are expected to be temporary and localized. Thus, these impacts are not anticipated to be significant, and specifically would not result in any population-level impacts to marine mammals, protected fish species, or sea turtles.

Offshore activities would result in localized impacts. The impacts of individual meteorological towers and their associated activities would not overlap because of different geographic locations. The incremental contribution of the proposed action to other past, present, and reasonably foreseeable actions that may affect the environment would be negligible to minor (Sections 4.1 and 4.7). Moreover, the proposed action would facilitate the collection of meteorological, oceanographic, and biological data of the environment within the WEA. These impact levels are derived from a four-level classification scheme used to characterize the predicted impacts if the proposal is implemented and activities occur as described. This classification scheme is defined in the *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf* (October 2007). The resources analyzed include air quality (Section 4.1.1.1); geology (Section 4.1.1.2); physical oceanography (Section 4.1.1.3); water quality (Section 4.1.1.4); avian and bat resources (Section 4.1.2.1); coastal and benthic habitats (Section 4.1.2.2); finfish, shellfish and essential fish habitat (Section 4.1.2.3); marine mammals (Section 4.1.2.4); sea turtles (Section 4.1.2.5); socioeconomic resources (Section 4.1.3) and coastal wetland habitats and ecosystems (Section 4.1.2.6).

Public and stakeholder comments, Task Force input, and information received through BOEM's outreach efforts also weighed heavily in this determination. BOEM finds that issuing leases and approving site assessment activities within the WEA under the proposed action would have no significant impact on the environment. As a result, the preparation of an EIS is not necessary for BOEM to proceed with the lease issuance process for a portion or all of the WEA.

SUPPORTING DOCUMENTS

The following environmental documents are available upon request or at www.boem.gov/:

- *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (October 2007, OCS EIS/EA 2007-046);
- *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia - Final Environmental Assessment* (January 2012, OCS EIS/EA 2012-003);
- *Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas, Draft Programmatic Environmental Impact Statement* (March 2012, OCS EIS/EA BOEM 2012-005);
- *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts, for U.S. Fish and Wildlife Service, Biological Assessment* (October 2012);
- Morin, Michelle, BOEM, Chief, Environmental Branch for Renewable Energy. Letter requesting formal consultation with the NMFS under Section 7 of the ESA, October 19, 2012, to John Bullard, NOAA NMFS, Regional Administrator, Northeast Region;
- Chapman, T.R., Supervisor, New England Office, USFWS, New England Field Office, Concord, New Hampshire. Concurrence letter responding to October 19, 2012, request to the USFWS to review the October 2012 *Biological Assessment*

for the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts, November 1, 2012, to M. Morin, BOEM;

- Bullard, John K., Regional Administrator, NOAA NMFS, Northeast Region, Gloucester, Massachusetts. Transmittal letter re: Formal Endangered Species Act (ESA) Section 7 Consultation for the Rhode Island, Massachusetts, New York, and New Jersey WEAs, April 10, 2013, to M. Morin, BOEM;
- *Endangered Species Act Section 7 Consultation Biological Opinion. Activity: Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas* (Issued April 10, 2013, NER-2012-9211); and
- *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts Revised Environmental Assessment* (attached).

CONCLUSION

I have thoroughly considered the prominent issues and concerns identified in the EA and by the public and cooperating and consulting agencies in their comments, as well as the evaluation of the potential effects of the proposed action and alternatives in the attached EA. It is my determination that there are no substantial questions regarding the reasonably foreseeable impacts of the proposed action or alternatives, and that no reasonably foreseeable significant impacts are expected to occur as the result of the preferred alternative or any of the alternatives contemplated in the EA. It is therefore my determination that implementing the proposed action or any of the alternatives would not constitute a major federal action significantly affecting the quality of the human environment under Section 102(2)(C) of the National Environmental Policy Act of 1969. As a result, an EIS is not required, and I am issuing this finding of no significant impact.

Michelle Morin

Michelle Morin
Chief, Environment Branch for Renewable Energy
Office of Renewable Energy Programs

May 21, 2013
Date

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
μm	micrometer(s)
μPa	microPascal
μs	microsecond(s)
ACHP	Advisory Council on Historic Preservation
ACPARS	Atlantic Coast Port Access Route Survey
ADCP	Acoustic Doppler Current Profiler
AIS	automatic identification system
AMAPPS	Atlantic Marine Assessment Program for Protected Species
AMI	Area of Mutual Interest
Area ID	Area Identification
ASMFC	Atlantic States Marine Fisheries Commission
AT&T	AT&T Inc.
AWOIS	Automated Wreck and Obstruction Information (database)
BIPCO	Block Island Power Company
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation, and Enforcement (*obsolete; now* BOEM)
BRAC	Base Realignment and Closure Act
BSEE	Bureau of Safety and Environmental Enforcement
BWDS	ballast water discharge standard
CAA	Clean Air Act
Call	Call for Information and Nomination
CEQ	Council on Environmental Quality
CETAP	Cetacean and Turtle Assessment Program
CFR	Code of Federal Regulations
CHIRP	Compressed High-Intensity Radar Pulse
CMSP	coastal and marine spatial planning

CO	carbon monoxide
CODAR	coastal ocean dynamic applications radar
COLOS	Coastal Buoy and the Coastal Oceanographic Line-of-Sight
COP	Construction and Operation Plan
CPT	cone penetration test
CRMC	(Rhode Island) Coastal Resources Management Council
CSO	combined sewer overflow
CZMA	Coastal Zone Management Act
dB	decibel(s)
dB re 1 µPa @ 1 m	decibels referenced to 1 microPascal at 1 meter
DMA	Dynamic Management Area
DOD	(United States) Department of Defense
DPS	distinct population segment
e.g.	for example
EA	environmental assessment
EEA	(Commonwealth of Massachusetts Executive Office of) Energy and Environmental Affairs
EEZ	exclusive economic zone
EFH	essential fish habitat
EIS	environmental impact statement
EPACT	Energy Policy Act
ESA	Endangered Species Act
ESRI	Environmental Science Research Institute; *also* Esri
et al.	and others
FAA	Federal Aviation Administration
FED	Federal
FMC	fishery management council
FMP	fishery management plan
FONSI	finding of no significant impact
FR	*Federal Register*
GGARCH guidelines	Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585
GHGs	greenhouse gases

GIS	geographic information system
GPS	global positioning system
HAPC	habitat areas of particular concern
HF	high-frequency
HMS	highly migratory species
HRG	high-resolution geophysical
HSUS	Humane Society of the United States
Hz	Hertz
i.e.	that is
IHA	incidental harassment authorization
Interim Policy EA	*Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey Environmental Assessment*
IUCN	International Union for Conservation of Nature
kHz	kiloHertz
LIDAR	light detection and ranging
LLC	limited liability corporation
LLP	limited liability partnership
LNG	liquefied natural gas
MA CZM	Massachusetts (Office of) Coastal Zone Management
MA DMF	Massachusetts Division of Marine Fisheries
MA OMTF	Massachusetts Ocean Management Task Force
MAFMC	Mid-Atlantic Fishery Management Council
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MARAD	Maritime Administration
Massachusetts EA	*Commercial Leasing for Wind Power on the Outer Continental Shelf Offshore Massachusetts Environmental Assessment*
MBTA	Migratory Bird Treaty Act
Mid-Atlantic EA	*Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia, Final Environmental Assessment*
MLW	mean low water
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service (*obsolete; now* BOEM)

MOTT	Massachusetts Office of Travel and Tourism
MOU	Memorandum of Understanding
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
ms	millisecond(s)
MSD	marine sanitation device
MW	megawatt(s)
n.d.	no date
NAAQS	National Ambient Air Quality Standards
NBEP	Narragansett Bay Estuary Program
NBNERR	Narragansett Bay National Estuarine Research Reserve
NDA	no discharge area
NDBC	National Data Buoy Center
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NGO	non-governmental organization
NHPA	National Historic Preservation Act (of 1969)
NM	nautical mile(s)
NMFS	National Marine Fisheries Service; *also known as* NOAA Fisheries Service
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOAA ENC®	National Oceanic and Atmospheric Administration Electronic Navigational Chart®
NOAA Fisheries Service	National Oceanic and Atmospheric Administration National Marine Fisheries Service; *also known as* NMFS
NOI	Notice of Intent
NOMAD	Naval Oceanographic and Meteorological Automated Device
NOS	National Ocean Service
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System

NPS	National Park Service
NUWC	Naval Undersea Warfare Center
NVIC	Navigation and Vessel Inspection Circular
NWI	National Wetlands Inventory
O_3	ozone
OAEP	(Office of) Offshore Alternative Energy Programs
Ocean SAMP	Rhode Island Ocean Special Area Management Plan; *also* Rhode Island Ocean SAMP
OCRM	(National Oceanic and Atmospheric Administration Office of) Ocean and Coastal Resource Management
OCS	Outer Continental Shelf
OCS G&G DPEIS	*Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas: Draft Programmatic Environmental Impact Statement*
OPAREA	(U.S. Navy) operating area
OREP	Office of Renewable Energy Programs
PAM	passive acoustic monitoring
PAMS	Passive Acoustic Monitoring System
Pb	lead
PCBs	polychlorinated biphenyls
PM_{10}	particulate matter 10 microns or less in diameter
$PM_{2.5}$	particulate matter 2.5 microns or less in diameter
ppm	part(s) per million
Programmatic EIS	*Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement*
PTS	permanent threshold shift
Rhode Island Ocean SAMP	Rhode Island Ocean Special Area Management Plan; *also* Ocean SAMP
RIAC	Rhode Island Airport Corporation
RIDEM	Rhode Island Department of Environmental Management
RIDOH	Rhode Island Department of Health
RMS	root-mean-squared
ROV	remotely operated vehicle

SAMP	special area management plan
SAP	site assessment plan
SAV	submerged aquatic vegetation
SEFSC	Southeast Fisheries Science Center
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales
SHPO	State Historic Preservation Office
SIP	state implementation plan
SMA	Seasonal Management Area
SO_2	sulfur dioxide
SOCs	Standard Operating Conditions
SODAR	sonic detection and ranging
SO_X	sulfur oxides
SPL	sound pressure level
T. F. Green Airport	Theodore Francis Green Airport
TNC	The Nature Conservancy
TSS	traffic separation scheme
TTS	temporary threshold shift
U.S.C.	United States Code
UMT	unidentified measure type
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDOC	United States Department of Commerce
USDOI	United States Department of the Interior
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USGS GAP	United States Geological Survey Gap Analysis Program
USV	unmanned surface vehicle
UUV	unmanned undersea vehicle
UXO	unexploded ordnance
Verizon	Verizon Communications, Inc.

VHF	very high frequency
VOC	volatile organic compound
WEA	Wind Energy Area
WTG	wind turbine generator

1 INTRODUCTION

The United States Department of the Interior (USDOI), Bureau of Ocean Energy Management (BOEM) has prepared a revised environmental assessment (EA) to determine whether issuance of leases and approval of site assessment plans (SAPs) within the Wind Energy Area (WEA) offshore Rhode Island and Massachusetts (referred to throughout this EA as the Rhode Island and Massachusetts WEA) would lead to reasonably foreseeable significant impacts on the environment and, thus, whether an environmental impact statement (EIS) should be prepared before leases are issued. An environmental analysis was conducted after the identification of a suitable area was completed, and the analysis is limited to the effects of lease issuance, site characterization activities (i.e., surveys of the lease area), and site assessment activities within this area (i.e., construction/installation and operation of meteorological towers and/or buoys on the leases to be granted). On July 2, 2012, BOEM published a Notice of Availability for the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts Environmental Assessment* (2012 EA) (77 FR 39508) for a 30-day comment period. To address comments received during the public comment period, public information meetings, stakeholder outreach, required consultations, and the Task Force meetings, BOEM has revised the 2012 EA. The analysis in this revised EA complies with the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) §§ 4321-4370f, and the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) 1501.3.

1.1 Purpose and Need

The purpose is to issue leases and approve SAPs to provide for the responsible development of wind energy resources in the previously identified Rhode Island and Massachusetts WEA (Figure 1-1). The need is to adequately assess wind and environmental resources of the WEA to determine whether and which areas within the WEA are suitable for and could support commercial-scale wind energy production.

1.2 Description of the Proposed Action

The proposed action that is the subject of this revised EA is the issuance of wind energy leases within all or some of the Rhode Island and Massachusetts WEA, as shown on Figure 1-1, and the approval of site assessment activities within those lease blocks. During the identification phase (Area Identification [Area ID]) of the WEA (*see* Appendix A), BOEM identified Alternative A as the proposed action as illustrated on Figure 1-2. Of the alternatives considered in this EA, Alternative A contemplates issuing leases in the largest geographic area. In addition to the proposed action, Alternative A, and five other alternatives, including no action, were considered, as detailed in Section 2.

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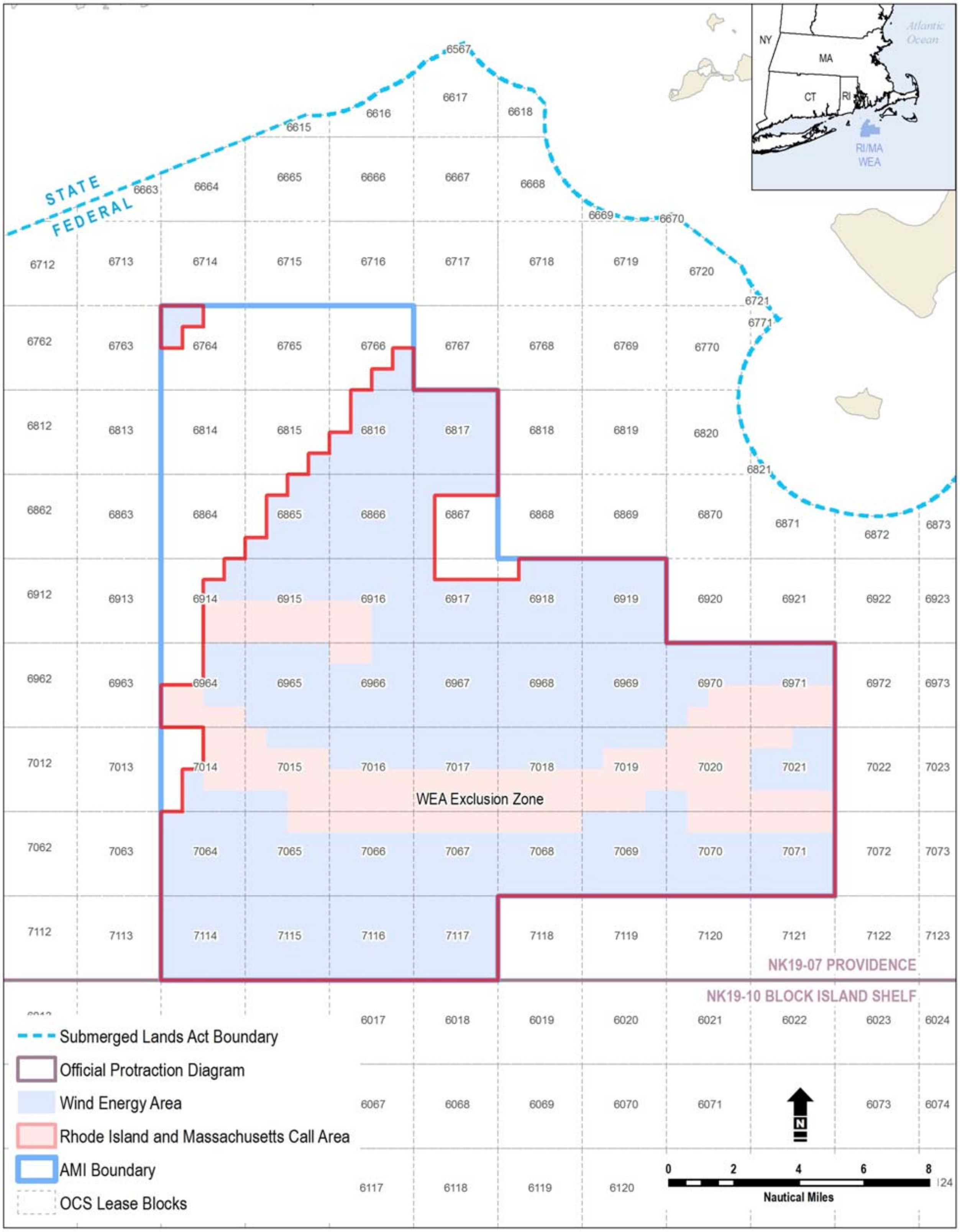

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011

Figure 1-1. Area of Mutual Interest, Call Area, and Wind Energy Area.

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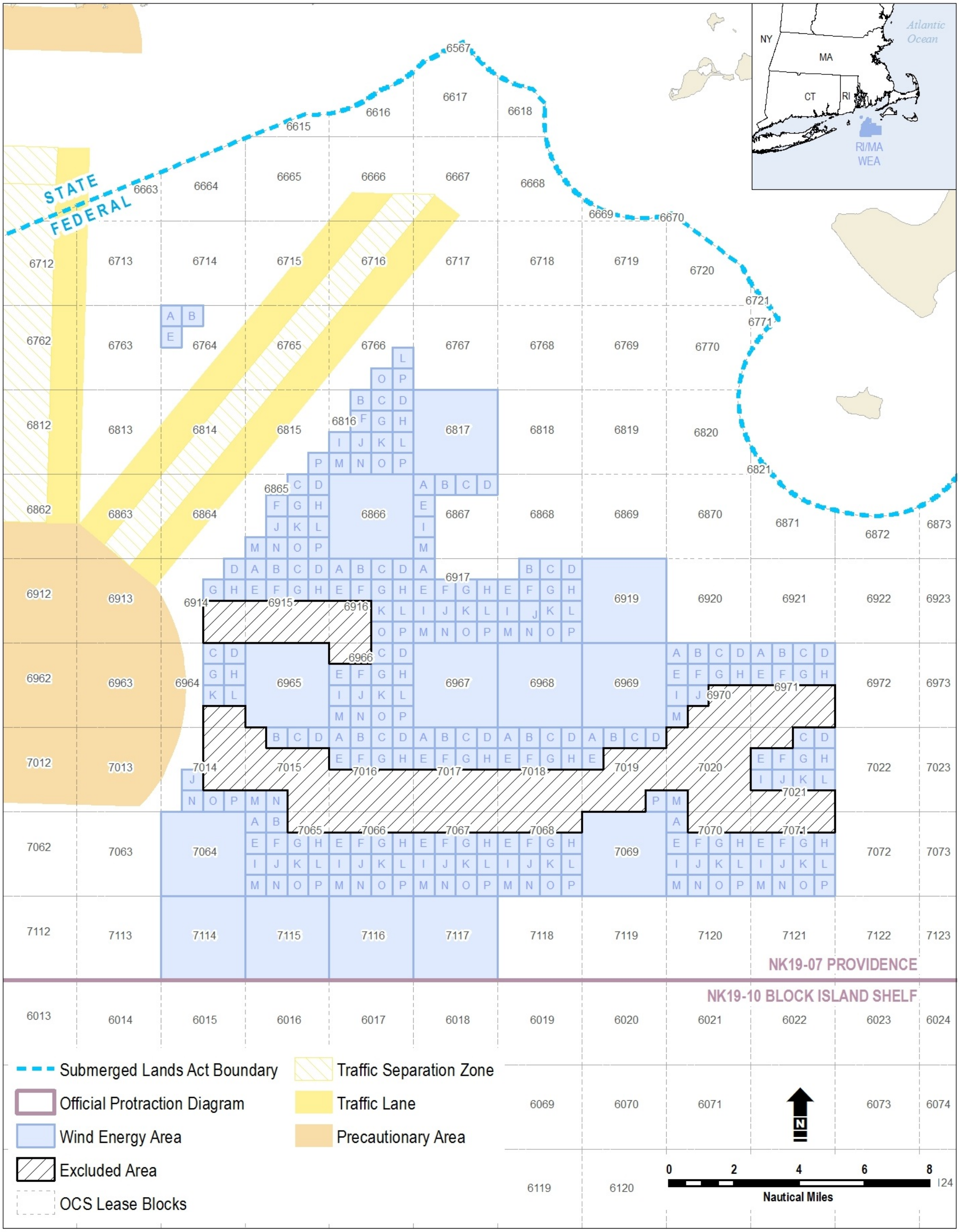

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011

Figure 1-2. Alternative A: Rhode Island and Massachusetts Wind Energy Area.

1.3 Background

1.3.1 BOEM Authority and Regulatory Process

The Energy Policy Act (EPACT) of 2005, Public Law No. 109-58, added Section 8(p)(1)(C) to the Outer Continental Shelf (OCS) Lands Act, which grants the Secretary of the Interior the authority to issue leases, easements, or rights-of-way on the OCS for the purpose of renewable energy development (43 U.S.C. § 1337(p)(1)(C)). The Secretary delegated this authority to the former Minerals Management Service (MMS), now BOEM. On April 22, 2009, BOEM promulgated final regulations implementing this authority at 30 CFR Part 285. BOEM's renewable energy regulations were codified on October 18, 2011, and are now found at 30 CFR Part 585.

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

1) **Planning and Analysis.** The first phase is to identify suitable areas to be considered for wind energy project leases through collaborative, consultative, and analytical processes using the state's intergovernmental renewable energy task forces, public information meetings, input from the states, Native American Tribes, and other stakeholders.
2) **Lease Issuance.** The second phase is the issuance of a commercial wind energy lease. The competitive lease process is set forth at 30 CFR 585.210 to 585.225, and the noncompetitive process is set forth at 30 CFR 585.230 to 585.232. A commercial lease gives the lessee the exclusive right to subsequently seek BOEM's approval for the development of the leasehold. The lease does not grant the lessee the right to construct any facilities; rather, the lease grants the right to use the leased area to develop its plans, which must be approved by BOEM before the lessee can move on to the next stage of the process (30 CFR 585.600 and 585.601).
3) **Approval of a Site Assessment Plan (SAP).** The third stage of the process is the submission of a SAP, which contains the lessee's detailed proposal for the construction/installation of a meteorological tower and/or the installation of meteorological buoys on the leasehold (30 CFR 585.605 to 585.618). The lessee's SAP must be approved by BOEM before it conducts these "site assessment" activities on the leasehold. BOEM may approve, approve with modification, or disapprove a lessee's SAP (30 CFR 585.613).
4) **Approval of a Construction and Operation Plan (COP).** The fourth and final stage of the process is the submission of a COP, a detailed plan for the construction and operation of a wind energy project on the lease (30 CFR 585.620 to 585.638). BOEM approval of a COP is a precondition to the construction of any wind energy facility on the OCS (30 CFR 585.628). As with a SAP, BOEM may approve, approve with modification, or disapprove a lessee's COP (30 CFR 585.628).

The regulations also require that a lessee provide the results of surveys with its SAP or COP, including a shallow hazards survey (30 CFR 585.626 (a)(1)), geological survey (30 CFR 585.616(a)(2)), geotechnical survey (30 CFR 585.626(a)(4)), and an archaeological resource survey (30 CFR 585.626(a)(5)). BOEM refers to these surveys as "site characterization" activities. Although BOEM does not issue permits or approvals for these site characterization activities, it will not consider approving a lessee's SAP or COP if the required survey results are not included. *See* "Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585,"[1] referred to herein as the 'GGARCH guidelines' (United States Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Office of Renewable Energy Programs [USDOI, BOEM, OREP] 2012a).

In addition to commercial leases, BOEM has the authority to issue leases to other Federal agencies and to States for the purpose of conducting renewable energy research activities that support the future production, transportation, or transmission of renewable energy. See 30 CFR 585.238. The terms of these types of research leases would be negotiated by the Director of BOEM and the head of the federal agency or the Governor of the relevant state, or their authorized representatives, on a case-by-case basis, subject to the provisions of 30 CFR Part 585, including those pertaining to public involvement.

1.3.2 "Smart from the Start" Atlantic Wind Energy Initiative

On November 23, 2010, Secretary of the Interior Ken Salazar announced the "Smart from the Start" wind energy initiative to accelerate the responsible development of wind energy on the Atlantic OCS. The initiative calls for the identification of areas on the Atlantic OCS that appear most suitable for commercial wind energy development activities and the availability of these areas for leasing and detailed site assessment activities.

On August 18, 2011, BOEM launched this initiative offshore Rhode Island and Massachusetts through publication in the *Federal Register* (FR) of a Notice of Intent (NOI) to prepare an EA (76 FR 51391-51393) and a Call for Information and Nominations (Call) (76 FR 51383-51391). The NOI and Call identified an area of the OCS offshore Rhode Island and Massachusetts, which was developed and later refined through extensive consultation with other federal agencies and BOEM's joint Rhode Island and Massachusetts intergovernmental renewable energy task force. On February 24, 2012, BOEM announced Area ID, or identification of a WEA under the "Smart from the Start" initiative, which defined the Rhode Island and Massachusetts WEA and identified Alternative A as the proposed action in this EA for consideration of lease issuance and approval of SAPs. Section 1.5 and Appendix A provide detailed information on the development of the WEA.

Separately, an area offshore Massachusetts that is adjacent to the Rhode Island and Massachusetts WEA has also been identified by BOEM for consideration for potential future wind energy leasing. BOEM announced Area ID for the Massachusetts WEA on May 30, 2012. The EA for the Massachusetts WEA was prepared separately from this EA and was published for public review on November 2, 2012 (77 FR 66185). Comments received during the Massachusetts EA process that are pertinent to the EA herein were considered in this revised EA.

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

1.4 Objective of this Environmental Assessment

This revised EA was prepared to assist BOEM in determining which OCS areas offshore of Rhode Island and Massachusetts should be the focus of the agency's wind energy leasing efforts pursuant to NEPA (42 U.S.C. §§ 4321-4370f) and the CEQ regulations at 40 CFR 1501.3. A number of reasonable foreseeable alternatives are considered, and the environmental and socioeconomic consequences (including potential user conflicts) associated with issuing leases and approving SAPs under each alternative are evaluated. This revised EA only considers whether issuing leases and approving site assessment activities in certain areas of the OCS offshore of Rhode Island and Massachusetts would lead to reasonably foreseeable significant environmental impacts on the environment and, thus, whether an EIS should be prepared before leases are issued (*see* 40 CFR 1508.11).

1.4.1 Information Considered

Information considered in preparing this NEPA document included the following:

- The Memorandum of Understanding (MOU) agreed upon in July 2010 by the governors of the State of Rhode Island and the Commonwealth of Massachusetts;
- Public response to the February 9, 2011, NOI to prepare the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment* (Mid-Atlantic EA; USDOI, BOEM, OREP 2012b) (76 FR 7226);
- Relevant material from the Mid-Atlantic EA (USDOI, BOEM, OREP 2012b);
- Public response to the August 18, 2011, NOI to prepare this EA (76 FR 51391);
- Public response to the August 18, 2011, Call for Information and Nominations (76 FR 51383);
- The two overlapping unsolicited requests for commercial leases within the Area of Mutual Interest (AMI) submitted to BOEM in October and November 2010;
- An unexploded ordnance (UXO) area indicated on National Oceanic and Atmospheric Administration (NOAA) nautical chart 13218;
- Public response to the February 6, 2012, NOI to prepare the *Commercial Leasing for Wind Power on the Outer Continental Shelf Offshore Massachusetts Environmental Assessment* (Massachusetts EA)(77 FR 5820);
- The *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey Environmental Assessment* (Interim Policy EA) (USDOI, MMS 2009a);
- The *Rhode Island Ocean Special Area Management Plan* (Rhode Island Ocean SAMP) (Rhode Island Coastal Resources Management Council [CRMC] 2010);
- Final *Massachusetts Ocean Management Plan* (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009);
- BOEM research and review of current relevant scientific and socioeconomic literature;
- Comments received in response to the Requests for Interest and Calls for Information associated with wind energy planning offshore of Rhode Island and Massachusetts;

- The *Cape Wind Energy Project, Final Environmental Impact Statement*, January 2009 (USDOI, MMS 2009b);
- The *Cape Wind Energy Project, Environmental Assessment*, April 28, 2010 (USDOI, MMS 2010);
- The *Cape Wind Energy Project, Environmental Assessment*, April 2011 (USDOI, BOEMRE, OAEP 2011);
- *Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas: Draft Programmatic Environmental Impact Statement*, March 2012 (OCS G&G DPEIS) (USDOI, BOEM 2012a);
- Ongoing consultations and coordination with the members of BOEM's Rhode Island and Massachusetts renewable energy task forces;
- Letters of notification sent by BOEM to potentially affected federally recognized Native American Tribal governments in Massachusetts, Rhode Island, and New York including the Mashpee Wampanoag Tribe, the Wampanoag Band of Gay Head (Aquinnah) Tribe, the Narragansett Indian Tribe, the Shinnecock Indian Nation, and the Saint Regis Mohawk Tribe;
- Ongoing consultations with other federal agencies including the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the United States Department of Defense (DOD), National Park Services (NPS), and the United States Coast Guard (USCG);
- Relevant material from *the Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (Programmatic EIS) (USDOI, MMS 2007);
- The *Project Plan for the Deployment and Operation of a Meteorological Data Collection Buoy within Interim Lease Site, Block 7033*, March 23, 2012, prepared for Garden State Offshore Energy, LLC (TetraTech EC, Inc. 2012); and
- Public response to the July 3, 2012, Notice of the Availability of an EA (NOA) (77 FR 39508).

1.4.2 Scope of Analysis

BOEM intends to use this revised EA to make informed decisions about the issuance of leases in the WEA and to subsequently process the SAPs associated with those leases. It is important to note that Alternative A does not include the consideration or approval of any commercial wind energy facility. As indicated above, BOEM does not issue permits for conducting shallow hazards, geological, geotechnical, or archaeological resource surveys. However, since BOEM regulations require that a lessee include the results of these surveys in its application for a SAP and a COP approval, the environmental consequences of these surveys are considered here as reasonably foreseeable consequences of issuing a lease. Thus, this revised EA analyzes the reasonably foreseeable consequences associated with two distinct BOEM actions in the WEA identified in the alternatives:

1) Lease issuance (including reasonably foreseeable consequences associated with shallow hazards, geological, geotechnical, and archaeological resource surveys); and
2) SAP approval (including reasonably foreseeable consequences associated with the installation of a meteorological tower(s) and/or meteorological buoys).

Additional analysis under NEPA will be required before any future decisions are made regarding construction/installation, operation and maintenance, or decommissioning of any future wind energy facility to be sited in the WEA. BOEM is not currently reviewing any COP, nor has any COP been submitted for the agency's consideration in the aforementioned WEA. The purpose of conducting surveys and installing meteorological measurement devices is to assess the wind resources in the lease area and to characterize the environmental and socioeconomic resources and conditions so that a lessee can determine whether the site is suitable for commercial development and, if so, submit a COP for BOEM review.

BOEM's experience with the Cape Wind Energy Project offshore of Massachusetts in Nantucket Sound, as well as its understanding of the evolution of the offshore wind industry in northern Europe, has demonstrated that rapidly changing technology, different wind resources and wave conditions, various seabed characteristics, different project economics, and the variety of possible project designs can affect whether, to what extent, and how a lease is ultimately developed. Additionally, project design and the resulting environmental impacts are often geographically and design-specific, and therefore it would be premature to analyze environmental impacts related to approval of any future COP at this time (Musial and Ram 2010; Michel *et al.* 2007). Since no entity is currently in a position to submit a COP (as no entity has yet been awarded a lease or acquired the necessary leasehold information to formulate such a plan), and since the specific information contained in such a plan would be determined by the reasonably foreseeable environmental consequences associated with the development of any lease, BOEM will not speculate in this revised EA as to what the consequences of the potential future development of any leasehold within a specific lease area would be.

Analyzing the specific environmental consequences of project construction/installation and operation and maintenance is not within the scope of this EA. This EA considers whether issuing leases and approving site assessment activities in certain areas of the OCS offshore of Rhode Island and Massachusetts would lead to reasonably foreseeable significant environmental impacts on the environment and, thus, whether an EIS should be prepared before leases are issued (*see* 40 CFR 1508.11). After BOEM issues a finding of no significant impact (FONSI) or completes an EIS process, BOEM may issue one or more wind energy leases in the WEA. If a particular lease is issued and the lessee subsequently submits a SAP, BOEM would then determine whether this revised EA adequately considers the environmental consequences of the activities proposed in the lessee's SAP. If the analysis in this revised EA adequately considers these consequences, then no further NEPA analysis would be required before the SAP is approved. If, on the other hand, BOEM determines that the analysis in this revised EA does not address consequences of the activities proposed by a prospective lessee, BOEM would then prepare an additional NEPA analysis before approving the SAP.

If and when a lessee is prepared to propose wind energy generation on its lease, the lessee would submit a COP. If a COP is submitted, BOEM would prepare a separate site- and project-specific NEPA analysis. This may take the form of an EIS and would provide additional opportunities for public involvement pursuant to NEPA and the CEQ regulations at 40 CFR 1500-1508. This NEPA process would provide federal and other public officials with comprehensive site- and project-specific information regarding the potential environmental impacts of the specific project that the lessee proposes. BOEM would use a site- and project-specific NEPA document to evaluate the potential environmental and socioeconomic consequences associated with the proposed project when considering whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR 585.628.

1.5 Development of the Wind Energy Area

BOEM established intergovernmental renewable energy task forces in Rhode Island and Massachusetts in November 2009 and began working with each task force to develop an area offshore of Rhode Island and Massachusetts to be considered for commercial wind leasing. The State of Rhode Island and the Commonwealth of Massachusetts then developed a partnership that resulted in an MOU, signed in July 2010 by governors Donald Carcieri of Rhode Island and Deval Patrick of Massachusetts. The MOU created an AMI on the OCS (Figure 1-1) and sets a framework for the two states to collaborate with BOEM about offshore wind energy development. BOEM has since convened joint meetings of the intergovernmental task forces to coordinate the planning process for offshore renewable energy leasing within the AMI.

In October and November 2010, BOEM received two geographically overlapping, unsolicited requests for commercial wind energy leases within the AMI from Deepwater Wind New England, LLC, and Neptune Wind, LLC. BOEM anticipated that there would be competitive interest within the AMI offshore of Rhode Island and Massachusetts (*see* Appendix A). Following consultations with the joint Rhode Island and Massachusetts intergovernmental task force, BOEM published "Commercial Leasing for Wind Power on the Outer Continental Shelf (OCS) Offshore Rhode Island and Massachusetts - Call for Information and Nominations (Call)," in the *Federal Register* on August 18, 2011 (76 FR 51383-51391). In delineating the geographic area presented in the Call, BOEM evaluated relevant competing resource and use conflict issues in the context of the full life-cycle of renewable energy projects, including leasing, proposed site characterization and site assessment activities, construction/installation, operation and maintenance, and decommissioning. BOEM also considered the information it received through consultations with the joint BOEM Rhode Island and Massachusetts renewable energy task forces regarding measures that may minimize conflicts between potential commercial wind energy development and multiple existing uses of the area.

Concurrent with the publication of the Call, on August 18, 2011, BOEM also published an NOI to prepare an EA to evaluate the environmental impacts associated with issuing commercial wind leases and with approving site assessment activities on those leases on the OCS offshore of Rhode Island and Massachusetts (76 FR 51391-51393). Both the Call and the NOI provided for a 45-day comment period, during which BOEM held public information sessions in Narragansett, Rhode Island; New Bedford, Massachusetts; and Martha's Vineyard, Massachusetts. In response to the Call, BOEM received eight overlapping nominations of interest from eight entities wishing to obtain a commercial wind energy lease.

The Call included certain areas that, if ultimately developed with commercial wind energy facilities, would likely cause substantial conflict with existing fishing uses. After consideration of the comments received on the NOI and Call, BOEM refined the Call and announced the WEA under the "Smart from the Start" initiative on February 24, 2012. The WEA excludes the "high value" fishing grounds, and these areas are not considered for leasing or approval of SAPs in this EA. The high-value fishing grounds removed from the Call for leasing consideration are aliquot parts of blocks 6914, 6915, 6916, 6964, 6966, 6970, 6971, 7014 through 7021, 7065 through 7068, 7070, and 7071. (*See* Figure 1-2 which depicts the high value fishing grounds removed from leasing consideration as “Excluded Area.”) For additional information concerning the development of the WEA, see Appendix A.

1.5.1 Coastal and Marine Spatial Planning

On July 19, 2010, President Obama signed Executive Order 13547, “Stewardship of the Ocean, Our Coasts, and the Great Lakes,” establishing a national ocean policy and the National Ocean Council (75 FR 43023). The Order establishes a comprehensive, integrated national policy for the stewardship of the ocean, our coasts, and the Great Lakes. The policy includes a framework for coastal and marine spatial planning (CMSP), defined as a comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas. Where BOEM actions affect the ocean, the Order requires BOEM to take such action as necessary to implement this policy, the stewardship principles, national priority objectives adopted by the Order, and guidance from the National Ocean Council. BOEM developed and refined the WEA in coordination with the intergovernmental renewable energy task forces following the principles of CMSP.

1.5.2 Rhode Island Ocean Special Area Management Plan

The Rhode Island Ocean SAMP is an adaptive planning and regulatory tool that the Rhode Island CRMC is applying in state waters and adjacent federal waters of Rhode Island to manage and fulfill regulatory responsibilities in the Ocean SAMP study area. The CRMC utilized the best available science to identify resource conflict-use areas and suitable placement of offshore energy facilities and received input from well-informed and committed environmental and civic organizations, local, state, and federal agencies, and resource users and researchers. As a result, the Ocean SAMP provides a comprehensive understanding of the rich and complex ecosystem. The Ocean SAMP also documents the interaction of the people of this region with the surrounding environment and how they depend upon these offshore resources for subsistence, work, and recreation. It also explains how biological resources such as fish, marine mammals, birds, and sea turtles feed, spawn, reproduce, and migrate throughout this region, thriving on the habitats present. On October 19, 2010, the Ocean SAMP was adopted by the CRMC, and on May 11, 2011, NOAA’s Office of Ocean and Coastal Resource Management (OCRM) approved the incorporation of the Ocean SAMP into the state’s federally approved coastal management program (Rhode Island CRMC 2010). The Rhode Island Ocean SAMP is the basis for the State of Rhode Island’s federal consistency process for the AMI and is recognized in the July 2010 MOU between Rhode Island and Massachusetts as the guiding document for the AMI.

1.5.3 Massachusetts Ocean Management Plan

On December 31, 2009, the Commonwealth of Massachusetts announced the adoption of the final Massachusetts Ocean Management Plan, a comprehensive ocean management plan that provides a framework for managing, reviewing, and permitting proposed uses of *state* waters only (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). The plan provides a roadmap for both environmental protection and sustainable use of ocean resources. For example, in two areas comprising just 2 percent of the planning area, the plan identifies zones suitable for commercial-scale wind energy development. Although the plan is limited to state waters, the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs (EEA) identified potentially suitable locations adjacent to these areas in federal waters for commercial-scale wind energy development because it recognized *"…that the three-nautical mile (5.6 km) limit of state jurisdiction (and the limit of jurisdiction of the ocean management plan) is an artificial constraint to considerations of technology, economics, and environmental and social benefits and impacts"* (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). Massachusetts requested BOEM form an intergovernmental task force in 2009 to assist BOEM in the planning and regulatory review associated with leasing areas of federal waters for large-scale wind energy development.

2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes five geographic alternatives for lease issuance and the approval of site assessment activities in the Rhode Island and Massachusetts WEA (Table 2-1). These alternatives were developed based on input from the following sources:

- Responses to the August 18, 2011, NOI to prepare this EA (76 FR 51391);
- Input from other federal agencies; and
- Environmental analysis conducted for this EA.

Table 2-1
Alternatives Considered

Alternative	Description
Alternative A (Preferred Alternative): The Proposed Action	Under Alternative A, lease issuance and approval of site assessment activities could occur in all areas of the Rhode Island and Massachusetts WEA (*see* Figure 1-2). High-value fishing grounds and fishery resources areas were excluded from the WEA (depicted as "Excluded Area" on Figure 1-2). *See* Section 1.2 "Description of the Proposed Action."
Alternative B: Area Exclusion to Protect the North Atlantic Right Whale	Under Alternative B, lease issuance and approval of site assessment activities could occur in all areas of the Rhode Island and Massachusetts WEA, except where right whales are more likely to occur — based upon historical records, whale watch boat records, and NMFS aerial and shipboard protected species abundance surveys (*see* Figure 2-1).
Alternative C: Area Exclusion within 15 Nautical Miles (NM) of the Massachusetts Coastline	Under Alternative C, lease issuance and approval of site assessment activities could occur in all areas of the Rhode Island and Massachusetts WEA except areas within 15 NM of the inhabited Massachusetts coastline because of potential impacts on visual and cultural resources (*see* Figure 2-2).
Alternative D: Area Exclusion within 21 NM of the Massachusetts Coastline	Under Alternative D, lease issuance and approval of site assessment activities could occur in all areas of the Rhode Island and Massachusetts WEA except areas within 21 NM of the inhabited Massachusetts coastline because of potential impacts on visual and cultural resources (*see* Figure 2-3)
Alternative E: Area Exclusion for Telecommunication Cables	Under Alternative E, lease issuance and approval of site assessment activities could occur in all areas of the Rhode Island and Massachusetts WEA except areas identified by Verizon Communications, Inc. because of potential impacts on telecommunication cables (*see* Figure 2-4).
Alternative F: No Action Alternative	Under the No Action Alternative, no wind energy leases would be issued and no site assessment activities would be approved within the Rhode Island and Massachusetts WEA.

The alternatives presented are the result of extensive meetings with task forces in both states, relevant consultations with federal, state, and local agencies and potentially affected Native American Tribes, and extensive input from the public and potentially affected stakeholders. Through the BOEM Rhode Island and Massachusetts joint renewable energy intergovernmental task forces and through public information meetings, BOEM also received useful environmental, economic, use conflict, and safety-related information in response to the Call and NOI comment period. The alternatives were identified and defined by excluding certain areas of the WEA because of the potential for affecting the following resources and uses:

- Fishing and fishery resources;

- North Atlantic right whales;
- Visual/cultural resources;
- Telecommunications cables; and
- Ocean vessel traffic.

2.1 Alternative A (Preferred Alternative): The Proposed Action

In consultation with other federal agencies and BOEM's Rhode Island and Massachusetts intergovernmental renewable energy task forces, BOEM identified a "Call Area" offshore of Rhode Island and Massachusetts (*also see* Sections 1.3.2 and 1.5). As a result of comments received on the NOI, Call, and other public information meetings, the "Call Area" has been further refined to arrive at the following WEA considered under the proposed action (*see* Figure 1-2). The total area is approximately 257 square nautical miles (164,750 acres) and contains 13 whole OCS lease blocks and 29 partial OCS lease blocks.

As noted above, because of the significant economic and social importance of fishing in southern New England, important fishing grounds were excluded from the WEA. Alternative A (the preferred alternative) is the issuance of commercial wind energy leases in the Rhode Island and Massachusetts WEA (*see* Figure 1-2) and implementation of BOEM-approved site assessment and characterization activities on those leaseholds. This action presumes reasonably foreseeable scenarios for leasing, site characterization, and site assessment. Because of the expressions of commercial wind energy interest, BOEM assumes that the entire WEA would be leased, resulting in up to four leaseholds (*see* Chapter 3, "Scenarios of Reasonably Foreseeable Activity and Impact-Producing Factors"). It is also assumed that site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological, and biological surveys) would be conducted, as applicable for the specific project, over the maximum amount of each leased area in the WEA. A site assessment scenario developed to address the range of data collection devices that may be installed under a BOEM-approved SAP assumes that, for each lease, zero to one meteorological tower, one or two buoys, or a combination, would be constructed or deployed (a total of up to four meteorological towers and eight meteorological buoys). The impacts of Alternative A (the preferred alternative) on environmental resources and socioeconomic conditions are described in detail in Section 4.1 of this EA.

2.2 Alternative B: Area Exclusion to Protect the North Atlantic Right Whale

The North Atlantic right whale is among the most endangered whales in the world. Current estimates of the North Atlantic right whale population are between 350 and 400 individuals (Waring *et al.* 2011). Two primary human-induced threats have been identified: (1) collisions with vessels (ship strikes) and (2) entanglement with fishing gear. Recent sightings data confirm that the endangered North Atlantic right whale is present in the Call Area during the species' regular migration. The whales pass through the Call Area during their migration between calving areas off the southeastern coast of the United States and primary feeding areas off the coast of Canada and in the Gulf of Maine. The North Atlantic right whale, which is protected under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA), has been observed exhibiting feeding behavior in the Call Area. According to the NMFS, North Atlantic right whales are found seasonally in the waters off Rhode Island and Massachusetts and have been documented in the waters of the Call Area. The Rhode Island Ocean SAMP includes information about sightings from 1828 to 2007, gathered from historical records, whale watch boats, and NMFS aerial and shipboard protected species abundance surveys and right whale surveys, for a total of 156 records, 91 of which occurred in the spring (Rhode Island CRMC 2010).

Comments from the Humane Society of the United States (HSUS), Oceana, Offshore Wind Development Corporation, Marine Mammal Commission, NMFS, Sierra Club, Defenders of Wildlife, The Nature Conservancy (TNC), Conservation Law Foundation, and the National Wildlife Federation received during the Call and NOI comment periods expressed concerns about potential impacts on right whales during site assessment activities.

Since the NOI focused on input relating to lease issuance and site characterization and site assessment activities, most of the issues expressed focused on the impacts that vessel traffic associated with site assessment activities would have on right whales. The concern most often identified was that the Call Area is an important migratory corridor and potential feeding habitat for the North Atlantic right whale. The HSUS petitioned the NMFS to include portions of the Call Area as critical habitat under the ESA. In addition to concerns about survey ships colliding with whales, the HSUS expressed concern that activity in the Call Area could displace North Atlantic right whales into areas where they might be subject to ship strikes in adjacent designated shipping lanes, or where prey species may not be available, or where they may experience an increased risk of entanglement with fishing gear, or where they may be at greater risk of predation themselves.

To reduce the likelihood of ship strikes from vessels engaged in site characterization and site assessment activities, lease issuance and approval of site assessment activities under Alternative B could occur in all areas of the Rhode Island and Massachusetts WEA, except where the North Atlantic right whale are more likely to occur based on historical sightings (Figure 2-1). Considering the applicable provisions of the ESA, under which the North Atlantic right whale is listed as endangered and conferred special protections, Alternative B considers for potential exclusion from lease issuance portions of blocks 6916, 6965, 6966, 6969, 6970, 6971, 7014, 7015, and 7021. The potential impacts of Alternative B on environmental and socioeconomic resources are described in detail in Section 4.2 of this EA.

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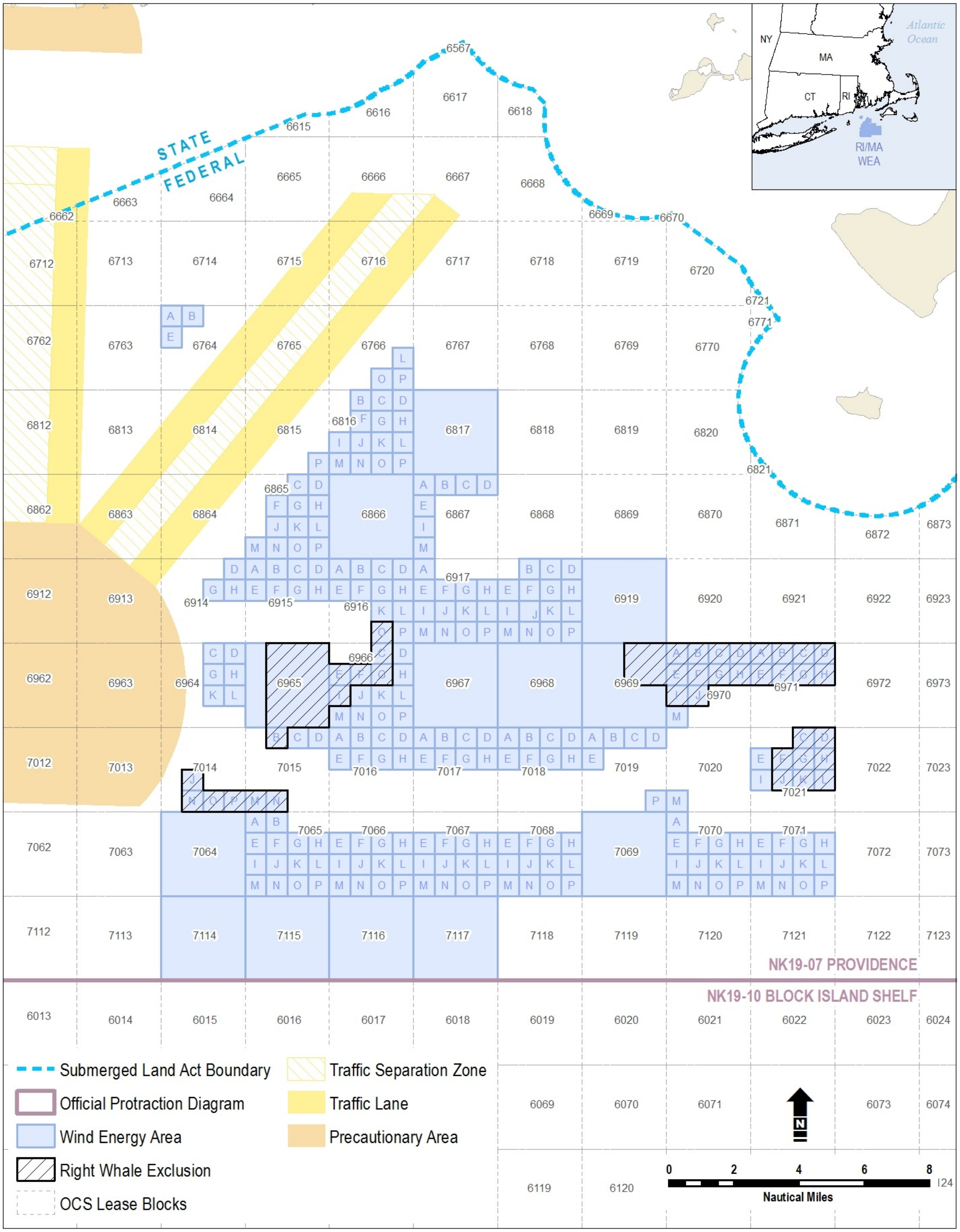

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011

Figure 2-1. Alternative B: North Atlantic Right Whale Exclusion.

2.3 Alternative C: Area Exclusion within 15 Nautical Miles of the Massachusetts Coastline

Historic properties of religious and cultural significance to Native Americans are found in the vicinity of the coast, likely because of the important role maritime resources played in the lives of native peoples. European colonists also were attracted to and found plentiful natural resources in coastal areas. The ocean coastline in this area has gone through several periods of change, yet it retains a variety of significant cultural resources from different periods in history, including districts, sites, buildings, and traditional cultural properties. For most of these historic properties along the shore, the coastal waters are a fundamental aspect of their historic significance and an integral feature in their historic setting. In the offshore waters, increasing levels of ship traffic over the past three centuries, combined with strong currents, storms, and frequent periods of heavy fog, created an environment in which shipwrecks on shore and collisions at sea were relatively common (Rhode Island CRMC 2010).

During the development of the Call Area, several members of the task forces requested that the coastal areas not be considered for leasing because visible structures in offshore areas could degrade onshore historical and cultural resources. In consideration of this request, Alternative C would exclude all areas within 15 nautical miles (NM) of the inhabited Massachusetts coastline from leasing consideration because of potential impacts on visual and cultural resources (Figure 2-2). The impacts of Alternative C on environmental and socioeconomic resources are described in detail in Section 4.3 of this EA.

2.4 Alternative D: Area Exclusion within 21 Nautical Miles of the Massachusetts Coastline

The Tribal Historic Preservation Officer of the Wampanoag Tribe of Gay Head (Aquinnah) requested a minimum distance of 21 NM from the Massachusetts coastline. The Wampanoag Tribe of Gay Head (Aquinnah) has tribal lands on the west side of Martha's Vineyard that include Gay Head Cliffs, which are designated as a National Natural Landmark by the NPS. These cliffs are a sacred place to the tribe.

Alternative D would exclude all areas within 21 NM of the inhabited Massachusetts coastline from leasing consideration because of potential impacts on visual and cultural resources (Figure 2-3). The impacts of Alternative D on environmental and socioeconomic resources are described in detail in Section 4.4 of this EA.

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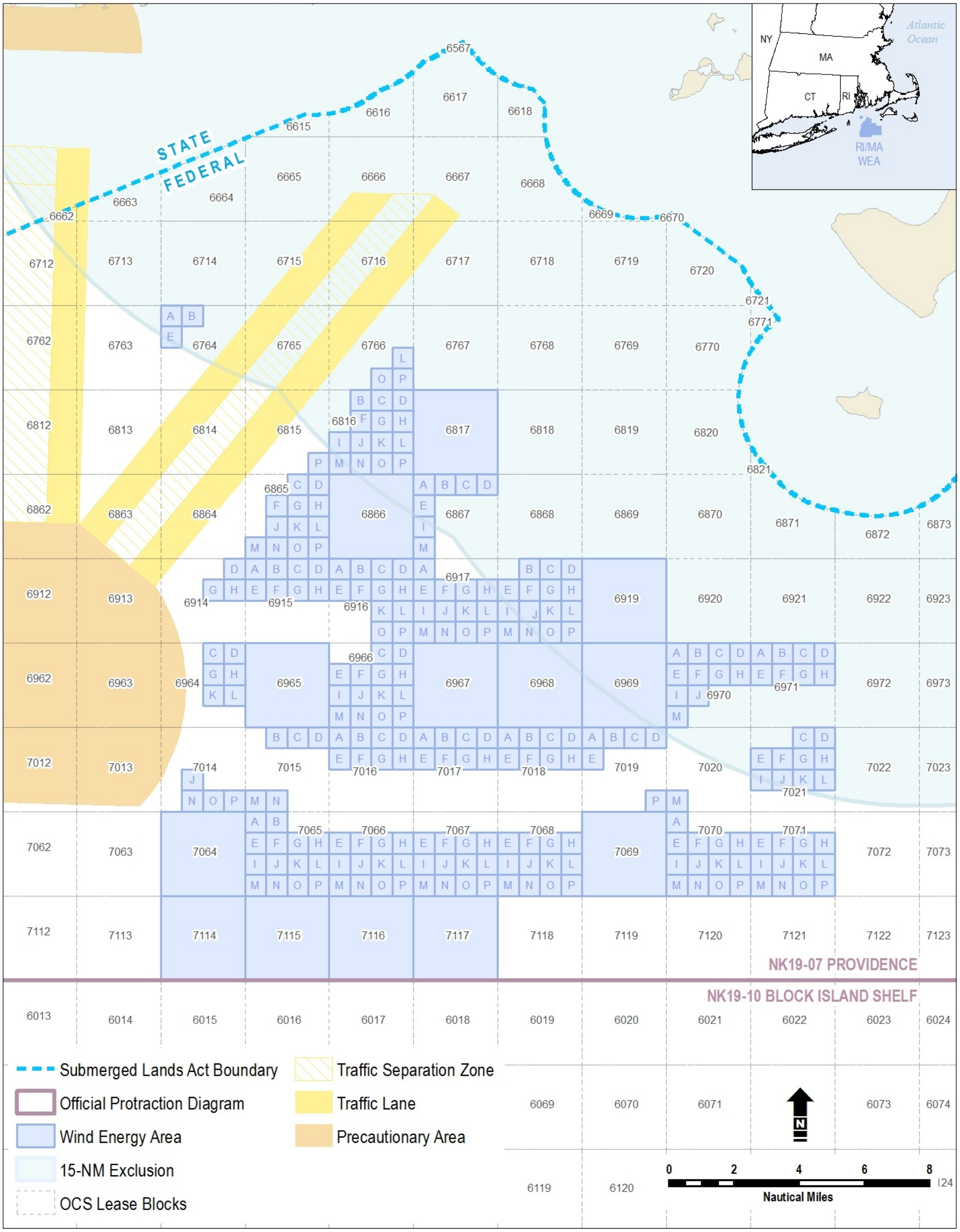

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011

Figure 2-2. Alternative C: Areas within 15-NM of the Inhabited Coastline.

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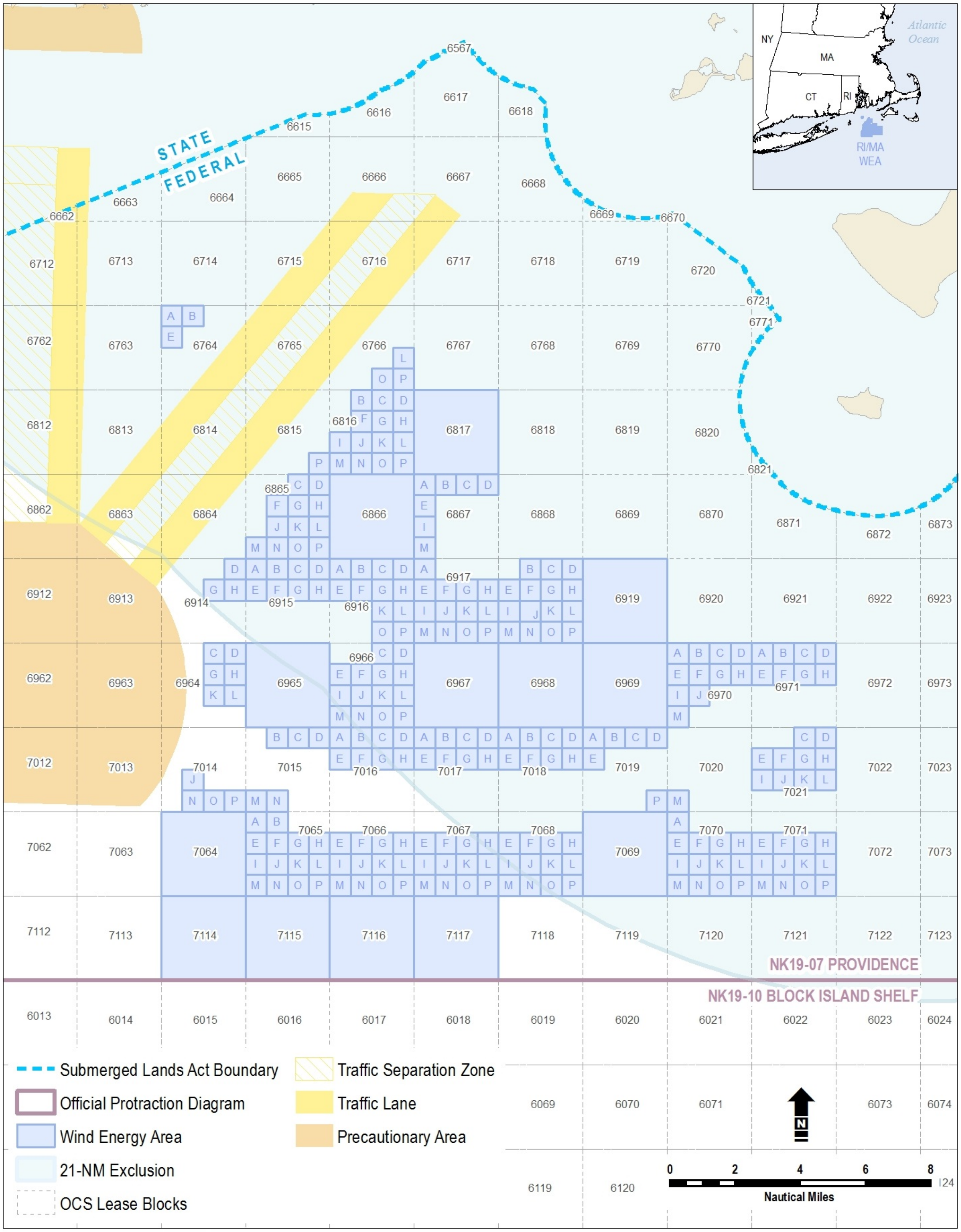

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011

Figure 2-3. Alternative D: Areas within 21-NM of the Inhabited Coastline.

2.5 Alternative E: Area Exclusion for Telecommunication Cables

Telecommunications cables are protected by international treaties dating to 1884, with the most recent being the United Nations Law of the Sea Convention of 1982. These treaties outline provisions to enable efficient construction, protection, and maintenance of communication cables.

Verizon Communications, Inc. (Verizon) is the owner and maintenance authority of the CB-1 (formerly Gemini) underwater telecommunications cable located offshore of Rhode Island. In communications with BOEM, Verizon stated that this cable is designated as "critical infrastructure" deserving of special protection, citing Homeland Security Presidential Directive 7: Critical Infrastructure Identification, Prioritization, and Protection (2003). Verizon requested that BOEM exclude the areas within the Call Area that overlap with the CB-1 cable. BOEM noted in its Call that Verizon requested the removal of OCS blocks within the southwest portion of the Call Area.

According to Verizon, the CB-1 cable is buried approximately 2 feet (approximately 0.6 meters) under the seabed. When asked if the corridor around the cable could be better refined and possibly reduced to less than an OCS block, Verizon's representative responded that it would require detailed sea-bottom investigations. Even with these additional investigations, Verizon may still want the full blocks removed.

BOEM has received some information indicating that AT&T Inc. (AT&T) also may have a cable with the designation of "critical infrastructure." AT&T might have a similar request for removal of blocks although AT&T did not provide comments for the Call or NOI. Initial information provided to BOEM by AT&T indicates that there are no active cables in the Call Area. However, there appears to be an inactive cable within a portion of the Call Area.

Alternative E would exclude all areas identified by Verizon as containing telecommunications cable(s) from consideration for leasing because of potential impacts on telecommunications cables (Figure 2-4). The impacts of Alternative E on environmental and socioeconomic resources are described in detail in Section 4.5 of this EA.

2.6 Alternative F: No Action Alternative

NEPA requires the analysis of a No Action Alternative. Under the No Action Alternative, no wind energy leases would be issued and no site assessment activities would be approved in the Rhode Island and Massachusetts WEA at this time. While site characterization surveys are not under BOEM's jurisdiction and could still be conducted, it is unlikely that these activities would occur without a commercial energy lease. The impacts of Alternative F (No Action) on environmental and socioeconomic resources are described in detail in Section 4.6 of this EA.

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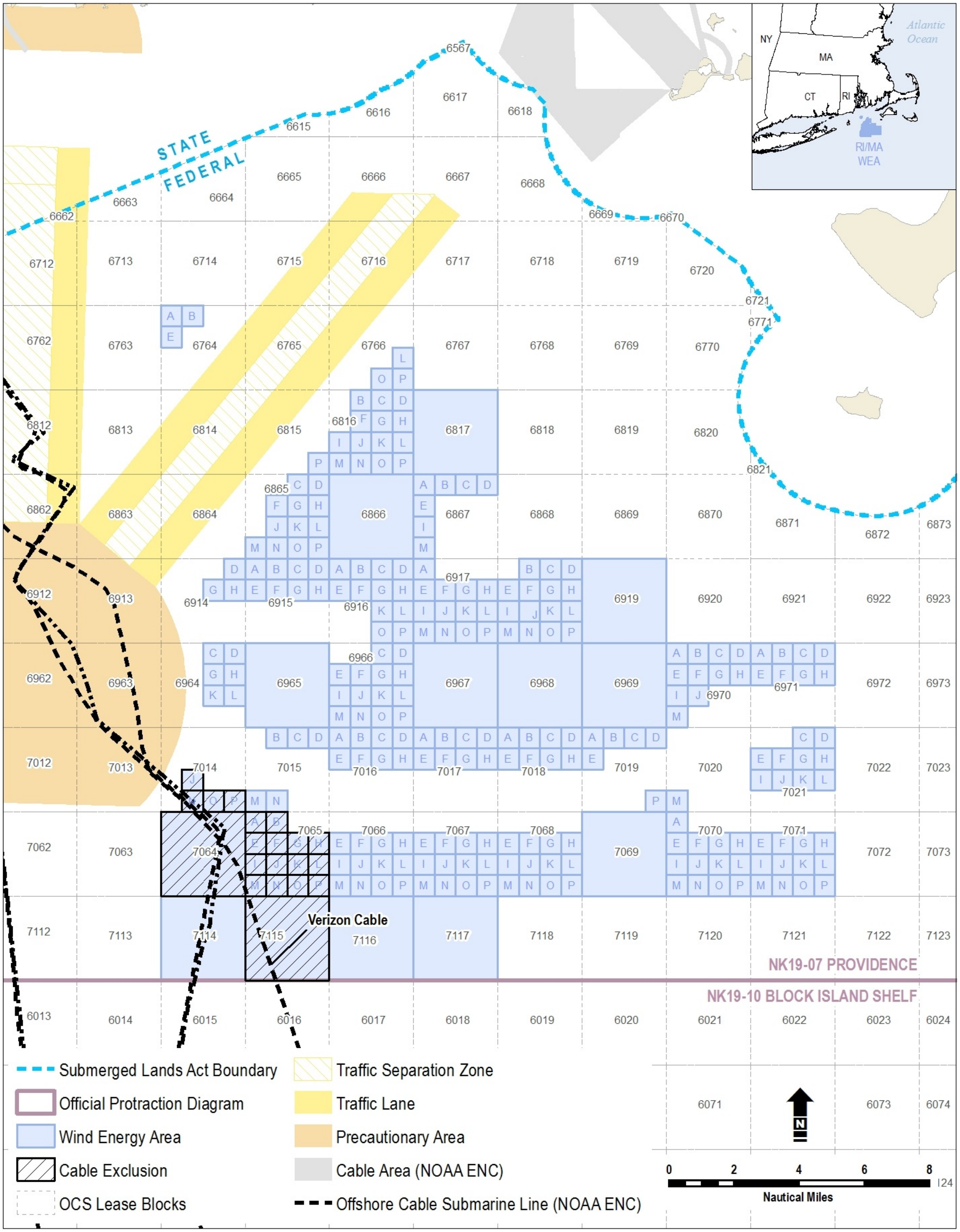

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; URI Environmental Data Center 2009

Figure 2-4. Alternative E: Areas Identified as Containing Telecommunication Cable(s).

2.7 Standard Operating Conditions

Under the renewable energy regulations, after the lease is issued, the lessee may not begin construction/installation of meteorological or other site assessment facilities until a SAP and the site characterization survey reports are submitted to, reviewed, and approved by BOEM (30 CFR 585.605 to 585.618). The lessee's SAP must contain a description of environmental protection features or measures that the lessee would implement.

BOEM's main strategy for minimizing impacts to offshore cultural resources and biologically sensitive habitats has been and will continue to be avoidance. For example, the exact location of meteorological towers and buoys would be adjusted to avoid adverse effects on offshore cultural resources or biologically sensitive habitats, if present. Based on the analysis in this EA, several Standard Operating Conditions (SOCs) were developed to reduce or eliminate the potential environmental risks to or conflicts with individual environmental and socioeconomic resources (*see* Appendix B). These SOCs were developed through the analyses presented in Section 4.1 and through consultation with other federal and state agencies.

BOEM has analyzed and refined the SOCs as part of the proposed action in this revised EA based upon staff recommendations and consultations with the NMFS and the USFWS pursuant to obligations under the ESA, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and public comments received. At this time, no fishery or fishery-related SOCs are for the lease issuance and site characterization activity. Development of any additional measures addressing these resources and potential impacts related to construction and operation of a wind energy facility will be considered at a future time as part of the consultations and assessments associated with the review of the COP. Construction and operation of an offshore wind energy facility are not part of the scope of this revised EA. Additional SOCs will be developed and analyzed after the collection and submittal of site characterization and assessment information. In addition, the SOCs in Appendix B incorporate the reasonable and prudent measures to protect endangered species required by the NMFS through their April 10, 2013, Biological Opinion[2] of BOEM's assessment of the proposed action (*see* Section 5.2.1, "Endangered Species Act").

BOEM may add other measures designed to mitigate the potential impacts of lease-specific site characterization activities and site assessment activities in the form of lease stipulations and/or conditions of approval of a SAP.

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[2] *See* http://www.nero.noaa.gov/protected/section7/bo/actbiops/boem_ocs_wind_energy_april_2013.pdf.

3 SCENARIO OF REASONABLY FORESEEABLE ACTIVITY AND IMPACT-PRODUCING FACTORS

To describe the level of activity that could reasonably result from the proposed action and alternatives, BOEM developed scenarios for routine activities (Section 3.1) and for non-routine events (Section 3.2). These scenarios provide the framework for the analyses of potential environmental and socioeconomic impacts of the proposed action (Section 4.1) and alternatives (Sections 4.2 through 4.6).

3.1 Routine Activities

This section discusses the reasonably foreseeable leasing scenario, infrastructure that could be built, and the activities (impact-producing factors) that could occur on those leases over the site assessment period (five years per lease [*see* Table 3-1]) subsequent to lease issuance, including site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological and oceanographic data collection facilities. The routine scenario is intended to be broad enough to cover the range of activities and structure types that would be allowed under a commercial wind lease and a SAP.

Table 3-1
Projected Site Characterization and Assessment Activities for the Proposed Action in the Rhode Island and Massachusetts Wind Energy Area

	Site Characterization Activities		Site Assessment Activities	
Leaseholds	High-Resolution Geophysical (HRG) Surveys (max NM/hours)	Geotechnical Sampling (min - max)	Installation of Meteorological Towers (max)	Installation of Meteorological Buoys (max)
Up to 4	17,500/4,000	500 - 1,400	4	8

3.1.1 Leasing Scenario

A reasonably foreseeable leasing scenario is necessary to develop a scenario for site characterization and assessment activities. Given that the industry is in its nascency, no historical record exists to use in constructing a leasing scenario for OCS wind energy development in the United States. Instead, BOEM based its leasing scenario assumptions on responses to BOEM's Call for the area offshore of Rhode Island and Massachusetts, published August 18, 2011 (*see* Section 1.5).

In response to the Call, BOEM received eight overlapping nominations of interest ranging from 350 megawatts (MW) to 2,000 MW. Based on the expressions of commercial wind energy development interest received by BOEM (Figure 3-1), it is assumed that the entire WEA would be leased. At the time, BOEM had not yet determined the auction format or the number of areas within the WEA that may be offered for competitive lease issuance, so for the purposes of creating a scenario, BOEM estimated that, under Alternative A, up to four leases may be issued on a competitive basis for the Rhode Island and Massachusetts WEA.

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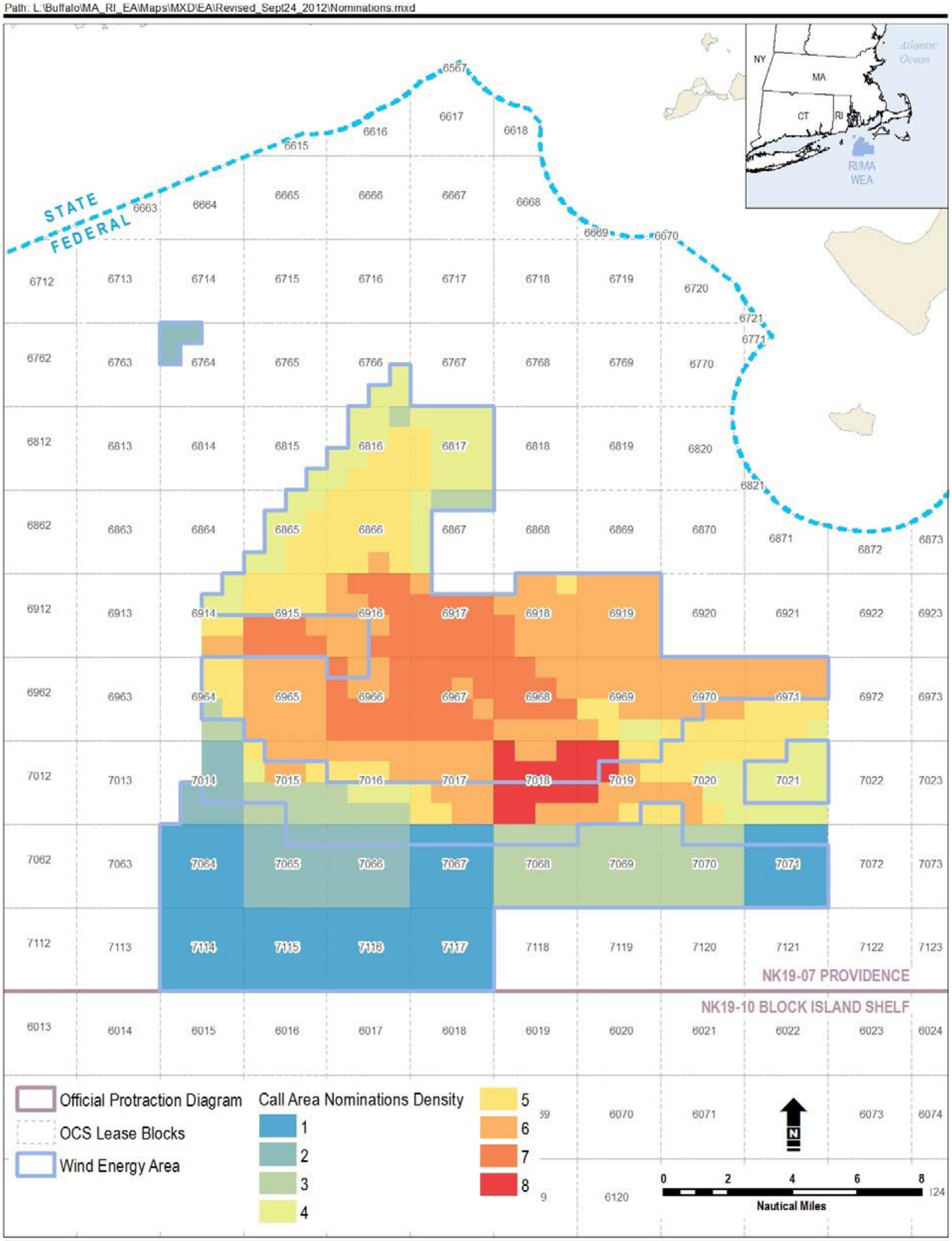

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011

Figure 3-1. Eight Overlapping Nominations of Interest Received in Response to the Call for Information and Nominations.

BOEM generated this estimate from the maximum project proposed in response to the Call and an average size of 500 MW for a typical wind energy facility (*see* also Section 1.5 for additional information).

3.1.2 Site Characterization Surveys

BOEM regulations require that a lessee provide the results of a number of surveys with both a SAP and a COP, including a shallow hazards survey, a geological survey, biological surveys, a geotechnical survey, and archaeological resource surveys (30 CFR 585.626 (a)(1) to (a)(5), respectively). BOEM refers to these surveys as "site characterization" activities. It is assumed that the site of a meteorological tower or buoy would be surveyed first to meet the similar data requirements for a lessee's SAP (30 CFR 585.610 and 585.611), and the site of a meteorological tower or buoy would not be resurveyed when the remainder of the leasehold is surveyed to meet the data requirements for a lessee's COP (30 CFR 585.626(a)). Although BOEM does not issue permits or approvals for these site characterization activities, the agency will not consider approving a lessee's SAP or COP if the required survey information is not included. As it is unlikely that any applicant would invest in undertaking these potentially expensive site characterizations prior to acquiring a lease (which would convey the exclusive right to apply for a SAP and a COP), and since the survey information must be submitted to BOEM before any SAP or COP could be approved, this revised EA treats site characterization activities as actions connected to the issuance of a lease.

As described in the Programmatic EIS (USDOI, MMS 2007), site characterization (e.g., locating shallow hazards, cultural resources, and hardbottom areas; evaluating installation feasibility; assisting in the selection of appropriate foundation system designs; and determining the variability of subsurface sediments) would necessitate using high-resolution geophysical (HRG) surveys and geotechnical sampling. On November 9, 2012, BOEM made the GGARCH guidelines (USDOI, BOEM, OREP 2012a) publicly available on its website.[3] These guidelines detail the information required to satisfy 30 CFR 585.626(a). In this guidance, the agency describes survey methods that, if lessees follow them, would yield information sufficient to allow the agency to consider approving a SAP or a COP. For the purposes of this site characterization scenario, BOEM assumes that all lessees would employ these methods or methods substantially similar to acquire the information required under 30 CFR 585.610 (b), 585.611 (SAP), and 30 CFR 585.626(a) (COP).

Lessees would be required to submit survey information only for those areas that would be disturbed or otherwise affected by the future actions it proposes for a lease area (*see* GGARCH guidelines [USDOI, BOEM, OREP 2012a]; *see also* 30 CFR 585.626). As explained further in Sections 3.1.2.1, 3.1.2.2, and 3.1.2.3, different types of site characterization surveys would be necessary to acquire the various types of information required by the regulations. Surveys with wider line spacing would likely be conducted for an entire lease area, while surveys for which narrower line spacing is recommended may be limited to the actual area of disturbance. This area of disturbance may or may not be equal to the entire lease area. However, in the absence of

[3] *see* http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx.

any specific proposal for ground-disturbing activities, it is assumed that a lessee would survey the entire lease area at the narrower line spacing, provided that the lessee plans to install bottom-founded structures or equipment over the entire lease area. If the lessee only plans to use a portion of the leased area, the survey requirements would be adjusted to cover the installation of bottom-founded structures or equipment over that portion of the lease area.

This assumption is reasonable because acquiring survey information for the entire lease area would give the lessee the maximum flexibility to propose structures in any area of a lease. For example, if the lessee only surveyed a portion of its lease, then, under 30 CFR 585.610(b), 585.611 (SAP), and 585.626(a) (COP), it could only propose building meteorological towers or installing buoys or future wind energy facilities in those areas. If those surveys reveal the presence in those areas of, for example, cultural resources or critical habitat that would preclude such development, then the lessee would need to conduct additional surveys on other portions of the lease that had not been previously surveyed to find a location suitable for construction. Doing so would duplicate the mobilization costs (both financially and in terms of time) associated with the additional surveys. As a practical matter, comprehensive lease surveys would be far more efficient and would allow the lessee the greatest flexibility in determining where on the leasehold to propose renewable energy-related structures. Comprehensive surveys also would accelerate the timeline for the lessee's proposed activities by eliminating the delays and costs associated with conducting surveys in stages.

Thus, it is assumed here that surveys would be conducted over the maximum amount of the leased area in the WEA as appropriate for the specific survey and the potential environmental effects associated with maximum surveying would be analyzed. The extent to which lessees survey less than 100 percent of their leasehold area would be the same extent to which the potential environmental effects associated with site characterization activities would be less than the effects analyzed in this EA. If the lessee opts to conduct its surveys in stages, it is assumed that the potential site of a meteorological tower or buoy would be surveyed first to meet the data requirements for a lessee's SAP (30 CFR 585.610 and 585.611) and that this site would not be resurveyed when the remainder of the leasehold is surveyed to meet similar data requirements for a lessee's COP (30 CFR 585.626(a)).

As discussed below in Section 3.1.2.1, in order to meet the information requirements of 30 CFR 585.610(b) and 585.626(a), different surveys would be conducted at various line spacings (*see* GGARCH guidelines [USDOI, BOEM, OREP 2012a]). The survey instruments needed to be towed behind the survey vessel at a wider line spacing would very likely be attached to the same vessel surveying for a different resource at the narrower line spacing. For example, there would be no need to incur the extra time and expense in sending one vessel out to survey the lease area at 492 feet (150 meters) line spacing for one survey and to send another vessel to conduct a different survey of the lease area at approximately 98 feet (30 meters) line spacing when a single vessel could do both simultaneously (*see* GGARCH guidelines [USDOI, BOEM, OREP 2012a]). As a result, it is assumed here that the lessees would not conduct separate, redundant surveys based on needed line spacing when the same vessel (or group of vessels) following the smallest line spacing could conduct the surveys necessary to acquire all relevant data in a single trip.

3.1.2.1 High-Resolution Geophysical Surveys

The lessee must submit the results of site characterization surveys with their SAP (30 CFR 585.610 and 585.611) and COP (30 CFR 585.626(a) and 585.627). The purpose of the HRG survey would be to acquire geophysical shallow hazards data and information pertaining to the presence or absence of archaeological resources and to conduct bathymetric charting.

Assuming lessees would follow the GGARCH guidelines (USDOI, BOEM, OREP 2012a) to meet the geophysical data requirements of 30 CFR 585.626(a), BOEM anticipates that the surveys would entail the following:

- Collecting geophysical data for shallow hazards assessments using magnetometer, side-scan sonar, and sub-bottom profilers flown at approximately 492 feet (150 meters) line spacing over the lease area.
- Collecting geophysical data for archaeological resources assessments using magnetometers, side-scan sonar, and sub-bottom profilers flown at approximately 98 feet (30 meters) line spacing.
- Collecting bathymetric charting information using a multi-beam echo sounder.

Possible types of HRG survey equipment are summarized below. Table 3-2 lists these typical types of equipment used in HRG site surveys and their acoustic intensity.

Bathymetry/Depth Sounder: A depth sounder is a microprocessor-controlled, high-resolution survey-grade system that measures precise water depths in both digital and graphic formats (PAL 2006 *as cited in* USDOI, BOEM, OREP 2012b). The system would be used in a manner that would record with a sweep appropriate to the range of depths expected in the survey area. BOEM's analysis assumes the use of multi-beam and/or single-beam bathymetry systems. The use of a multi-beam bathymetry system may be more appropriate for characterizing lease areas that contain complex topography or fragile habitats.

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

Seafloor Imagery/Side-Scan Sonar: This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (USDOI, MMS 2007). A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or 'pingers') located on the sides, which generate and record the returning sound that travels through the water column at a known speed. To meet regulatory requirements as explained in the GGARCH guidelines (USDOI, BOEM, OREP 2012a), it is anticipated that lessees would use a digital dual-frequency side-scan sonar system with frequencies of 445 and 900 kiloHertz (kHz) and no less than 100 and 500 kHz to record continuous planimetric images of the seafloor.

Shallow and Medium (Seismic) Penetration Sub-bottom Profilers: Typically, a high-resolution compressed high-intensity radar pulse (CHIRP) system sub-bottom profiler is used to generate a profile view below the bottom of the seabed, which is interpreted to develop a geologic cross-section of subsurface sediment conditions under the track line surveyed. A boomer (seismic reflection profiling equipment that typically operates at low frequencies [ranging typically from about 0.5 to 4 kHz]) sub-bottom profiler system is capable of penetrating depths of 32 to 328 feet (10 to 100 meters), depending on frequency and seafloor composition.

Table 3-2
Typical Equipment to be Used During a High-Resolution Geophysical Survey

Source	Pulse Length	Broadband Source Level (dB re 1 µPa at 1 m)
Boomer	180 µs	212
Side-scan Sonar	20 ms	226
CHIRP Sub-bottom Profiler	64 ms	222
Multi-beam Depth Sounder	225 µs	213

Key:
µs = microseconds.
CHIRP = compressed high-intensity radar pulse.
dB re 1 µPa at 1 m = decibels referenced to 1 microPascal at 1 meter.
ms = milliseconds.

Source: USDOI, BOEM 2012a.

The types of equipment listed here are representative of equipment that lessees have proposed to BOEM in draft project plans received under Interim Policy leases[4]. It should be noted that actual equipment could use frequencies and/or sound pressure levels somewhat below or above those indicated in Table 3-2. This scenario does not include using any air guns for deep seabed penetration in order to determine the location, extent, and properties of oil and gas resources (such as two-dimensional and three-dimensional exploratory seismic surveys) because renewable energy facilities are placed meters, rather than miles, deep into the seabed.

Scenario for HRG Surveys

This revised EA assumes that the WEA would be surveyed in its entirety and that geophysical surveys for shallow hazards (approximately 492 feet [150 meters] line spacing) and archaeological resources (approximately 98 feet [30 meters] line spacing) would be conducted at the same time and on the same vessels conducting sweeps at the finer line spacing. This would result in about 500 NM of HRG surveys per OCS block (3 statute miles by 3 statute miles [approximately 5 kilometers by 5 kilometers]), not including turns. Assuming a vessel speed of 4.5 knots (Continental Shelf Associates, Inc. 2004) and 10-hour days (daylight hours minus transit time to the site), it would take about 11 days to survey one OCS block or about 100 days to survey an average-sized lease of about eight or nine OCS blocks.

[4] *see* http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx#Interim_Policy

3.1.2.2 Geotechnical Sampling

Geotechnical sampling is used to assess the suitability of shallow foundation soils for supporting a structure or transmission cable under any operational and environmental conditions that might be encountered (including extreme events) and to document soil characteristics necessary for the design and installation of all structures and cables. Sub-bottom sampling obtains physical and chemical data on surface sediments to provide a detailed geotechnical evaluation of the structure's foundation(s) based on analysis of soil borings from the site (e.g., 30 CFR 585.626(4)). The results allow for a thorough investigation of the stratigraphic and geo-engineering properties of the sediment that may affect the foundations or anchoring systems of a wind energy project, which would be necessary for BOEM to consider in a SAP or, later, a COP for a given lease. Geotechnical samples of foundation soils should also be collected and tested to thoroughly understand engineering properties in the area of interest. Because of the cost of each geotechnical sample, BOEM assumes that the lessee would first conduct the HRG surveys and integrate the results of HRG surveys (including analysis of archeological, shallow hazard, and bathymetric data) in planning the geotechnical site survey and in selecting locations/depths of soil samples and in situ tests. (Costs can range from $25,000 to $35,000 per cone penetration test [CPT] to $500,000 per deep boring.) In the renewable energy context, "deep" is considered to be approximately 427 feet (approximately 130 meters) below the seabed (USDOI, BOEM, OREP 2012b).

Scenario for Geotechnical Sampling

Renewable energy regulations require geotechnical samples and sediment testing at the site of any proposed bottom-founded structure (30 CFR 585.610(b) for the SAP and for the COP (585.626(a)). This scenario assumes that one geotechnical sample would be taken at the foundation location for each anticipated meteorological tower and/or buoy. (*See* Section 3.1.3 below for a description of the reasonably foreseeable scenario for the installation of meteorological towers and/or buoys associated with the proposed action.) The number of geotechnical samples required for COPs would depend on the number of turbines a lessee ultimately proposes (30 CFR 585.626(a)(4). As discussed in the Programmatic EIS (USDOI, MMS 2007), spacing between turbines is based on rotor diameter, which is associated with turbine size and is typically determined on a case-by-case basis to minimize wake effect. For example, in Denmark's offshore applications, a spacing of seven rotor diameters between units has been used (USDOI, MMS 2007). Spacing of 6-by-9 rotor diameters, or six rotor diameters between turbines in a row and nine rotor diameters between rows was approved for the Cape Wind project (USDOI, MMS 2009b). In some land-based settings, turbines are separated by much greater distances, as much as 10 rotor diameters from each other (USDOI, MMS 2007). Based on this range in spacing for a 3.6-MW (110-meter rotor diameter) turbine and a 5-MW (130-meter rotor diameter) turbine, it would be possible to place 14 to 40 turbines in one OCS block (3 statute miles by 3 statute miles [approximately 5 kilometers by 5 kilometers]). Assuming: (1) a "maximum" scenario of wind development on every OCS block (which is extremely unlikely, but the lower number of samples associated with less development would result in lower environmental impacts), and (2) that a geotechnical sample (vibracore, CPT, and/or deep boring) would be conducted at every potential wind turbine location throughout the

WEA, and (3) that geotechnical sampling would be conducted every nautical mile along each of the up-to-four projected transmission corridors to shore[5] (*see* GGARCH guidelines [USDOI, BOEM, OREP 2012a]), and (4) that a geotechnical sampling would be conducted at the foundation of each meteorological tower and/or buoy, and (5) the HRG survey could total up to 17,500 NM under Alternative A.

3.1.2.3 Biological Surveys

A lessee must submit the results of biological surveys with its SAP (30 CFR 585.610(b)(5)) and COP (30 CFR 585.626(a)(3)). To assist BOEM in complying with NEPA and other relevant laws, a lessee's SAP and COP must describe biological resources, including avian resources, that could be affected by the activities proposed in its plan (30 CFR 585.611(a),(b)(5) and 585.627(a)). Once a plan is submitted, BOEM, in consultation with the USFWS and the NMFS, would determine whether there is sufficient information to characterize species distribution and abundance and assess the potential impacts of the proposed activities.

Vessel and/or aerial surveys would need to characterize three primary biological resources categories: (1) benthic habitats; (2) avian resources; and (3) marine fauna. It is assumed all vessels and aircraft associated with the proposed action would be required to abide by the Vessel Strike Avoidance Measures detailed in Appendix B. If take of marine mammals is anticipated to occur as a result of the activity then appropriate authorizations under the MMPA must be obtained.

Benthic Habitats

The shallow hazard and geological and geotechnical surveys described in Section 3.1.2.1 above would capture all the salient features of the benthic habitat on the leasehold. These surveys would acquire information suggesting the presence or absence of exposed hardbottoms of high, moderate, or low relief; hardbottoms covered by thin, ephemeral sand layers; seagrass patches; and other algal beds, all of which are key characteristics of benthic habitat (*see* Section 4.1.2.2, "Coastal and Benthic Habitats"). As a result, BOEM does not anticipate that lessees would need to conduct separate surveys to characterize the benthic habitats that could be affected by their potential future leasehold activities because the geological and geotechnical surveys (*see* Section 3.1.2.1 above) would provide enough detailed information for BOEM to adequately assess potential impacts on benthic habitats in a specific lease area.

Avian Resources

Under renewable energy regulations at 30 CFR 585.626(a)(3), lessees are required to describe the state of the avian resources in its lease area in its COP submission. In some areas, such as the Rhode Island and Massachusetts WEA, abundant information is available regarding the avian resources in the area. The *Spatial Distribution, Abundance, and Flight Ecology of Birds in Nearshore and Offshore Waters of Rhode Island: January 2009 to August 2010, Interim Technical Report for the Rhode Island Ocean Special Area Management Plan* (Winiarski *et al.*

[5] The lessee would seek for opportunities to co-locate within a projected transmission corridor, possibly reducing the number of corridors by having one or more transmission cables to shore sited within a particular corridor.

2011) provides quantitative estimates of the spatial distribution and abundance of birds in the nearshore and offshore waters of Rhode Island. Avian surveys of a lease area may be required before submitting a COP. The survey protocols and duration, developed based on the best available science for minimizing uncertainty in avian counts, will be chosen by BOEM in consultation with the USFWS and the lessee, and may generally last two to three years (see BOEM's "Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585"[6]. The information resulting from these surveys will ensure that adequate site-specific data are available to inform siting and permitting decisions. Avian surveys generally involve simple visual observation, either from a vessel or aircraft. Shipboard observations would generally be sufficient for the purpose of identifying the state of avian resources in the lease area, and it would be most efficient for lessees to survey for avian resources while conducting the other surveys described above. The goal of the surveys is to define the spatial distribution of avian species throughout the year in areas that a lessee ultimately proposes to develop (30 CFR 585.626). The environmental analysis in this revised EA assumes that lessees would conduct monthly boat and/or aerial surveys for two to three years, during the site assessment period of a lease, before submitting a COP, which would capture the seasonal variation in avian numbers. Similar to guidelines developed in Germany, boat surveys would likely cover 10 percent of the lease area (Bundesamt für Seeschifffahrt und Hydrographie 2007). It is estimated it would take one to two days to cover 10 percent of an average-sized leasehold of about eight OCS blocks, which would likely be adequate for determining the presence of avian species. Surveying the same area using aerial surveys would take less than one day. Although these surveys could be made from vessels conducting site characterization and assessment activities in the lease area, BOEM anticipates that a typical lease area (based on an average leasehold of eight OCS blocks) may be subject to a maximum of 24 to 72 additional boat and/or aerial surveys for the purpose of characterizing avian resources. If a lessee requires less time to adequately characterize the avian resources of its leasehold, and vessels used for site assessment and characterization activities are used for 100 percent of the avian surveys, or if adequate information regarding the state of avian resources already exists, then the environmental impacts associated with conducting avian surveys would be less than those discussed in this revised EA (*see* Section 4.1.2.1, "Avian and Bat Resources.")

Marine Fauna

Under the renewable energy regulations, lessees are required to describe the state of marine mammals, sea turtles, and fish resources in its lease area in its SAP submission (30 CFR 585.610(b)) and COP submission (30 CFR 585.626(a)(3)). The distribution and relative abundance of marine mammals and sea turtles in the waters of the Ocean SAMP study area—encompassing Narragansett Bay, Block Island Sound, Rhode Island Sound, and nearby coastal and continental shelf areas—were assessed using all of the available sources of information on the occurrence of marine mammals and sea turtles in that study area (Kenney and Vigness-Raposa 2010).[7] The relationship between benthic habitat complexity and demersal fish community diversity in the waters of the Ocean SAMP study area (as described previously),

[6] *See* http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx.
[7] *See* http://seagrant.gso.uri.edu/oceansamp/pdf/appendix/10-Kenney-MM&T.pdf.

were assessed via demersal fish community sampling efforts and side-scan sonar data collected from various locations within Rhode Island and Block Island Sounds (Malek *et al.* 2010)[8]. Although the assessments, "Marine Mammals and Sea Turtles of Narragansett Bay, Block Island Sound, Rhode Island Sound, and Nearby Waters: An Analysis of Existing Data for the Rhode Island Ocean Special Area Management Plan," and "Fisheries Ecology in Rhode Island and Block Island Sounds for the Rhode Island Ocean Special Area Management Plan 2010," both include the entire AMI (Rhode Island Sound, Block Island Sound, and adjacent continental shelf waters out to about the 50-meter isobath), BOEM anticipates that leases in a WEA that have not yet been surveyed for marine resources would need to characterize the state of these resources to meet the COP information requirement.

Multi-year assessment periods may be necessary to capture natural seasonal and inter-annual variability of marine fauna within the WEA and immediate surroundings. Some data on the presence or absence and densities of marine fauna within the WEA and immediate surroundings are readily available. However, these data are often incomplete or may not be available at a scale fine enough to assess the potential impacts of activities within a certain lease area. It is generally envisioned that fish, marine mammal, sea turtle, and bird aerial and shipboard surveys could be conducted simultaneously. Shipboard observations would generally be sufficient for the purpose of identifying the state of marine mammals in the lease area, and survey vessels and aircraft would likely already have marine mammal observers on board due to standard NMFS requirements and their incidental harassment authorization (IHA) under the MMPA (*also see* informal consultation for "Non-Competitive Lease for Wind Resource Data Collection on the Northeast Outer Continental Shelf" [Kurkul 2009; U.S. Department of Commerce {USDOC}, NOAA, NMFS 2010a and 2010b *as cited in* USDOI, BOEM, OREP 2012b] and "Biological Opinion on the Cape Wind Energy Project of Nantucket Sound" [NMFS 2010a]). Marine fauna information also could be efficiently obtained through instrumentation installed on a meteorological tower or buoy, such as Acoustic Doppler Current Profilers (ADCPs; Fiedler, Barlow, and Gerrodette 1998) or fixed passive acoustic monitors (PAMs) (to detect both marine mammals and fish species). In addition, marine fauna information from surveys can be supplemented with publicly available information on geography website portals that aggregate siting information from several different sources.

Independent marine fauna surveys may be needed in special circumstances or to address important data gaps. Shipboard and aerial survey information may be augmented by the deployment of PAMs in such cases (including both marine mammal and fish detection systems). As a result of the potential variability in data, the ability or inability to couple different surveys together, and the fact that it is unlikely that there would be any substantial data gaps after vessel surveys and monitoring via meteorological tower/buoy instrumentation, BOEM anticipates that very little, if any, additional vessel or aerial traffic would be associated with marine fauna surveys within the WEA.

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[8] *See* http://seagrant.gso.uri.edu/oceansamp/pdf/appendix/14-Maleketal_RISAMP.pdf.

3.1.2.4 Timing

The timing of lease issuance and weather and sea conditions would be the primary factors influencing timing of survey activities. Under the reasonably foreseeable site characterization scenario, BOEM would issue leases in 2013. It is assumed lessees would begin survey activities as soon as possible after receiving a lease and as sea states and weather conditions permit. The most suitable sea states and weather conditions would occur from April to August (Atlantic Renewable Energy Corporation and AWS Scientific, Inc. 2004). Although lessees have five years for site characterization activities before a lessee must submit a COP (30 CFR 585.235(a)(2)), the lessee must submit a SAP within six months of lease issuance (30 CFR 585.235 (a)(1)). It is anticipated that the site characterization activities required for preparation of the SAP would take place in the first six months after lease issuance (30 CFR 585.610). The majority of the remaining site assessment and site characterization activities would take place in years 1 through 3 to allow time to prepare the COP which must be submitted six months prior to the expiration of the five-year lease term. This would mean that for leases issued in 2013, the majority of the site assessment surveys would be conducted from 2013 through 2016. Under Alternative A (the proposed action and preferred alternative), site characterization is projected to occur over five years, from 2013 to 2018.

3.1.2.5 Onshore Activities

As noted in Section 3.1.2.4, the timing of lease issuance and weather and sea conditions would be the primary factors influencing timing of survey activities. Under the reasonably foreseeable site characterization scenario, BOEM would issue leases in 2013. It is assumed lessees would begin survey activities as soon as possible after receiving a lease and as sea states and weather conditions permit. This premise would be to "front-load" the work during the five-year lease term. In order to survey all of the potential leases in the WEA, site characterization surveys would have to use multiple vessels, considering that the entire WEA may be leased. Since using vessels that could accommodate all of the necessary survey equipment and conducting as many surveys simultaneously would be most efficient, BOEM anticipates that 65- to 100-feet-long vessels would be used, depending on availability. Vessels must be able to accommodate a crew for several days and be large enough to mount enough cable to tow instruments. Survey vessels would use existing ports and harbors for trip departures and returns and require a diesel refueling station. Vessels conducting HRG surveys and geotechnical sampling work can either depart from one of the 18 large commercial ports or numerous smaller (Figure 3-2) commercial ports (if those ports meet the requirements of the project) along the Eastern Seaboard, but primarily from Narragansett Bay because it is closer. The proximity to the lease blocks from a port and availability of suitable vessels would likely be the key determinant of where survey work would originate. Because the survey vessels that are used for HRG surveys and geotechnical sampling are smaller than most commercial ocean-going vessels and require a smaller navigation channel depth, survey vessels can use most existing commercial ports in Types 5 and 6 Waters (*see* Section 4.1.3.7, "Land Use and Coastal Infrastructure" for additional information).

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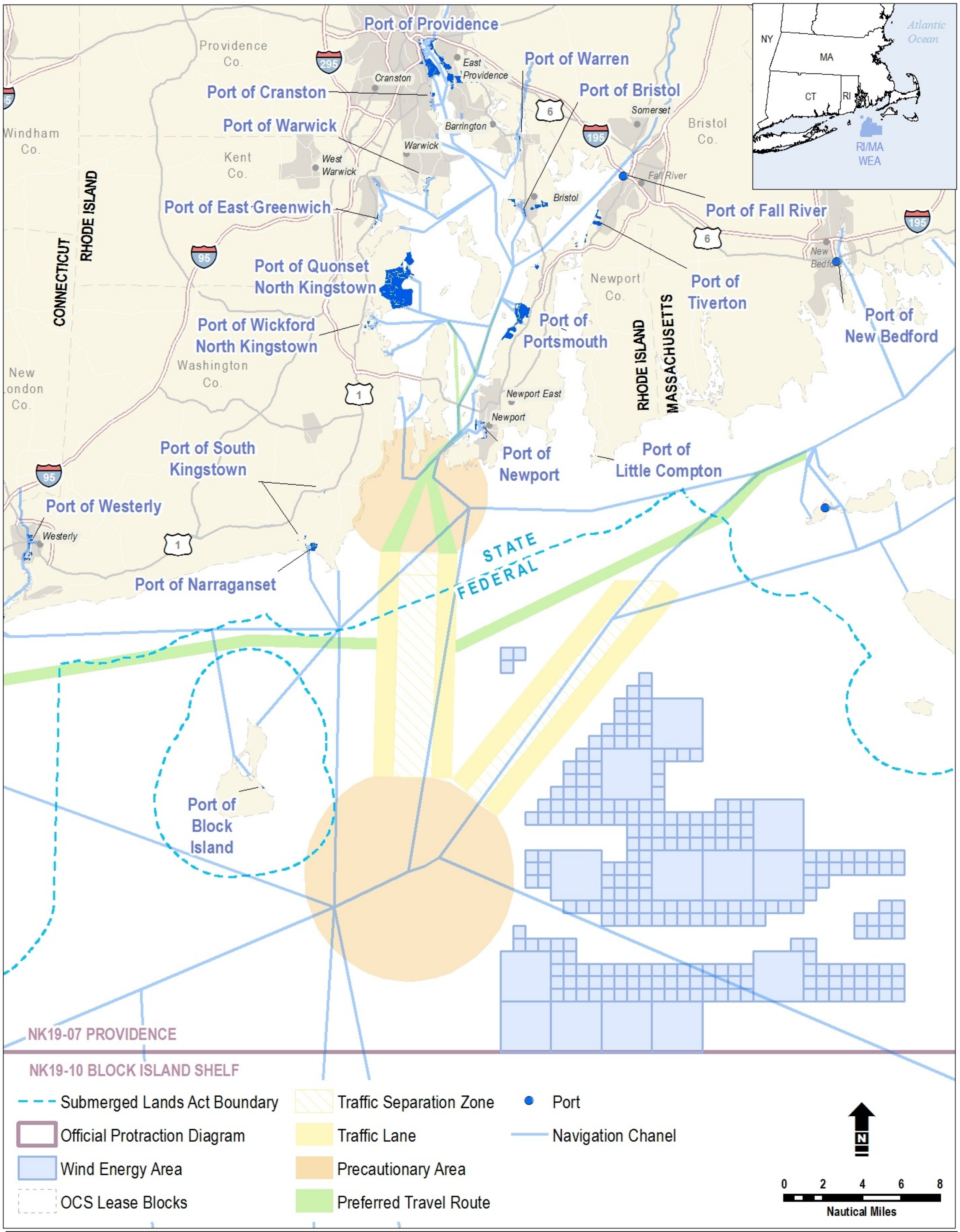

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; RI OceanSAMP 2009

Figure 3-2. Selected Ports and Navigation Features.

3.1.2.6 Vessel Traffic Associated with Site Characterization

Vessel traffic associated with all site characterization surveys (HRG surveys, geotechnical, and biological surveys) is projected to occur over a five-year period, considering that there may be up to four leases awarded [lessees have five years to perform site assessment activities before they must submit a COP (30 CFR 585.235(a)(2)]. The lessee must submit a COP at least six months before the end of the site assessment term if the lessee intends to continue to the lease's operations term (30 CFR 585.618(c)). Table 3-1 notes the number of HRG surveys and number of geotechnical samples that would be associated with the proposed action (*see* Section 3.1.2.4, "Timing," above) and, as explained further in Sections 3.1.2.1, 3.1.2.2, and 3.1.2.3, different types of site characterization surveys would be needed to acquire the necessary information required by the regulations. For HRG surveys, this scenario assumes a vessel speed of 4.5 knots (Continental Shelf Associates, Inc. 2004) and 10-hour days (daylight hours minus transit time to and from the site). For geotechnical sampling, this scenario assumes one vibracore, CPT, and/or deep boring sample would be taken each work day. Each work day would be associated with one round trip. In addition, BOEM presumes that 24 to 72 extra independent surveys would be conducted to characterize avian resources under the proposed action (*see* Section 3.1.2.3, "Biological Surveys," above).

More than half the vessel traffic associated with Alternative A (the proposed action and preferred alternative) would be related to site characterization activities. Unlike the vessel traffic associated with site assessment activities/staging areas for meteorological towers and components (*see* Section 3.1.3.4), which would tend to utilize the larger ports with suitable berth capabilities, the vessels associated with site characterization activities could use any port in the area relative to travel distance considering travel time and other fuel costs.

Based on these assumptions, approximately 930 to 1,970 vessel trips (round trips) associated with all site characterization surveys are projected to occur as a result of the proposed action over five years, from 2013 to 2018.

3.1.2.7 Operational Waste

Operational waste generated from all vessels associated with the proposed action includes bilge and ballast waters, trash and debris, and sanitary and domestic wastes. Bilge water is water that collects in the lower part of a ship (commonly referred to as the ship's bilges). The bilge water is often contaminated by oil that may leak from a vessel's machinery. The discharge of any oil or oily mixtures with more than 15 parts per million (ppm) into the territorial sea is prohibited under 33 CFR 151.10. However, discharge is not prohibited in waters farther than 12 NM from shore if the oil concentration is less than 100 ppm. As a result, to the extent that bilge water is discharged at sea, BOEM anticipates that the discharge would be more likely to occur beyond 12 NM from shore.

Ballast water is used to maintain the stability of the vessel and may be pumped from coastal or marine waters. Generally, the ballast water is pumped into and out of separate compartments and is not usually contaminated with oil. However, the same discharge criteria apply to ballast water as to bilge water (33 CFR 151.10). The vessels associated with site characterization activities are unlikely to require ballasting or de-ballasting to maintain stability because most of the vessels in this service and size range operate with permanent ballast.

The discharge of trash and debris is generally prohibited (*see* 33 CFR 151.51 to 151.77) with the exception of food waste, which may be discharged only if more than 3 miles (approximately 5 kilometers) offshore if it is first passed through a comminutor (garbage disposal) and can pass through a 25-millimeter mesh screen. With limited exceptions, all other trash and debris must be returned to shore for proper disposal at municipal and solid waste facilities. Ballast water may be subject to the USCG Ballast Water Management Program to prevent the spread of aquatic nuisance species (113 FR 32869 [June 14, 2004]). BOEM assumes compliance with regulations and therefore assumes that vessel operators would discharge trash and debris in compliance with applicable regulations. Vessel operators are expected to abide by the USCG Ballast Water Management Program.

All vessels with installed toilet facilities must have an operable Type I (if 65 feet or less in length), Type II, or Type III marine sanitation device (MSD) onboard that complies with 40 CFR 140 and 33 CFR 159. A Type II MSD macerates waste solids so that the discharge contains no suspended particles and has a bacteria count below 200 per 100 milliliters. Type III MSDs are holding tanks and are the most common type of MSD found on boats. These systems are designed to retain or treat the waste until it can be disposed of at the proper shore-side facilities. State and local governments regulate domestic or greywater discharges. However, a state may prohibit the discharge of all sewage within any or all of its waters. Massachusetts' no discharge area (NDA) includes Buzzards Bay, Nantucket, and several of the harbors on Cape Cod in Massachusetts (Figure 3-3). As of August 1998, all of the marine waters in the state of Rhode Island—605 miles (approximately 974 kilometers) of coastline—were designated as an NDA.

Domestic waste consists of all types of wastes generated in the living spaces onboard a ship, including greywater that is generated from dishwasher, shower, laundry, bath and washbasin drains. Greywater from vessels is not regulated outside the state's territory and may be disposed of overboard. Greywater should not be processed through the MSD, which is specifically designed to handle sewage. BOEM assumes that vessel operators would discharge greywater overboard outside of state waters or store it onboard until they are able to dispose of it at a shore-side facility.

3.1.3 Site Assessment Activities and Data Collection Structures

A SAP describes the activities (e.g., installation of meteorological towers and/or buoys) a lessee plans to perform for the assessment of the wind resources and ocean conditions at its commercial lease (30 CFR 585.605). No site assessment activities could take place on a lease until BOEM has approved a lessee's SAP (30 CFR 585.600(a)). Once approved, the site assessment term or time period to conduct site assessment activities for a commercial lease is five years from the date of lease issuance (30 CFR 585.235(a)(2)). It is assumed that each lessee would install some type of data-collection device (e.g., meteorological tower, buoy, or both) on its lease area to assess the wind resources and ocean conditions of the leasehold. This information would allow the lessee to determine whether the lease is suitable for wind energy development, where on the lease it would propose development, and what form of development to propose in a COP.

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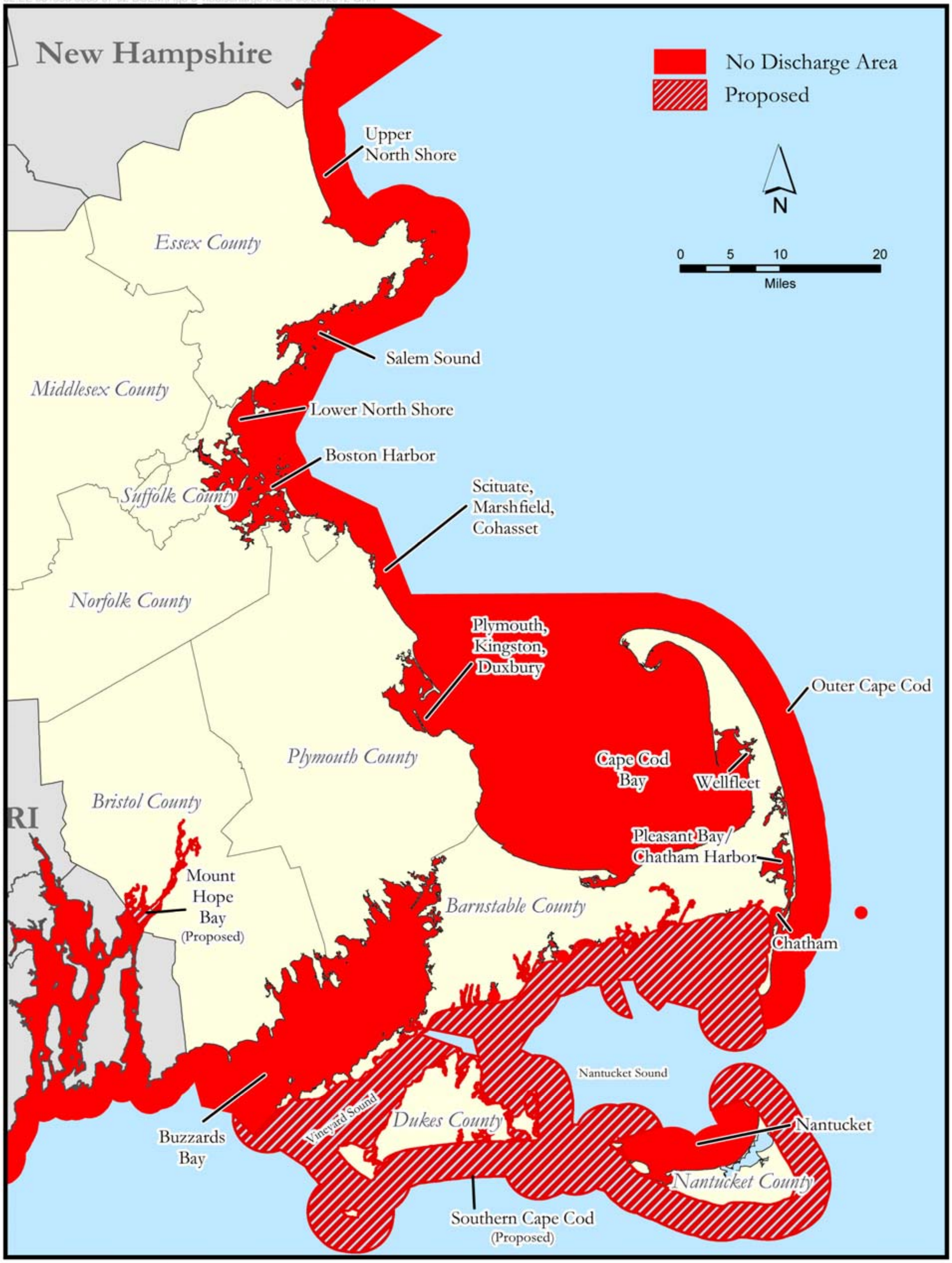


SOURCE: USEPA 2012b (http://www.epa.gov/region1/eco/nodiscrg/ma.html)

Figure 3-3. 2012 No Discharge Areas in Massachusetts.

All of the alternatives described herein assume that lessees would install and operate meteorological towers and/or meteorological buoys to assess wind energy resource potential during the site assessment term of their lease. The lessee must submit a COP at least six months before the end of the site assessment term if the lessee intends to continue to the lease's operations term (30 CFR 585.618(c)). If the COP describes continued use of existing facilities, such as a meteorological tower or buoy approved in the SAP, the lessee may keep such facilities in place on their lease during BOEM review of the COP for approval (30 CFR 585.618(a)). Following the technical and environmental review of the submitted COP, if BOEM determines that such facilities may not remain in place throughout the operations term, the lessee must initiate the decommissioning process (30 CFR 585.618(c)). Depending on how long it takes to install a meteorological tower, whether the lessee submits a COP (or the lease expires), and/or how long subsequent COP approval would take, BOEM anticipates that a meteorological tower would be present for approximately five years before the agency decides whether to allow the tower to remain in place for the lease's operations term or whether the tower should be decommissioned immediately.

The following scenario addresses the reasonably foreseeable range of data collection devices that lessees may install under an approved SAP. The actual tower and foundation type and/or buoy type and anchoring system would be included in a detailed SAP submitted to BOEM, along with the results of site characterization surveys, prior to BOEM's decision to approve, approve with modification, or disapprove a SAP (30 CFR 585.613).

BOEM anticipates that the entire Rhode Island and Massachusetts WEA (proposed action and preferred alternative) would be leased, resulting in up to four leaseholds (*see* Section 3.1.1, "Leasing Scenario"). For each leasehold, zero or one meteorological tower, one or two buoys, or a combination would be constructed or deployed (*see* Table 3-3).

Table 3-3
Projected Number of Meteorological Towers and Buoys
in the Rhode Island and Massachusetts Wind Energy Area

Meteorological Towers (maximum)	Meteorological Buoys (maximum)
4	8

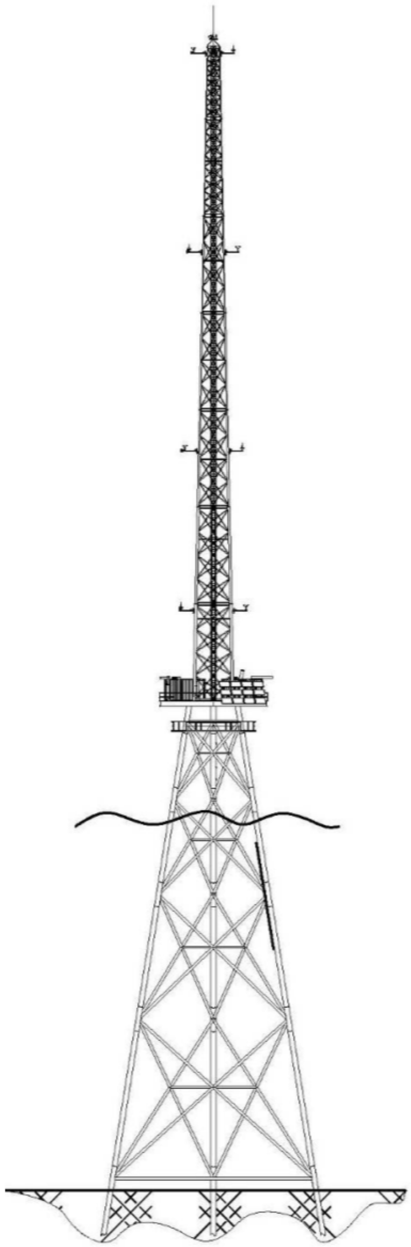
3.1.3.1 Meteorological Towers and Foundations

One of the traditional instruments used for characterizing wind conditions is the meteorological tower. A typical meteorological tower consists of a mast mounted on a foundation anchored to the seafloor. The mast may be either a monopole (Figure 3-4) or a lattice (similar to a radio tower) type (Figure 3-5). The mast and data-collection devices would be mounted on a fixed or pile-supported platform (monopile, jackets, or gravity bases) or floating platform (spar, semi-submersible, or tension-leg) (Figure 3-6).

Source: Cape Wind Associates, LLC 2011a.

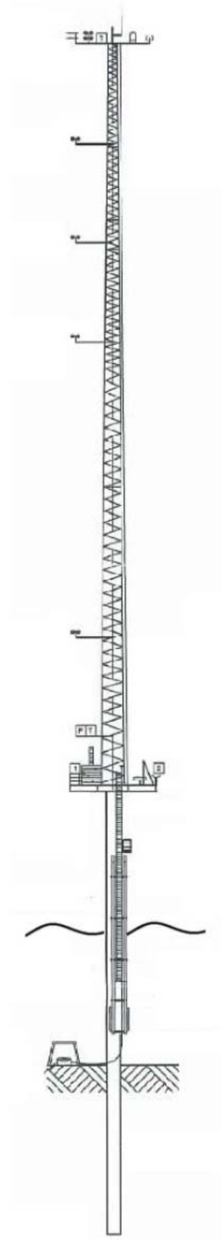
Figure 3-4. Cape Wind Meteorological Tower.

As of this date, no proposals have been submitted for data-collection devices or meteorological towers mounted on a floating platform (spar, semi-submersible, or tension-leg). Since no proposals for these types of floating platforms have been submitted, it is assumed that data collection devices would be mounted on a fixed or pile-supported platform (monopile, jackets, or gravity bases). It is anticipated that fixed or pile-supported platforms—compared with semi-submersible or tension-leg floating platforms—would have fewer impacts from bottom disturbance and noise due to a smaller footprint. If BOEM receives an application for a semi-submersible or tension-leg platform, the agency would consider whether such a platform would lead to environmental consequences not considered in this EA.



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

Figure 3-5(a).
Lattice-type Mast Mounted on a Steel Jacket Foundation.



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

Figure 3-5(b).
Lattice-type Mast Mounted on a Monopile Foundation.

Figure 3-5. Examples of Lattice Mast Meteorological Towers.

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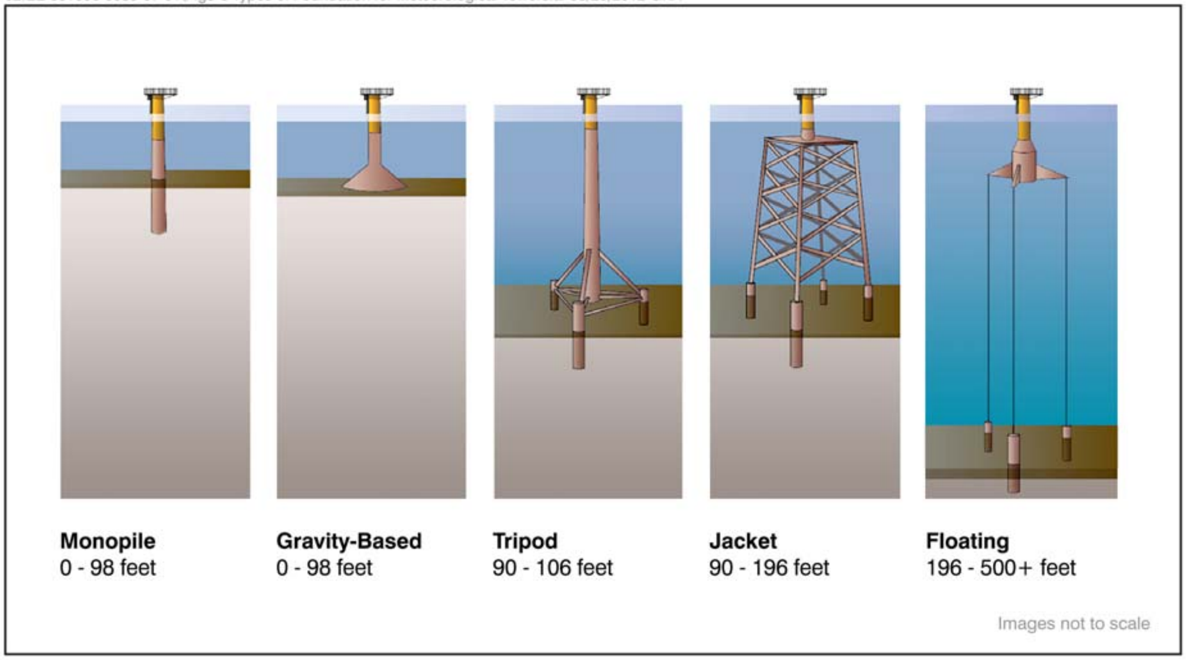


SOURCE: Adapted from Musial, Butterfield, and Ram 2006, as cited in TetraTech EC, Inc. 2010.

Figure 3-6. Types of Foundations for Meteorological Towers.

The only meteorological tower installed on the OCS for the purposes of renewable energy site assessment is located on Horseshoe Shoal, in Nantucket Sound (Figure 3-4). The system has gathered comprehensive data on wind, wave, tide height, current, and water temperature for the area where the proposed project would be sited. In 2002, the United States Army Corps of Engineers (USACE) prepared an EA for this meteorological tower (USACE 2002). As shown on Figure 3-4, a monopole mast was used for this meteorological tower. The tower was installed in 2003 and consists of three pilings supporting a single steel pile that supports the deck. The overall height of the structure is 197 feet (60 meters) above mean lower low water.

It is assumed that the deck of a fixed platform would be supported by a single 10-foot diameter (approximately 3-meter diameter) monopile, tripod, or a steel jacket with three to four 36-inch-diameter piles. The monopole or piles would be driven between 25 and 100 feet (approximately 7.6 and 30.5 meters) into the seafloor, depending on subsea geotechnical properties. The foundation structure and a scour-control system, if required based on potential seabed scour anticipated at the site, would occupy less than 2 acres (0.81 hectare). Once installed, the top of a meteorological tower would be 295 to 328 feet (90 to 100 meters) above mean sea level.

The area of ocean bottom affected by a meteorological tower would range from about 200 square feet (approximately 18.6 square meters), if supported by a monopile, to about 2,000 square feet (185.8 square meters) if supported by a jacket foundation. The final foundation selection would be included in a detailed SAP submitted to BOEM along with the results of SAP-related site characterization surveys before BOEM begins to consider the SAP for approval.

Meteorological Tower and Foundation Installation

Review of the SAP

After a lease is issued and initial survey activities are conducted, the lessee may not install a meteorological tower until a SAP is submitted for review to and approved by BOEM (30 CFR 585.614(a)). BOEM regulations (30 CFR 585.600 to 585.618) require that the SAP include the following information:

- A description of the proposed activities, including the technology intended to be used in conducting activities authorized by the lease and all additional surveys the lessee intends to conduct;
- The surface location and water depth for all proposed facilities to be constructed in the leased area;
- General structural and project installation information with proposed schedules;
- A description of the safety, prevention, and environmental protection features or measures that the lessee would use;
- A brief description of how the meteorological tower and other components on the leased area would be removed and the leased area restored as required by the lease;
- Any other information reasonably requested by BOEM to ensure the lessee's activities on the OCS are conducted in a safe and environmentally sound manner; and
- Results of the geophysical and geological surveys, hazards surveys, archaeological surveys, and baseline collection studies (e.g., biological) with supporting data.

If a particular lease is issued, and the lessee subsequently submits a SAP, BOEM would then determine whether this revised EA adequately considers the environmental consequences of the activities proposed in the lessee's SAP. If the analysis in this revised EA adequately considers these consequences, then no further NEPA analysis would be required before the SAP could be approved. If, on the other hand, BOEM determines that the analysis in this revised EA is inadequate for that purpose, BOEM would prepare an additional NEPA analysis before approving the SAP.

The siting of meteorological towers also would be authorized by the USACE, likely under a Nationwide Permit 5 for scientific measurement devices. The USACE is a cooperating agency on this EA (*see* Section 5.1.3, "Cooperating Agencies").

Timing

The timing of the issuance of a lease award and weather and sea conditions are the primary factors that would influence the timing of meteorological tower construction/installation. Under the reasonably foreseeable site characterization scenario, BOEM would issue leases in 2013. It is assumed lessees would begin survey activities as soon as possible after receiving a lease and as sea states and weather conditions permit. The most suitable sea states and weather conditions would occur from April to August (Atlantic Renewable Energy Corporation and AWS Scientific, Inc. 2004). Although lessees have five years for site characterization activities before a lessee must submit a COP (30 CFR 585.235(a)(2)), the lessee must submit a SAP within six months of lease issuance (30 CFR 585.235 (a)(1)). It is anticipated that the site characterization activities required for preparation of the SAP would take place in the first six months after lease issuance (30 CFR 585.610). The majority of the remaining site assessment and site characterization activities would take place in years 1 through 3 to allow time to prepare the COP which must be submitted six months prior to the expiration of the five-year lease term. This would mean that for leases issued in 2013, the majority of the site assessment surveys would be conducted from 2013 through 2016. Under Alternative A (the proposed action and preferred alternative), site characterization is projected to occur over five years, from 2013 to 2018.

Total installation time for one meteorological tower would take eight days to ten weeks, depending on the type of structure to be installed and the weather and ocean conditions (USDOI, MMS 2009a). Because weather and sea conditions, acquiring permits, and availability of vessels, workers, and tower components can delay projects, it is possible that installation may not occur during the first year of a lease and may be spread over more than one construction season. If installation occurs over two construction seasons, then it is likely that the foundation would be installed first, with limited meteorological equipment mounted on the platform deck, and the mast and remaining equipment would be installed the following year (USDOI, MMS 2009a).

Onshore Activity

A meteorological tower platform would be constructed or fabricated onshore at an existing fabrication yard. Production operations at fabrication yards would include cutting, welding, and assembling steel components. These yards occupy extensive areas, with equipment that includes lifts and cranes, welding equipment, rolling mills, and sandblasting machinery. The location of these fabrication yards is directly tied to the availability of a channel large enough to allow these structures to be towed. The average bulkhead depth needed for water access to fabrication yards is 15 to 20 feet (4.6 to 6.1 meters). Thus, platform fabrication yards must be located at deep-draft seaports or along the wider and deeper sections of inland waterways (*see* Section 4.1.3.7, "Land Use and Coastal Infrastructure" for port information). Alternatively, a meteorological tower could be fabricated at various facilities or at inland facilities in sections and then shipped by truck or rail to the port's staging area. The meteorological tower would then be partially assembled and loaded onto a barge for transport to the offshore site. Final assembly of the tower itself would be completed offshore (USDOI, MMS 2009a).

Because the proposed action only contemplates the installation of up to four meteorological towers, and since the fabrication facilities in the relevant major port areas are spacious and can accommodate such a project, BOEM does not anticipate that the fabrication of meteorological towers associated with the proposed action would have any substantial effect on the operations, transportation or conditions at these facilities.

Offshore Activity

During installation, a radius of approximately 1,500 feet (457 meters) around the site would be needed for support vessels to maneuver and anchor. The following sections describe the installation of a foundation structure and tower. Several vessels would be involved in installing and constructing a meteorological tower (Table 3-4).

Table 3-4
Projected Vessel Usage and Specifications
for the Construction/Installation of a Meteorological Tower

Vessel Type	Round Trips	Hours On-Site	Length (feet / meters)	Displacement (tons)	Engines (horsepower)	Fuel Capacity (gallons)
Crane barge	2	232	150 to 250 / 45.7 to 76.2	1,150	0	500
Deck cargo	2	232	150 to 270 / 45.7 to 82.3	750	0	0
Small cargo barge	2	232	90 / 27.4	154	0	0
Crew boat	22	54	51 to 57 / 15.5 to 17.4	100	1,000	1,800
Small tug boat	4	54	65 / 19.8	300	2,000	14,000
Large tug boat	8	108	95 / 29	1,300	4,200	20,000

Source: USDOI, MMS 2009a.

Installation of the Foundation Structure and Mast

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

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

Scour-Control System

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

A rock armor scour-protection system may be used to stabilize a structure's foundation area. Rock armor and filter layer material would be placed on the seabed using a clamshell bucket or a chute. The filter layer would help prevent the loss of underlying sediments and sinking of the rock armor (ESS Group, Inc. 2006). In water deeper than 15 feet (4.6 meters), the median stone size would be about 50 pounds (approximately 22.6 kilograms) with a stone layer thickness of about 3 feet (approximately 0.9 meters). The rock armor for a monopile foundation for a wind turbine has been estimated to occupy 16,000 square feet (0.37 acres [0.15 hectares]) of the seabed (ESS Group, Inc. 2006). While the piles of a meteorological tower would be much smaller than those of a wind turbine, a meteorological tower may be supported by up to four piles. Therefore, the maximum area of the seabed impacted by rock armor for a single meteorological tower is estimated to also be 16,000 square feet (0.37 acre [0.15 hectares]).

Artificial seagrass mats are made of synthetic fronds that mimic seafloor vegetation to trap sediment. The mats become buried over time and have been effective in controlling scour in both shallow and deep water (ESS Group, Inc. 2004). Monitoring of scouring at the Cape Wind meteorological tower found that at one pile where two artificial seagrass scour mats were installed, there was a net increase of 12 inches of sand, and at another pile with artificial seagrass scour mats, there was a net scour of 7-inch pilings; both occurred over a three-year timeframe (Ocean and Coastal Consultants Inc. 2006). If used, these mats would be installed by a diver or underwater remotely operated vehicle (ROV). Each mat would be anchored at 8 to 16 locations, about 1 foot (0.3 meter) into the sand. It is anticipated that for a pile-supported platform, four mats each of about 16.4 by 8.2 feet (5 by 2.5 meters) would be placed around each pile. Including extending the sediment bank, a total area disturbance of about 5,200 to 5,900 square feet (approximately 483.1 to 548.1 square meters) for a three-pile structure and 5,900 to 7,800 square feet (approximately 548.1 to 724.6 square meters) for a four-pile structure is estimated. For a monopile, it is anticipated that eight mats about 16.4 by 16.4 feet (5 by 5 meters) would be used and the total area of disturbance would be about 3,700 to 4,000 square feet (approximately 343.7 to 371.6 square meters).

Operation and Maintenance of Towers

As previously discussed, if a lessee installs and operates a meteorological tower on its leasehold, the length of time the tower would be present would be influenced by several factors, including how long it takes to install the tower, whether the lessee has submitted a COP, and/or how long the subsequent BOEM review of the COP takes. BOEM anticipates that a tower may be present for approximately five years before the final decision is made to either allow the tower to remain or be decommissioned.

While the meteorological tower is in place, data would be collected and processed remotely, so data cables to shore would not be necessary. The structure and instrumentation would be accessible by boat for routine maintenance. As indicated in previous site assessment proposals submitted to BOEM, lessees with towers powered by solar panels or small wind turbines would make monthly or quarterly vessel trips for operation and maintenance activity over the five-year life of a meteorological tower (USDOI, MMS 2009a). However, if a diesel generator is used to power the meteorological tower's lighting and equipment, a maintenance vessel would make a trip at least once every other week, if not weekly, to provide fuel, change oil, and perform maintenance on the generator. Depending on the frequency of the trips, support for the meteorological towers in the WEA would result in between 16 quarterly and 104 weekly round trips per year for the up to four meteorological towers. No additional or expansion of onshore facilities would be required to conduct these tasks. It is projected that crew boats 51 to 57 feet (15.5 to 17.3 meters) in length with 400- to 1,000-horsepower engines and 1,800-gallon fuel capacity would be used for routine maintenance and generator refueling if diesel generators are used. The distance from shore would make vessels more economical than helicopters, so the use of helicopters to transport personnel or supplies during operation and maintenance is not anticipated.

Lighting and Marking

All meteorological towers and buoys, regardless of height, would be lighted and marked for navigational purposes. Meteorological towers and buoys would be considered Private Aids to Navigation, which are regulated by the USCG under 33 CFR 66. A Private Aid to Navigation is a buoy, light, or day beacon owned and maintained by any individual or organization other than the USCG. These aids are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards to navigation.

If meteorological towers are taller than 199 feet (60.7 meters), as BOEM expects, the lessee would also be required to file a "Notice of Proposed Construction or Alteration" with the Federal Aviation Administration (FAA) per federal aviation regulations (14 CFR 77.13). The FAA is in the process of finalizing guidance for marking and lighting meteorological towers less than 199 feet tall (Edgett-Baron, personal communication, 2011 *as cited in* USDOI, BOEM, OREP 2012b). According to the FAA, specific mitigation measures, including lighting requirements, would be applied on a case-by-case basis (Edgett-Baron, personal communication, 2011 *as cited in* USDOI, BOEM, OREP 2012b). Any meteorological tower more than 199 feet (60.7 meters) tall also would require an obstruction evaluation analysis by the FAA to determine if a meteorological tower would pose a hazard to air traffic and a Determination of Hazard/No Hazard issued by the FAA if within 12 NM of shore. If BOEM receives a SAP for a meteorological tower outside of FAA jurisdiction, BOEM would determine if the proposed meteorological tower would pose a threat to air navigation.

Aesthetics/Visual

As discussed in Chapter 5.2.21.2 of the Programmatic EIS (USDOI, MMS 2007), a meteorological tower in a typical seascape would introduce a vertical line that would contrast with the horizon line and would introduce a geometrical man-made element into a potentially natural landscape. Some color contrast would also be present, if towers are marked or colored to provide navigational aids and prevent vessel collisions per USCG requirements, where the towers would be equipped with lighting designed in accordance with USCG and FAA regulations and guidance documents. Visibility of the towers from shore would depend upon weather conditions and sun direction, although distance from shore would be the most significant factor.

The main concerns related to visual impacts of meteorological towers would be those presented by the widest and most substantial portion of the tower (the deck) rather than the relatively slender (approximately 10- to 16-foot [3- to 5-meter]) mast. Visual impacts would be contingent upon the distance from shore, earth curvature, wave height, and atmospheric conditions which could screen some or all of the deck from view. The distance (NM) that the deck of a meteorological tower would be visible by an observer on the shoreline is calculated as 1.17 times the square root of the observer's height (approximately 6 feet [2 meters]), plus 1.17 times the square root of the height of the deck (approximately 40 feet [12 meters]). Based on this calculation, the deck of a meteorological tower located farther than 10 NM from shore would not be visible by an observer standing on the shoreline.

Other Uses

The meteorological tower and platform could be used to gather information other than meteorological information such as data regarding avian and marine mammals in the lease area. Other equipment that could be installed on meteorological towers is discussed in Section 3.1.3.3 below, "Meteorological Tower and Buoy Equipment."

Decommissioning of Meteorological Towers and Foundations

At the latest (*see* "Timing" section above), within a period of two years after the cancellation, expiration, relinquishment, or other termination of the lease, the lessee would be required to remove all devices, works, and structures from the site and restore the leased area to its original condition before issuance of the lease (30 CFR 585, Subpart I).

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

Cutting and Removing

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

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

Removal of the Scour-Control System

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

Disposal

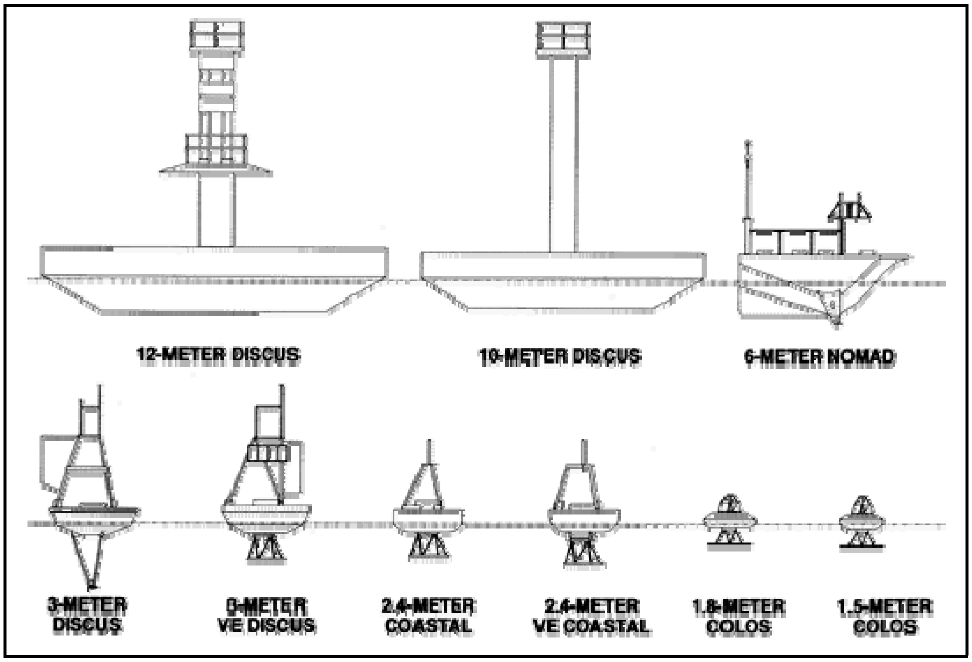
Obsolete materials have been used as artificial reefs along the coastline of the United States to provide valuable habitat for numerous species of fish in areas devoid of natural hardbottom and the meteorological tower structures may have the potential to serve as artificial reefs. However, the structures must not pose an unreasonable impediment to future development. If the lessee ultimately proposes to use the structure as an artificial reef, its plan must comply with the artificial reef permitting requirements of the USACE and the criteria in the National Artificial Reef Plan of 1985 (33 U.S.C. 35.2103). The state agency responsible for managing marine fisheries resources must accept liability for the structure before BOEM would release the federal lessee from the obligation to decommission and remove all structures from the lease area (USDOI, MMS 2009a). Unless portions of the meteorological tower would be approved for use as artificial reefs, all materials would be removed by barge and transported to shore. The steel would be recycled and remaining materials would be disposed of in existing landfills in accordance with applicable law.

3.1.3.2 Meteorological Buoy and Anchor System

While a meteorological tower has been the traditional device for characterizing wind conditions, several companies have expressed their interest in installing one or two meteorological buoys per lease instead. Meteorological buoys can be used as an alternative to a meteorological tower in the offshore environment for collecting wind, wave, and current data. It is assumed that if a lessee chooses to employ buoys instead of meteorological towers, a maximum of two buoys per lease would be installed. These meteorological buoys would be anchored at fixed locations and would regularly collect observations from many different atmospheric and oceanographic sensors.

A meteorological buoy can vary in height, hull type, and anchoring method. NOAA has successfully used discus-shaped buoys (known as Naval Oceanographic and Meteorological

Automated Devices or ‘NOMADs’) and the newest, the Coastal Buoy and the Coastal Oceanographic Line-of-Sight (COLOS) buoys (Figure 3-7). The hull type chosen usually depends on its intended deployment location and measurement requirements. To assure optimum performance, a specific mooring design is produced based on hull type, location, and water depth. For example, a smaller buoy in shallow coastal waters may be moored using an all-chain mooring. On the other hand, a large discus buoy deployed in the deep ocean may require a combination of chain, nylon, and buoyant polypropylene materials designed for many years of service (USDOC, NOAA, National Data Buoy Center [NDBC] 2008).



Source: USDOC, NOAA, NDBC 2008.

Figure 3-7. Schematic of Buoys.

Discus-shaped, boat-shaped, and spar buoys are the types of buoys that would most likely be adapted for offshore wind data collection. A large discus-shaped hull buoy (Figure 3-8) has a circular hull ranging between 33 and 40 feet (between approximately 10 and 12 meters) in diameter and is designed for many years of service (USDOC, NOAA, NDBC 2006). The boat-shaped hull buoy (Figure 3-9) is an aluminum-hulled, boat-shaped buoy that provides long-term survivability in severe seas (USDOC, NOAA, NDBC 2006).

Source: USDOC, NOAA, NDBC 2008

Figure 3-8. A 10-Meter Discus-Shaped Hull Buoy.

A buoy's specific mooring design is based on hull type, location, and water depth (USDOC, NOAA, NDBC 2006). Buoys can use a wide range of moorings to attach to the seabed. On the OCS, a larger discus-type or boat-shaped hull buoy may require a combination of a chain, nylon, and buoyant polypropylene materials designed for many years of ocean service. Some deep-ocean moorings have operated without failure for more than 10 years (USDOC, NOAA, NDBC 2008). The spar-type buoy (Figure 3-10) can be stabilized through an onboard ballasting mechanism approximately 60 feet (approximately 18 meters) below the sea surface. Approximately 30 to 40 feet (approximately 9 to 12 meters) of the spar-type buoy would be above the ocean surface where meteorological and other equipment would be located. Tension legs attached to a mooring by cables has been proposed for one spar-type buoy (TetraTech EC, Inc. 2012).

Source: USDOC, NOAA, NDBC 2008

Figure 3-9. A 6-Meter Boat-Shaped Hull Buoy (also known as a NOMAD).

The subject plan provides detailed information about deployment and operational activities associated with the proposed Garden State Offshore Energy, LLC, offshore meteorological data collection system known as the New Jersey Offshore Research Device (NJORD) at the Limited Lease site (Block 7033) for the purpose of collecting wind resource and select metocean and biological data. The data will be used to determine the viability of constructing an offshore wind energy facility in the surrounding waters.

Buoys likely would arrive from the manufacturer at the lessee's staging areas by truck, rail, or sea, then would be assembled and fitted with instrumentation and tested before deployment via a vessel with enough deck space to accommodate a structure potentially up to 60 feet wide (approximately 18 meters) and a crane to lower the buoy into the sea (USDOC, NOAA 2011 *as cited in* USDOI, BOEM, OREP 2012b; TetraTech EC, Inc. 2012).

Source: Australian Maritime Systems. n.d.

Figure 3-10. A Spar Buoy.

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

Buoy Installation

Boat-shaped, spar-type, and discus-shaped buoys are typically towed or carried aboard a vessel to the installation location. Once at the location site, the buoy either would be lowered to the surface from the deck of the transport vessel, towed, or placed over the final location and the mooring anchor dropped. A boat-shaped buoy in shallower waters of the WEA may be moored using an all-chain mooring, while a larger discus-type buoy would likely use a combination of chain, nylon, cable and buoyant polypropylene materials (USDOC, NOAA, NDBC 2006). Spar-type buoys may have all-chain moorings or cables. Previous proposals indicate anchors for boat-shaped and discus-shaped buoys would weigh about 6,000 to 8,000 pounds with a footprint of about 6 square feet (approximately 0.6 square meter) and an anchor sweep of about 8.5 acres (approximately 3.4 hectares). Moorings for a spar-type buoy tension leg anchoring system may weigh up to 165 tons with a 26 by 26 feet (approximately 8 by 8 meters) footprint. After installation, the transport vessel would remain in the area for several hours while technicians configure proper operation of all systems. Boat-shaped and discus-shaped buoys would typically take one day to install and two days for tension-type moorings. Transport and installation vessel anchoring for one day is anticipated for these types of buoys (Fishermen's Energy 2011 *as cited in* USDOI, BOEM, OREP 2012b; TetraTech EC, Inc. 2012).

Typically, a spar-type buoy would be towed to the installation location by a transport vessel after assembly at a land-based facility. Deployment would occur in two phases: deployment of a clump anchor to the seabed as a pre-set anchor (Phase 1) and deployment of the spar buoy and connection to the clump anchor (Phase 2). Phase 1 would take approximately one day and would include placing the clump anchor on a barge and transporting it to the installation site. The monitoring buoy would be anchored to the seafloor using a clump weight anchor and mooring chain. Installation would take approximately two days. The total area of bottom disturbance associated with buoy and vessel anchors would range from 28 by 28 feet (approximately 8.5 by 8.5 meters), with a total area of 784 square feet (73 square meters) to a 1,200-foot-radius (365.8 meters) anchor sweep for the installation vessel with a total of just over 100 acres of disturbance. The maximum area of disturbance of benthic sediments would occur during anchor deployment and removal (e.g., sediment resettlement, sediment extrusion, etc.) for this type of buoy.

Onshore Activity

Existing ports would be used for onshore activities such as fabrication, staging, and launching crew/cargo vessels (*see* Section 4.1.3.7, "Land Use and Coastal Infrastructure," for information pertaining to existing ports or industrial areas that would be used for meteorological buoys). Existing port facilities would not have to be expanded because these facilities are large enough to accommodate fabrication, staging, and launching activities.

Operation and Maintenance of Buoys

Monitoring information from the buoys would be transmitted to shore via internal communication systems, including systems performance information such as battery levels and charging systems output, the operational status of navigation lighting, and buoy positions. All data gathered via sensors would be fed through a radio system that would transmit the data string to an onshore receiver (Tetra Tech EC, Inc. 2010 *as cited in* USDOI, BOEM, OREP 2012b). On-site inspections and preventive maintenance (i.e., marine fouling, wear, and lens cleaning) is expected to be monthly or quarterly, with specialized components (i.e., buoy, hull, anchor chain, and anchor scour) periodically inspected at separate intervals; these periodic inspections would likely coincide with the monthly or quarterly inspection to minimize the need for additional boat trips to the site.

Since limited space would restrict the equipment that could be placed on a buoy, BOEM anticipates that this equipment would be powered by small solar panels or wind turbines or small diesel generators. Weekly or biweekly vessel trips would be necessary for refueling generators. The generators are not anticipated to carry more than 240 gallons of fuel.

Decommissioning Buoys

Decommissioning is basically the reverse of the installation process. Equipment would be recovered using a vessel(s) equivalent in size and capability to that used for installation (*see* "Buoy Installation" above). For small buoys, a crane lifting hook would be secured to the buoy. A water/air pump system would de-ballast the buoy into the horizontal position. The mooring chain/cables and anchor would be recovered to the deck using a winching system. The buoy would then be towed to shore by the barge.

All buoy decommissioning is expected to be completed within one or two days. Buoys would be returned to shore and disassembled or reused in other applications. It is anticipated that the mooring devices and hardware would be reused or recycled (Fishermen's Energy 2011 *as cited in* USDOI, BOEM, OREP 2012b).

3.1.3.3 Meteorological Tower and Buoy Equipment

Meteorological Data Collection

Meteorological data can be obtained using anemometers, vanes, barometers, and temperature transmitters mounted either directly on the tower or buoy or on instrument support arms. In addition to conventional anemometers, remote-sensing technology can be used. Light detection and ranging (LIDAR), sonic detection and ranging (SODAR), and coastal ocean dynamic applications radar (CODAR) devices may be used to obtain meteorological data. LIDAR is a ground-based remote sensing technology that operates via the transmission and detection of light. SODAR is also a ground-based remote sensing technology; however, it operates via the transmission and detection of sound. CODAR utilizes high-frequency (HF) surface wave propagation to remotely measure ocean surface waves and currents.

Ocean Monitoring Equipment

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

Other Equipment

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

3.1.3.4 Vessel Traffic Associated with Site Assessment

Vessel trips would be associated with all phases of site assessment (installation, operation and maintenance, and decommissioning). Numerous existing ports or industrial areas in the adjacent states are expected to be used in support of the proposed action. The ports to be used for site characterization surveys for Alternative A would range from large commercial ports in Narragansett Bay, Rhode Island, and/or Buzzards Bay, Massachusetts, to smaller ports in Rhode Island and Massachusetts. Port selection depends on the type and size of vessel to be used and proximity of a lease block to a port. More information on these ports is provided in Section 4.1.3.7, "Land Use and Coastal Infrastructure." There are six ports and harbors adjacent to the Ocean SAMP area (*see* Rhode Island CRMC 2010[9]).

Based on previous site assessment proposals submitted to BOEM, up to about 40 round trips by various vessels are expected during construction/installation of each meteorological tower. If each potential lessee decides to install a meteorological tower on its leasehold, a total of 40 round trips are estimated for construction/installation or 160 rounds trips for up to four meteorological towers (40 multiplied by 4). These vessel trips may be spread over multiple construction seasons during the five-year term of the lease, depending on factors such as weather and sea conditions, assessing suitable site(s) within a leasehold, acquiring the necessary permits, and availability of vessels, workers, and meteorological tower components. Since the decommissioning process would basically be the reverse of construction/installation, vessel

[9] Chapter 7: Marine Transportation, Navigation, and Infrastructure.

usage during decommissioning would be similar to vessel usage during construction/installation, so another 160 round trips are estimated.

One vessel would typically take one or two days to install meteorological buoys. One round trip is assumed for the installation of each buoy and again for its decommissioning. If each potential lessee decides to install meteorological buoys on its leasehold, a total of 16 to 32 round trips are estimated for the construction/installation, operation and maintenance, and decommissioning of the up to eight anticipated meteorological buoys.

Assuming a single maintenance trip to each meteorological tower weekly to quarterly and/or to each buoy monthly to quarterly, the proposed action would result in an additional 48 to 312 vessel trips per year, or 240 to 1,560, vessel trips over a five-year period.

The total vessel traffic associated with all site assessment activities (installation, operation and maintenance, and decommissioning of the meteorological towers and meteorological buoys) that could be reasonably anticipated in connection with the proposed action ranges from 576 to 1,912 round trips over a five-year period (*see* "Operation and Maintenance of Towers" in Section 3.1.3.1, "Meteorological Towers and Foundations").

In comparison, as provided in Section 3.1.2.6, approximately 930 to 1,970 vessel trips (round trips) associated with all site characterization surveys are projected to occur as a result of the proposed action over a five-year period, from 2012 to 2018.

3.2 Non-Routine Events

Chapter 5.2.24 of the Programmatic EIS (USDOI, MMS 2007) discusses in detail potential non-routine events and hazards that could occur during data collection activities. The primary events and hazards are: (1) severe storms such as hurricanes and extratropical cyclones; (2) collisions between the structure or associated vessels with other marine vessels or marine life; and (3) spills from collisions or during generator refueling. These events and hazards are summarized below.

3.2.1 Storms

The Atlantic basin includes the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. The Atlantic Ocean hurricane season is June 1 to November 30, with a peak in September when the chance that a hurricane could impact the WEA at some time during the proposed action would be likely. The Atlantic basin averages about 10 tropical-strength storms or more per year; about half reach hurricane level (USDOC, NOAA 2005) and 2.5 become major hurricanes (Category 3 or higher). Hurricanes can originate in different locations and travel much different paths from the average.

Since 1900, 39 tropical systems have impacted New England. Twenty-five were hurricanes while 14 were tropical storms. Any tropical storm or hurricane is capable of bringing a combination of high winds, large storm surges, and severe inland flooding along rivers and streams.

Of the 24 hurricanes, nine made landfall along the southern New England coast. Of those nine hurricanes, seven were either of Category 2 or 3 intensity based on the Saffir-Simpson hurricane scale. Though the primary threat to New England is during August and September, the region has been affected as early as June and as late as mid-October (Northeast States Emergency Consortium n.d.).

The worst hurricane to affect New England was the Great Hurricane of 1938, which struck on September 21. The Great Hurricane of 1938 struck at high tide, which coincided with the highest astronomical tide of the year, pushing a storm surge of 12 to 15 feet across the south coast and up the many bays and inlets including Narragansett Bay and Buzzards Bay.

According to the Rhode Island Ocean SAMP, Rhode Island is not regularly impacted by hurricanes. There has not been a single hurricane strike on Rhode Island since 1996, despite the period from 2000 to 2010 being labeled as one of the most active hurricane periods on record (NOAA Coastal Services Center n.d.) and the 2012 hurricane season being classified above-normal (NOAA 2012a). The historical record shows 17 hurricanes making landfall in Rhode Island: seven Category 1 storms, eight Category 2 storms, and two Category 3 storms. The most recent Category 3 hurricane was Esther during 1961, and the most recent named hurricane was Bob, a Category 2 hurricane, during 1991.

3.2.2 Allisions and Collisions

A meteorological tower or buoy located in the WEA could pose a risk to navigation. An allision between a ship and a meteorological structure could result in the loss of the entire facility and/or the vessel as well as loss of life and spill of diesel fuel. When a vessel hits a buoy system, it can damage the buoy hull so the buoy loses its buoyancy and sinks, or it damages the equipment or its supporting structure. Vessels associated with site characterization and assessment activities could collide with other vessels and possibly capsize, which may lead to a diesel spill.

Collisions and allisions are considered unlikely since vessel traffic is controlled by multiple routing measures, such as safety fairways, traffic separation schemes (TSSs), and anchorages. These higher traffic areas were excluded from the WEA. Risk of allisions with meteorological towers and buoys would be further reduced by USCG-required marking and lighting.

Allision and collision incident data for the Gulf of Mexico and Pacific regions were reviewed for the years 1996 through 2010 (USDOI, BOEMRE 2011a *as cited in* USDOI, BOEM, OREP 2012b) and indicate that allisions and collisions that could result in major damage to property and equipment would be unlikely. These areas contain many fixed structures on the OCS similar to the meteorological facilities that would be installed. These facilities would need to be operated and maintained during their lease terms just as the fixed structures in the Gulf of Mexico and Pacific regions do. Over a 15-year period in the Gulf of Mexico and Pacific regions, with more than 4,000 structures present at any one time, 236 allisions with platforms or associated OCS structures and collisions between vessels were reported. While only allisions and collisions that result in property or equipment damage greater than $25,000 must be reported, this number also includes reports of minor damage (less than $25,000). The most commonly reported causes of the allisions and collisions included human error, weather-related causes, equipment failure on the vessels, and navigational aids not working on the structures.

3.2.3 Fuel Spills

A fuel spill could occur as a result of vessel collisions, accidents, or natural events. If a collision leads to major hull damage, a fuel spill could occur. The volume of fuel that could be released by a vessel involved in a collision would depend on the type of vessel and severity of the collision. From 2000 to 2009, the average fuel spill size for vessels other than tank ships and tank barges was 88 gallons (U.S. Department of Homeland Security, USCG 2011 *as cited in* USDOI, BOEM, OREP 2012b) and, if the proposed action resulted in a fuel spill in any given area, BOEM anticipates that the average volume would be about the same.

Vessels are expected to comply with USCG requirements relating to prevention and control of fuel spills. Most equipment on the meteorological towers and buoys would be powered by batteries charged by small wind turbines or solar panels. However, there is a possibility that diesel generators may be used on some of the meteorological towers and buoys, which may cause minor diesel fuel spills during refueling of generators.

Impacts would depend greatly on the material spilled (diesel fuel in the related vessel and infrastructure types), the size and location of a spill, the meteorological conditions at the time, and the speed with which cleanup plans and equipment could be employed. Diesel fuel is a refined petroleum product that is lighter than water. It may float on the water's surface or be dispersed into the water column by waves. Diesel is a distillate of crude oil and does not contain the heavier components that contribute to crude oil's longer persistence in the environment. If a diesel spill occurred, it would be expected to dissipate rapidly and then evaporate and biodegrade within a few days (USDOI, MMS 2007b *as cited in* USDOI, BOEM, OREP 2012b).

4 ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

4.1 Alternative A (Preferred Alternative): The Proposed Action

4.1.1 Physical Resources

4.1.1.1 Air Quality

Alternative A could affect the air quality in and offshore of Rhode Island and Massachusetts because survey and construction vessels would use ports in these states and travel through state waters to and from the WEA. Annual prevailing winds are from the west 12 percent of the year; however, winds from the south, north, and west-northwest each occur about 8 percent of the year (Western Regional Climate Center 2012a). During the summer ozone season (May through September), southerly winds predominate and occur 12 percent of the time, compared with westerly winds at 10 percent of the time (Western Regional Climate Center 2012b). Southerly winds would transport offshore emissions to onshore areas, primarily from vessels transiting the area and working offshore. The volume of pollutants that could be emitted, in comparison with existing vessel traffic, current ambient air quality, and the development in many of the port and coastal areas that could be affected would be minor. The reasonably foreseeable impacts of Alternative A on existing air quality are expected to be minor.

Site characterization surveys would be conducted by multiple vessels over a five-year period following award of leases by BOEM. The ports to be used for site characterization surveys for Alternative A would range from large commercial ports in Narragansett Bay, Rhode Island, and/or Buzzards Bay, Massachusetts, to smaller ports in Rhode Island and Massachusetts. Port selection would depend on the type and size of vessel to be used and proximity of a lease area to a port. More information on these ports is provided in Section 4.1.3.7, "Land Use and Coastal Infrastructure."

Section 4.2.2.2 of the Programmatic EIS (USDOI, MMS 2007) describes air quality in the Rhode Island and Massachusetts air quality control region, and Section 4.2.2.3 of the Programmatic EIS describes regulatory controls on OCS activities that would affect air quality. The following is a summary of that information and incorporates new and site-specific information.

4.1.1.1.1 Description of the Affected Environment

Ships transit the waters in and adjacent to the WEA among a variety of other ports, including the Port of New York and New Jersey, the Port of Boston, and ports located on the East Coast or abroad. The Clean Air Act (CAA) of 1970 directed the U.S. Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for air pollutants that are listed as "criteria" pollutants because there was adequate reason to believe that their presence in the ambient air "may reasonably be anticipated to endanger public health and welfare." The NAAQS apply to sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$ [particulate matter with aerodynamic diameters of 10 microns or less and 2.5 microns or less, respectively]), and lead (Pb) (40 CFR Part 50). The primary NAAQS are set at levels to protect public health with an adequate margin of safety. The

USEPA has designated secondary NAAQS to protect public welfare. All of the standards are expressed as concentrations in air and duration of exposure. Many standards address both short- and long-term exposures. Any individual state may adopt a more stringent set of standards. When the monitored pollutant levels in an area of a state exceed the NAAQS for any pollutant, the area is classified as "nonattainment" for that pollutant.

The USEPA air quality standards for ozone are 0.075 ppm (8-hour average) for the 2008 standard and 0.08 ppm (8-hour average) for the 1997 standard. Currently, implementation of the 2008 standard is underway by the USEPA. As part of the implementation, the USEPA published a proposed rule on February 7, 2012, providing methods for determining nonattainment classifications (e.g., marginal, moderate, severe) and attainment deadlines for each classification. However, areas designated nonattainment for the 1997 ozone standard still must continue to implement plans and programs to show attainment with the 1997 standard even though the 2008 standard is also in effect and being implemented. Ozone is a regional air pollutant issue. Prevailing southwest to west winds carry air pollution from the Ohio River Valley and the Mid-Atlantic south of the WEA, where major nitrogen oxide (NO_X) and volatile organic compounds (VOCs) emission sources (e.g., power plants, transportation) are located to the northeast, contributing to high ozone episodes.

All of the counties that may be affected by emissions associated with Alternative A meet the NAAQS for NO_2, CO, SO_2, $PM_{2.5}$, PM_{10}, and Pb (USEPA 2010a and 2010b). Counties containing port cities and other coastal counties near the WEA do not meet the applicable 1997 NAAQS; for the 2008 8-hour ozone NAAQS some of the counties containing port cities and other coastal counties near the WEA do not meet the NAAQS, based on the state's and USEPA designations (*see* Table 4-1).

Table 4-1
Total Number of Coastal Counties in Nonattainment of Each Criteria Pollutant per State

Criteria Pollutant	Massachusetts	Rhode Island	Connecticut	New York
8-hour O_3 (2008 Standard) [(a)]	One (Dukes County)	None	All Counties	All Counties on Long Island
$PM_{2.5}$ (1997 Standard)	None	None	New Haven Fairfield	All Counties on Long Island

Note:
(a) Nonattainment designations for the 2008 8-hour O_3 standard are preliminary and under discussion between each state and the USEPA.

Key:
O_3 = ozone.
$PM_{2.5}$ = particulate matter of 2.5 microns or less.

Source: USEPA 2010a and 2010b.

Ozone, one of the most widespread pollutants in the U.S. (American Lung Association 2012), is a problem in Rhode Island and Massachusetts during the summer months. Ambient air quality measurements are taken by the Rhode Island Department of Environmental Management (RIDEM). These measurements are representative of onshore air quality in Rhode Island and Massachusetts in the vicinity of the WEA. During 2009, there was one day in which the 0.075

ppm 8-hour ozone standard was exceeded across the State of Rhode Island (RIDEM and Rhode Island Department of Health [RIDOH] 2009). However, cooler and wetter than normal weather contributed to the low number of ozone exceedance days in 2009. The average number of annual ozone exceedance days from 2004 to 2008 was 12 days (RIDEM and RIDOH 2009).

$PM_{2.5}$ levels in Rhode Island in 2009 were below (better than) the annual and 24-hour $PM_{2.5}$ NAAQS. The annual average concentration of $PM_{2.5}$ for the five fine-particle monitoring sites in Rhode Island was 7.9 micrograms per cubic meter (RIDEM and RIDOH 2009). During 2009, the air quality index for Rhode Island was "good" on 81 percent of the reporting days, "moderate" on 19 percent of the reporting days, and "unhealthful" on 0.3 percent of the reporting days (RIDEM and RIDOH 2009).

Class I Areas

Class I areas are defined in Sections 101(b)(1), 169A(a)(2), and 301(a) of the CAA, as amended (42 U.S.C. 7401(b), 7410, 7491(a)(2), and 7601(a)). Class I areas are federally owned or managed lands where very little air quality degradation is allowed, controlled by stringent incremental limits for NO_2, SO_2 and PM_{10}. In these areas, air quality-related values, including visibility, are protected. There are two Class I areas, one in Vermont (Lye Brook), which is northwest of the WEA, and one in New Jersey (Brigantine), which is southwest of the WEA; both are more than 124 miles (200 kilometers) away from the WEA. These Class I areas are too distant to be affected by emissions resulting from Alternative A.

Regulatory Controls on OCS Activities that Affect Air Quality

Any CAA permit that may be needed by USEPA regulations would be issued by USEPA Region 1 or by the appropriate state agency authorized to do so by the USEPA. Some emissions associated with OCS sources may require compliance with the General Conformity Rule (40 CFR Part 93, Subpart B). These regulations implement Section 176 of the 1990 CAA Amendments, which require that federal actions conform to applicable state implementation plans (SIPs) developed by states and approved by the USEPA for the purpose of attaining or maintaining compliance with NAAQS. To determine whether a conformity determination is required for activities described in a particular SAP, BOEM would conduct an applicability analysis when a SAP is received. A conformity determination is required when the total direct and indirect emissions for criteria pollutants in a nonattainment or maintenance area exceed *de minimis* rates specified in 40 CFR 93.153(b)(1) and (2). The emissions estimates must include emissions from transportation of materials, equipment, and personnel and must extend to the construction/installation and decommissioning phases as well as to the operation and maintenance phase of the proposed action. Conformity applies only to emissions within state boundaries (onshore and in state waters) and emissions that are located within 25 NM of the state's seaward boundary that are not included in the USEPA CAA permit.

4.1.1.1.2 Impact Analysis of Alternative A

Impacts of Routine Activities and Events

Increased vessel traffic associated with site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and/or buoys could occur simultaneously, and possibly overlap, with the projected increases in current vessel traffic levels associated with these ports (*see* Section 4.1.3.7, "Land Use and Coastal Infrastructure"). The additional vessel activity associated with Alternative A is anticipated to be relatively small (*see* Section 3.1.2.6, "Vessel Traffic Associated with Site Characterization") when compared with existing and projected future vessel traffic in the area. Vessel round trips in connection with site characterization and assessment activities under Alternative A would range from 1,500 to 4,000 over a five-year period if the entire WEA were leased and the maximum number of site characterization surveys were conducted (*see* Sections 3.1.2.6, "Vessel Traffic Associated with Site Characterization," and 3.1.3.4, "Vessel Traffic Associated with Site Assessment"). Due to the proximity of various ports to the WEA, these trips would be divided among large commercial ports in Narragansett Bay, Rhode Island, and/or Buzzards Bay, Massachusetts, to smaller ports in Rhode Island and Massachusetts. Port selection depends on the type and size of vessel to be used and proximity of a lease area to a port. If any of the 18 existing ports are used for the construction/installation, operation and maintenance, and decommissioning of the meteorological towers and buoys, round trips per year would average about 7 to 22 trips or 34 to 112 over a five-year period (*see* Section 3.1.2.6, "Vessel Traffic Associated with Site Characterization," and Section 4.1.3.7, "Land Use and Coastal Infrastructure").

Routine activities (*see* Section 3.1), which include site characterization activities and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys, have the potential to impact local air quality. Potential emission sources would include support vessels, survey vessels, and equipment, and diesel generators that could be used to power equipment on meteorological towers. Vessels associated with the Alternative A would emit SO_2, NO_2, CO, O_3, PM_{10} and $PM_{2.5}$, VOCs, and other chemicals categorized as air pollutants.

Emissions of Criteria Pollutants

The primary emission sources associated with site assessment activities would be engine exhaust from vessel traffic (e.g., boat or barge) and heavy equipment (e.g., pile-drivers) (*see* Chapter 5.2.2.2 of the Programmatic EIS [USDOI, MMS 2007]). In general, most criteria pollutant emissions would be from internal combustion engines burning diesel fuel during the construction/installation or decommissioning of a meteorological buoy or tower and would include primarily NO_X and CO, lesser amounts of VOCs and PM_{10} (mostly in the form of $PM_{2.5}$), and negligible amounts of sulfur oxides (SO_X).

Site Characterization Surveys

Survey vessels would emit pollutants both in state waters and in waters over the OCS while traveling to and from the WEA and while conducting site characterization surveys within the WEA. Impacts from pollutant emissions associated with these vessels would likely be localized within the WEA and in the vicinity of vessel activity.

Prevailing southerly (southwest to southeast flow) winds would transport emissions from offshore areas to onshore ozone non-attainment areas; however, by the time the emissions reached onshore areas, they would have dispersed enough to be undetectable. In state waters, additional vessel traffic associated with survey vessels moving in and out of each port can reasonably be predicted to be relatively small because of the relatively low volume of vessel traffic over the five years of activity. (Vessel activity is discussed in Sections 3.1.2.6, "Vessel Traffic Associated with Site Characterization" and 4.1.3.8, "Navigation and Vessel Traffic.") The trips per year would be a very small contribution to the annual average traffic in each port, coastal, and harbor area's activity. The additional pollutant emissions resulting from the vessel traffic associated with the WEA would be negligible in the WEA.

Vessels used for the HRG surveys in the WEA would cover a maximum of 17,500 NM and 4,000 hours of operation (*see* Section 3.1, Table 3-1). It is unlikely that these activities would impact onshore air quality because of the distance from shore where the vessel activity would occur.

Construction and Decommissioning

Several major ports are suitable for supporting fabrication and staging meteorological towers and buoys (*see* Section 4.1.3.7, "Land Use and Coastal Infrastructure"). Alternative A is projected to need up to four meteorological towers and up to eight meteorological buoys in the WEA (*see* Section 3.1, Table 3-1). Potential impacts on ambient air quality in the WEA during construction and decommissioning are expected to be minor due to the short duration of these activities and the location of these activities offshore. Estimated emissions of criteria air pollutants from the construction and decommissioning of each anticipated meteorological tower would be similar to values published in the Mid-Atlantic Final EA (USDOI, BOEM, OREP 2012b) of approximately 13 tons of NO_X (based on estimates provided by Bluewater Wind New Jersey LLC, now NRG Bluewater Wind). As a result, if all of the lessees within the WEA choose to erect meteorological towers, the total amount of all criteria pollutant emissions associated with constructing and decommissioning (including vessel traffic) all four of the anticipated towers offshore would be 52 tons. If all tower construction occurred in the same year or in separate years, total annual emissions would be less than the General Conformity *de minimis* level of 100 tons per year for $NO_{X,}$ corresponding to the ozone nonattainment designation of the coastal areas. The total criteria pollutant emissions for one meteorological tower and associated vessels are therefore anticipated to be well below the General Conformity *de minimis* level. A General Conformity analysis would be performed if a submitted SAP indicates that the site assessment activities would emit more than 100 tons of a criteria pollutant per year for which the WEA onshore area is designated as either nonattainment or maintenance.

Emissions associated with a buoy would be much less than those associated with a tower because buoys are towed or carried aboard a vessel and then anchored to the seafloor. No drilling equipment would be required to install meteorological buoys. Each installation and decommissioning of a meteorological buoy can be completed in approximately one to two days respectively, which involves one round trip (*see* Section 3.1.3.2, "Meteorological Buoy and Anchor System"). This is well below the number of trips required for tower installation and, therefore, emissions associated with construction and decommissioning the number of projected meteorological buoys would also be below the pollutant threshold.

Emissions associated with the construction and decommissioning of the anticipated meteorological data collection facilities, whether towers or buoys, would be minor based on the estimate of less than 100 tons per year per leasehold. The majority of these emissions would occur within the WEA and would not affect local onshore air quality.

Operations

As explained in Section 3.1.2.4, "Timing," BOEM assumes that meteorological towers and buoys in the WEA would be operating concurrently or staggered over a five-year lease period. Equipment on the meteorological data collection facilities would be powered by batteries charged by small wind turbines, solar panels, and/or diesel generators. Diesel generators may be used as the main source of power on meteorological towers and a backup power source on meteorological buoys. While turbines and solar panels would produce no emissions, diesel generators would emit NO_X, CO, PM_{10}, $PM_{2.5}$ and SO_2. All criteria pollutant emissions are estimated to total approximately 1 ton per year for each facility (Bluewater Wind New Jersey Energy LLC 2009 *as cited in* USDOI, BOEM, OREP 2012b). Total operational emissions for up to four meteorological towers in the WEA would be 4 tons per year. Use of diesel generators in the WEA is not expected to impact local onshore air quality because of the distance of the towers from shore and low emission levels.

Support vessels traveling to and from shore and in harbor or port areas for operation and maintenance of the meteorological towers are anticipated to make approximately 240 to 1,560 round trips over five years (*see* Sections 3.1.2.6, "Vessel Traffic Associated with Site Characterization" and 3.1.3.4, "Vessel Traffic Associated with Site Assessment"). These vessels would contribute very little to preexisting emission totals in these areas because the trips would be spread over five years. Therefore, additional pollutant emissions, based on estimated vessel trips in conjunction with vessel trips and air emissions from the already busy ports and harbors, are expected to have negligible impacts.

Impacts of Non-Routine Events

The most likely impact on air quality from non-routine events would be caused by vapors from fuel spills resulting from either vessel collisions or allisions or from servicing or refueling generators that may be located on the meteorological towers or buoys. Vessel collisions within or outside the WEA or at the sites of the meteorological towers and buoys in the WEA (up to four towers and up to eight buoys) could cause a spill (*see* Section 3.2.3, "Fuel Spills"). If a vessel spill occurred, the estimated spill size would be approximately 88 gallons (based on the average spill size for vessels other than tank ships and tank barges [U.S. Department of Homeland Security, USCG 2011 *as cited in* USDOI, BOEM, OREP 2012b]). It is estimated that a buoy generator could contain 240 gallons of diesel fuel (Fishermen's Energy of New Jersey LLC 2011 *as cited in* USDOI, BOEM, OREP 2012b). If such a spill were to occur, it would be expected to dissipate very rapidly and then evaporate and biodegrade within a few days (USDOI, MMS 2007b *as cited in* USDOI, BOEM, OREP 2012b). Air emissions from a diesel spill would be minor and temporary. A diesel spill occurring in the WEA would not be expected to have impacts on onshore air quality because of the estimated size of a spill, prevailing atmospheric conditions over the WEA, and distance from shore. The impacts of emissions on air quality in the vicinity of the spill within the WEA are expected to be minor and temporary.

In the unlikely event of vessel collision or allision, a spill could occur while en route to and from the WEA or while a lessee surveys potential cable routes to shore. Spills occurring in these areas, which include harbor and coastal areas, are not anticipated to have significant impacts on onshore air quality due to the small estimated size and short duration of the spill. If such a spill were to occur, the impacts on local air quality are expected to be minor and temporary.

4.1.1.1.3 Conclusions

Potential impacts on onshore ambient air quality from Alternative A are expected to be minor for several reasons. Only a small number of vessels would traverse the WEA and nearshore area at any one time over the course of five years of site assessment and characterization activities. Also, the current ambient concentration of air quality parameters would not be affected by the small amount of air pollutants emitted during operations if generators are used. The short duration of these activities and the location of these activities offshore during installation and decommissioning for Alternative A are also reasons the impacts would be minor. Prevailing southerly (southeast through southwest) winds would transport emissions from offshore to onshore areas; however, the distance to shore and low level of emissions would minimize any detectable impact on ambient or onshore air quality.

Emissions associated with Alternative A within ports and harbors would be negligible due to the low volume of vessel activity associated with Alternative A, particularly when compared with the high volume of current activity in and around these areas that emit air pollutants, and in light of the current ambient air quality in most of these areas. A non-routine event such as a diesel spill may have short-term impacts on ambient air quality in a localized area, but these effects would dissipate very quickly. Neither routine activities nor non-routine events in harbor areas, coastal waters, or in the WEA are expected to significantly impact onshore air quality. Class I air quality areas are too distant (more than 124 miles [200 kilometers]) to be affected by emissions from activities in the WEA.

4.1.1.2 Geology

The Rhode Island and Massachusetts WEA has recently undergone extensive environmental analysis and assessment, including an assessment of the subsea geology. A detailed description of the subsea geology of this area is provided in the Rhode Island Ocean SAMP (Rhode Island CRMC 2010). Since the area evaluated in the Rhode Island Ocean SAMP directly corresponds to the area evaluated in this revised EA, most of the information provided in this revised EA is a summary of Section 210 of the Rhode Island Ocean SAMP. Accordingly, that information is presented in Appendix C of this EA.

As explained in Appendix C, impacts or the risks of liquefaction, karst terrain, volcanism, and human activities are not associated with Alternative A due to the minimal physical scale of any structures that would be deployed or constructed. In addition, the likelihood of a damaging earthquake occurring in the WEA over the life of the project is very low. However, the irregular seafloor, sand waves, boulder areas and, to a lesser extent, gas-charged areas can impact facility siting in a leasehold and data from detailed geohazard surveys would be used to evaluate vulnerability. Therefore, impacts to geology are expected to be negligible.

4.1.1.3 Physical Oceanography

The WEA of offshore Rhode Island and Massachusetts has recently undergone extensive environmental analysis and assessment, including an assessment of the physical oceanography. A detailed description of the physical oceanography of this area is provided in the Rhode Island Ocean SAMP. Since the area evaluated in the Rhode Island Ocean SAMP directly corresponds to the area evaluated in this revised EA, most of the information provided in this revised EA is a summary of Section 210 of the Rhode Island Ocean SAMP. Accordingly, that information is presented in Appendix C of this EA.

As explained in Appendix C, the proposed action is not expected to affect the physical oceanography in the WEA including wave action, tidal processes, temperature, salinity, stratification, and circulation, due to the minimal physical scale of any structures that would be deployed or constructed; however, enhanced wave action, currents, and tides caused by adverse weather conditions may temporarily impede surveys, construction/installation, operation and maintenance, and decommissioning activities. These conditions are expected to be negligible and short-term.

4.1.1.4 Water Quality

Water quality can be defined generally as an indicator of the ability of a waterbody to maintain the ecosystems it supports or influences. In coastal and marine environments, the quality of the water is influenced by the bays and rivers that drain into the area, the quantity and composition of wet and dry atmospheric deposition (USDOI, BOEM, OREP 2012b and USDOI, MMS 2007), and the influx of constituents from sediments. In addition to these natural inputs, water quality can be affected by discharges, run-off, dumping, burning, spills, and other human activities and by subsequent potential pollutants that may be released into the water via vessel traffic and anti-fouling paints. Mixing or circulation of the water can either improve the water through flushing or be the source of factors contributing to the decline of water quality.

Water quality is evaluated by measuring factors that are considered important to the health of an ecosystem. The factors influencing coastal and marine environments are temperature, salinity, dissolved oxygen, nutrients, the presence of chlorophyll, hydrogen (pH), oxidation reduction potential (Eh), pathogens, and turbidity or suspended load. Trace constituents such as metals and organic compounds also can affect water quality. Contaminants, which are associated with the suspended sediment load, may ultimately reside in the sediments rather than the water column.

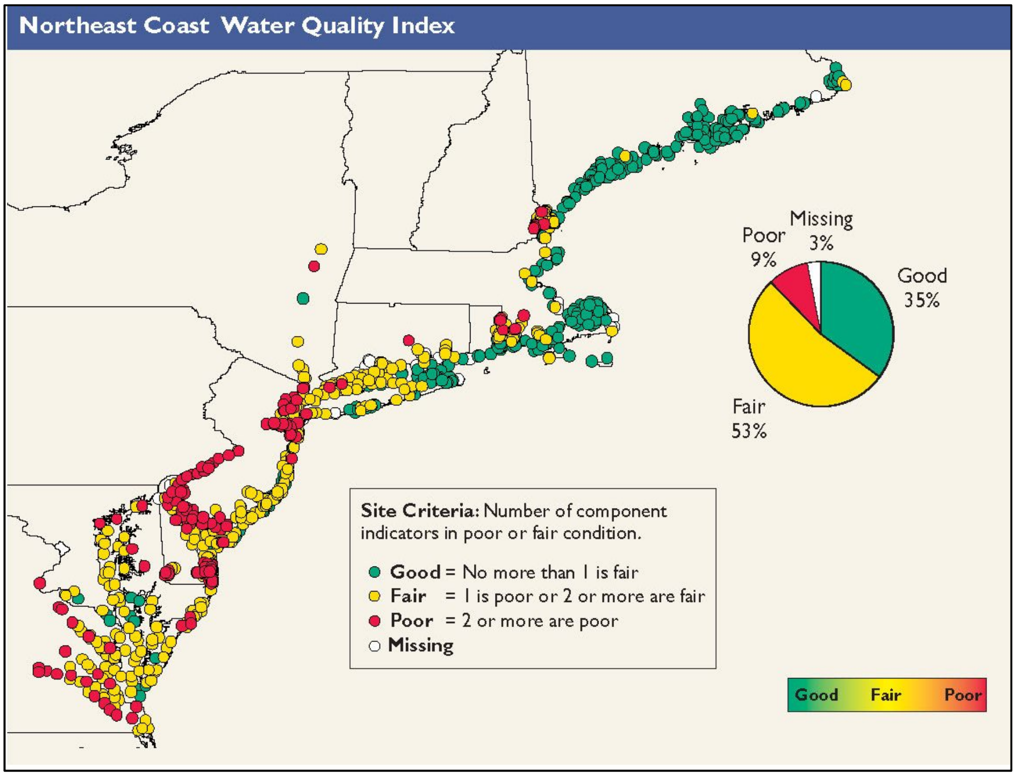
Coastal waters include all the ports/harbors, rivers, bays, and estuaries that could be affected by Alternative A (e.g., traversed by vessels during site characterization and assessment activities). Marine waters include waters offshore that are state territory (within 3 NM of shore) as well as those above the OCS in the WEA and on the path between the WEA and shore.

4.1.1.4.1 Description of the Affected Environment

Chapter 4.2.4 of the Programmatic EIS (USDOI, MMS 2007) describes coastal and marine water quality in the Atlantic region, including the regions in which the Rhode Island and Massachusetts WEA is located. The following summarizes that information and incorporates new and site-specific information.

Coastal Waters and Water Quality

In the National Coastal Condition Report IV (USEPA 2012c), the USEPA rated the quality of the nation’s coastal waters on a scale of poor, fair, and good using an index based on dissolved oxygen, chlorophyll *a*, nitrogen, phosphorus, and water clarity. According to the National Coastal Condition Report IV, the water quality for the relevant portions of the Northeast, which includes the Rhode Island and Massachusetts coastlines as well as Narragansett Bay, was rated by the USEPA as "good" to "fair" for water quality (Figure 4-1).



Source: USEPA 2012c.

Figure 4-1. Water Quality Index for the Northeast Coast.

Rhode Island and Massachusetts Coastal Waters

The Rhode Island ports of Quonset Point, Providence, Bristol Harbor, Tiverton, Melville, Newport, and the Massachusetts port of Fall River are all located in Narragansett Bay. Approximately 2 billion gallons (7.5 billion liters) of fresh water per day flow into Narragansett Bay from various sources (rivers, streams, and groundwater originating in Rhode Island and southern Massachusetts) to mix with saltwater from the Atlantic Ocean (Narragansett Bay Estuary Program [NBEP] 2012). The Narragansett Bay Region, which includes the Narragansett Bay and Wood-Pawcatuck watersheds as well as Rhode Island's coastal salt ponds, spans 2,066 square miles (5,351 square kilometers), with 1,028 square miles (2,662 square kilometers) in Massachusetts, 984 square miles (2,549 square kilometers) in Rhode Island, and 57 square miles (148 square kilometers) in Connecticut; it has a population of more than 2 million people and includes more than 100 cities and towns (NBEP 2012). The Narragansett Bay estuary is 192 square miles (497 square kilometers), located in both Rhode Island (95 percent) and Massachusetts.

The NBEP uses multiple indicators to assess water quality and habitat in Narragansett Bay. Approximately 33 percent of Rhode Island's estuarine waters are impaired by low dissolved oxygen levels (hypoxia) due to high nutrient content and poor circulation (NBEP 2012). The most severe conditions occur annually in the Seekonk River, followed by Greenwich Bay. Approximately 21 percent of Rhode Island's estuarine waters are impaired for shellfishing by high bacteria levels (NBEP 2012). This impairment follows a north-south pollution gradient (highest in the north) that results from discharges of raw sewage from combined sewer overflows (CSOs), failing septic systems, and runoff. (Bacterial counts are expected to decline in the near future in the Upper Bay because a CSO retention tunnel in Providence, Rhode Island, has been completed by the Narragansett Bay Commission.) Impairments resulting from contaminants in runoff are aggravated by the fact that approximately 14 percent of the land cover in the Narragansett Bay watershed is impervious, and land use changes in both Rhode Island and Massachusetts show a dramatic increase in developed land. Since 1995, approximately 30 percent of the land that had been undeveloped throughout Rhode Island has since been developed, and in Massachusetts, residential land use increased by approximately 47 percent between 1971 and 1999. Species composition in Narragansett Bay has changed over the last 50 years, showing a decrease in demersal (bottom-dwelling) fish and an increase in benthic invertebrates, pelagic fish, and squid. This trend is likely the result of fishing pressure and warming waters. The average surface water temperature in the bay has increased by 3.6 degrees Fahrenheit (°F) (i.e., by 2 degrees Celsius [°C]), since 1959. Levels of the contaminants mercury and polychlorinated biphenyls (PCBs) are high enough in fish to require fish consumption advisories in the bay.

Marine Waters

Although no data specific to water quality in the WEA are available at this time, as the distance from shore increases, oceanic circulation and the volume of the water increasingly determine water quality by dispersing, diluting, and biodegrading contaminants. Since the vast majority of pollutants and threats to marine waters originate on land, there are far fewer identified threats to marine water quality originating from activities in the marine environment.

Discharges from ships and onshore wastewater treatment facilities are the most likely sources of water-borne contaminants in the WEA. Ocean-going vessels sometimes discharge bilge and ballast water and sanitary waste before entering state waters because of state restrictions on discharges in their waters. Sewage outfalls from both the Rhode Island and Massachusetts coasts currently discharge treated municipal wastewater to the Atlantic Ocean in such concentrations and volume that water quality in the WEA could be affected.

Mid-Atlantic ocean waters beyond 3 miles (approximately 5 kilometers) offshore typically have very low concentrations of suspended particles, generally less than 1 milligram per liter (Louis Berger Group 1999). Levels may be higher in bottom waters because bottom currents may resuspend sediments. Storms may cause suspended sediment loads to increase by one to two orders of magnitude, but this effect dissipates soon (within days) after the storm passes. Sand, the predominant sediment type in the area, does not retain contaminants, and thus resuspension of sediments is not a potential source of pollution. The distance of the WEA from the shoreline bays and rivers limits the potential influence of land-based contaminants.

4.1.1.4.2 Impact Analysis of Alternative A

Impacts of Routine Activities and Events

The routine activities associated with Alternative A that would impact coastal and marine water quality include vessel discharges (including bilge and ballast water and sanitary waste) and structure installation and removal. A general description of these impacts on coastal and marine water quality is presented in Section 5.2.4 of the Programmatic EIS (USDOI, MMS 2007). The following summarizes that information and incorporates new and site-specific information.

Onshore Discharges

Point-source discharges onshore and in state waters are regulated by the USEPA, the agency responsible for coastal water quality, or a USEPA-authorized state agency. The USEPA National Pollutant Discharge Elimination System (NPDES) storm water effluent limitation guidelines control storm water discharges from support facilities such as ports and harbors. Activities associated with staging and fabrication of the meteorological towers and buoys would account for a very small amount of activity at existing port facilities during staging, anticipated to take eight days to ten weeks (*see* "Timing" in Section 3.1.3.1, "Meteorological Towers and Foundations"). Alternative A is not anticipated to increase runoff or onshore discharge into harbors, waterways, coastal areas, or the ocean environment.

Vessel Discharges

Vessel discharges may affect water quality when vessels are traveling to and from the WEA and during site characterization surveys and site assessment activities in the WEA. Vessel discharges include bilge and ballast water and sanitary waste. Bilge water is water that collects in the lower part of a ship. The bilge water is often contaminated by oil that leaks from the machinery on the vessel. The discharge of oily mixtures from vessel bilges is regulated under 33 CFR 151.10, which requires specialized treatment and monitoring of oily mixtures before they can be legally discharged. Bilge water discharges may occur in nearshore and offshore waters provided that the effluent is processed by an approved oily water separator and the oil content is less than 15 ppm. In navigable waters of the United States, vessels may not discharge any effluent that contains oil that causes a sheen on the surface of the water or an emulsion beneath the water, which is a violation of 40 CFR 110. Bilge water that cannot be discharged in compliance with these standards must be retained onboard the vessel for subsequent discharge at an approved port reception facility per 33 CFR 151.10(f).

Ballast water is less likely to contain oil but is subject to the same oil content discharge limits. Ballast water is used to maintain stability of the vessel and may be pumped from coastal or marine waters. Generally, the ballast water is pumped into and out of separate compartments and is not usually contaminated with oil; however, the same discharge criteria for bilge water apply to ballast water (33 CFR 151.10). Ballast water also may be subject to the USCG's Ballast Water Management Program to prevent the spread of aquatic nuisance species.

The USCG's final rule was published March 23, 2012 in the *Federal Register* and was effective June 21, 2012. The USCG amended 33 CFR 151 and 46 CFR 162 to establish ballast water discharge standards (BWDSs) and added an approval process for ballast water management systems intended for onboard use to meet BWDSs. The new BWDSs set an *"allowable concentration of living organisms in ballast water discharged from ships in waters of the US."* The new standards are the most stringent that can be implemented by vessels and that can be enforced by the USCG (United States Department of Homeland Security, USCG 2012).

In coastal waters, bilge and ballast water with an oil content of 15 ppm or less may be discharged. In *Report to Congress: Study of Discharges Incidental to Normal Operation of Commercial Fishing Vessels and Other Non-Recreational Vessels Less than 79 Feet* (USEPA 2010c), the USEPA described the type of sampling wastewater discharges from vessels that would be associated with Alternative A, e.g., tugboats, small research vessels, and supply boats. The samples were taken from port waters and coastal city waters in the Mid-Atlantic and in other areas. Using the samples, the USEPA modeled how these vessel types may impact water quality. It was determined that vessels discharging to a relatively large waterbody, such as the WEA, were not likely to cause an exceedance of the national recommended water quality criteria. However, there is the potential for these discharges to impact water quality locally and temporarily (a few days) within the WEA. Vessels traveling through portions of the WEA that are outside the 12NM boundary could release bilge water and ballast water into the ocean. However, as noted above, oceanic circulation and the volume of water increasingly serve to disperse, dilute, and biodegrade such contaminants, and while the discharges thus may affect the water quality locally and temporarily, the potential impacts from these vessels, if any, are expected to be minor.

There are three types of MSDs. Type I macerates the sewage so there are no visible solids and then reduces the bacteria count to less than 1,000 per 100 milliliters using chemicals before discharge at sea. A Type II MSD macerates waste solids so that the discharge contains no suspended particles, and the bacteria count must be below 200 per 100 milliliters. The discharge of treated sanitary waste would still contribute small amounts of nutrients to the water. Type III MSDs are holding tanks and are the most common type of MSD sewage treatment system aboard vessels. These systems are designed to retain or treat the waste until it can be disposed of at the proper shore-side facilities.

Domestic waste consists of all types of wastes generated in the living spaces onboard a ship, including greywater that is generated from dishwashing, shower, laundry, bath, and washbasin drains. Greywater from vessels is not regulated outside state waters, and vessel operators may discharge greywater outside state waters. Since the WEA is outside state waters, it would be likely that vessels would discharge greywater while operating on the OCS. However, oceanic circulation and the volume of water increasingly serve to disperse, dilute, and biodegrade contaminants such as greywater, and while the small amount of discharge associated with these vessels into such a large waterbody may affect the water quality locally and temporarily, the potential impacts on water quality in the open ocean, if any, are expected to be minor.

Because the discharge of trash is generally prohibited, BOEM concludes that no environmental effects are likely to occur as a result of trash discharge, even if some trash or debris is discharged accidentally.

Sediment Disturbance

Sediment could be disturbed by vessel and buoy anchoring; geological, geophysical, and geotechnical hazards; and archaeological (GGARCH) surveys, and structure installation and removal, most of which would take place within the WEA.

Anchoring

The process of anchoring vessels and buoys and anchor removal would cause intermittent disturbance of the seafloor, with sediment moving into the water column followed by sedimentation. The amount and duration of increased turbidity would depend on the activity, the sediment grain size, current velocity, and water depth. An estimated 930 to 1,970 round trips over the entire five-year period are anticipated with Alternative A, if the entire area of the WEA is leased and the maximum amount of site characterization surveys are conducted in the leased areas of the WEA. A portion of this vessel traffic—specifically, that associated with bottom sampling, construction/installation, and decommissioning—could be anchored. Anchoring and removal are short-term processes, and sediment is expected to settle within a few minutes of disturbance. Short-term impacts on turbidity and water clarity are expected to be local and only in discrete areas of the WEA. These impacts are anticipated to be temporary, localized, and minor.

Site Characterization Surveys

The geophysical surveys in the WEA (*see* Section 3.1.2.1, "High-Resolution Geophysical Surveys") would not likely influence water quality except for vessel discharges, as described above, but sediment coring would temporarily disturb the seafloor, introduce sediment into the water column, and temporarily increase turbidity and sedimentation. It is anticipated that a total of 500 to 1,400 sediment samples would be collected in the WEA ranging over a five-year period (*see* Section 3.1.2.2, "Geotechnical Sampling"). To the extent that sediment samples are collected by drilling equipment, the disposition of the sediment core material itself could affect water quality in the short-term, i.e., causing turbidity and a degradation of water clarity in the immediate area of disturbance. These impacts are anticipated to be temporary, localized, and minor.

Installation and Decommissioning

Up to four meteorological towers and up to eight meteorological buoys (*see* Table 3-1) are anticipated to be installed and ultimately decommissioned within the WEA. It is not anticipated that all four meteorological towers and all eight meteorological buoys would be constructed simultaneously (*see* "Timing" in Section 3.1.3.1, "Meteorological Towers and Foundations"). Impacts on water quality resulting from the construction and installation of meteorological towers would be sediment dispersal, resuspension, and subsequent sedimentation from pile-driving and anchoring activities.

Within a period of two years after the cancellation, expiration, relinquishment, or other termination of the lease, the lessee would be required to remove all devices, works, and structures from the site and restore the leased area to its original condition before issuance of the lease (30 CFR 585.902(a)). Decommissioning the meteorological towers would begin with removing all meteorological instrumentation from the tower, typically a single vessel. A derrick barge would be transported to the offshore site and anchored next to the structure. The mast would be removed from the deck and loaded onto the transport barge. The deck would be cut from the foundation structure and loaded on the transport barge. The same number of vessels necessary for installation would likely be required for decommissioning. The sea bottom area beneath installed structures would be cleared of all materials that have been introduced to the area in support of the lessee's project. As required by BOEM, the lessee would sever bottom-founded structures and their related components at least 15 feet (5 meters) below the mudline to ensure that nothing would be exposed that could interfere with future lessees and other activities in the area (30 CFR 585.910(a)). Water quality would be affected during decommissioning activities, including sediment resuspension and re-sedimentation during the removal process. When the tower structure is decommissioned, sediments that had collected in any scour control system, mats, or rock armor would be temporarily disturbed. The mats and rock armor would be returned to shore for disposal (*see* Section 3.1.3.1, "Meteorological Towers and Foundations").

Because installing the towers and/or buoys is expected to take eight days to ten weeks (*see* "Timing" in Section 3.1.3.1) and decommissioning is expected to take one week (*see* "Decommissioning" in Section 3.1.3.1), impacts on water quality would be localized and temporary, and these impacts are expected to be minor. If all lessees installed meteorological buoys, a total of eight buoys would be installed in the WEA. Meteorological buoy installation and decommissioning would likely each take one to two days (*see* Section 3.1.3.2, "Meteorological Buoy and Anchor System"). Impacts on water quality resulting from the installation of meteorological buoys would consist of sediment dispersal, resuspension, and subsequent sedimentation from anchoring. During decommissioning, water quality would be affected by material dislodged during the removal of the buoy anchor. Because the installation and removal of a buoy does not involve any pile-driving or installation (or removal) of a foundation (*see* Section 3.1.3.2), a buoy would likely have even less of an impact on local water quality than would the installation and decommissioning of a meteorological tower. However, if every lessee chose to install two buoys instead of one tower, there would be approximately twice as many buoys as towers (eight) in the Rhode Island and Massachusetts WEA on the OCS. Nevertheless, the impacts during installation and decommissioning of this number of meteorological buoys on the OCS offshore of Rhode Island and Massachusetts may create temporary and localized water and sediment impacts, but these impacts are anticipated to be minor.

Impacts of Non-Routine Events

Vessels, generators, and pile-driving hammers used during site characterization and site assessment activities in the WEA and along potential transmission corridors comprise multiple sources of diesel fuel, lubricating oil, and hydraulic oil. Spills could occur during refueling or other fluid exchange or as the result of an allision or collision.

A vessel allision with meteorological structures or collision with other vessels may result in a spill of diesel fuel, lubricating oil, or hydraulic oil. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. Spills are not projected to have significant impacts due to the small size of a possible spill. A spill could occur while en route to and from the WEA, but this is considered unlikely. If a spill occurred, either inside or outside of the WEA, the estimated spill size would be small. Vessel allision with a meteorological buoy containing a diesel-powered generator may also occur. It is estimated that a buoy generator could contain 240 gallons of diesel fuel (Fishermen's Energy of New Jersey, LLC 2011 *as cited in* USDOI, BOEM, OREP 2012b). If a diesel spill of this size occurred, it would be expected to dissipate very rapidly in the open ocean, then evaporate and biodegrade within a few days (*see* Section 3.2.3, "Fuel Spills").

The meteorological towers and buoys could serve as attractants for marine life, which in turn could attract recreational fishermen to the area. Therefore, there is some potential for collisions with recreational fishing boats and accidental release of gasoline or diesel fuel. If this occurred, the spill would be similarly small and would dissipate and biodegrade in the same manner as discussed above.

Storms and decreased visibility (rain, snow, fog) may contribute to allisions and collisions that could result in a spill, yet the storm conditions would cause the spill to dissipate faster. In addition, vessel activity related to site characterization and site assessment activities within the WEA likely could be postponed as a result of poor weather, which would tend to reduce the likelihood of an allision or collision resulting in an oil spill.

As a result, the impacts on the environment that could result from an oil spill associated with Alternative A, if one occurred, are expected to be both minor and temporary.

It is also possible that larger vessels, such as tankers or container ships, could collide with meteorological structures in the WEA. Such a collision is considered unlikely because these structures would be sparsely placed on the OCS offshore of Rhode Island and Massachusetts and would be lit and marked for navigational purposes (*see* Section 3.1.3.1, "Meteorological Towers and Foundations"). If a larger vessel collided with a meteorological facility, a large spill would be extremely unlikely (*see* Section 3.2.2, "Allisions and Collisions"). Thus, the largest spill that could result in the unlikely event that a larger ship collided with a meteorological facility is on the order of 240 gallons (908 liters)—the estimated amount of generator fuel that could be present on the meteorological facility itself (assuming that a generator is present on the facility).

4.1.1.4.3 Conclusions

Impacts on coastal and marine waters from vessel discharges associated with Alternative A are expected to be of short duration and remain minor, and no significant impacts are expected. Sediment disturbance resulting from anchoring and coring would be short-term, temporarily impacting local turbidity and water clarity. As a result, sediment disturbance resulting from Alternative A is not anticipated to result in any significant impact on any area in the WEA or along any potential transmission corridors. Since collisions and allisions occur infrequently and rarely result in oil spills, the risk of a spill would be small. In the unlikely event of a fuel, lubricating oil, or hydraulic oil spill, minor impacts would be expected because the spill would very likely be small and would dissipate and biodegrade within a short time. As a result, if a spill occurred, the potential impacts on water quality are not expected to be significant. Moreover, storms may disturb surface waters and cause a faster dissipation of diesel if spilled, but impacts on water quality would be negligible and of a short duration. Therefore, impacts from vessel discharges, sediment disturbance, and potential spills associated with Alternative A on harbors, ports, coastal areas, and the WEA are expected to be minor.

4.1.2 Biological Resources

4.1.2.1 Avian and Bat Resources

4.1.2.1.1 Birds: Description of the Affected Environment

Migratory Birds

The Atlantic Coast along Rhode Island and Massachusetts plays an important role in the ecology of many bird species. The WEA is located within the Atlantic Flyway, which is one of the four primary North American Flyways used by migratory birds during spring and fall migrations. All migratory birds native to North America are protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-12).[10] The coastlines of Rhode Island and Massachusetts are used as a migratory corridor by birds as they move from their breeding grounds in northern latitudes (including New England, Canada, and the Artic) to their wintering grounds, which may extend from Rhode Island and Massachusetts down to the subtropical and tropical areas of Central and South America. These areas are also used by birds that breed in the southern hemisphere and "winter" along the Atlantic Coast. The timing of migration and migration route used varies by bird species and by season. Migrating birds use inland, coastal, and near-coastal habitats as well as offshore waters as stopover sites for resting and refueling during migration. Generally, bird abundance declines in offshore environments as the distance from shore increases—a pattern that has been observed in Europe (Petersen *et al* 2006) and offshore of Rhode Island (Paton *et al*. 2010; Winiarski *et al.* 2011), New Jersey (Geo-Marine, Inc. 2010), and New York (Menza *et al*. 2012). Migratory birds could pass through the WEA; however, their numbers are expected to be low due to the distance of the WEA from shore. The distribution and abundance of birds is also generally well-characterized for this WEA in multiple reports (e.g., O'Connell *et al.* 2009; Paton *et al*. 2010; Winiarski *et al.* 2011; Menza *et al.* 2012; and Winiarski and Paton 2012).

Bald and Golden Eagles

Pursuant to the MBTA and the Bald and Golden Eagle Protection Act (16 U.S.C. 668; 50 CFR 22), "take" or "disturbance" of any bald or golden eagle is prohibited. However, a valid permit would be available where an applicant has first taken all practicable steps to avoid take of eagles (50 CFR 22 and 50 CFR 21.11).

A review of nesting bald eagles in Rhode Island from 1967 through 2007 shows no breeding bald eagles recorded in Rhode Island from 1967 through 2002 and one pair nesting at Scituate Reservoir from 2003 through 2007 (Center for Biological Diversity 2007). In 2008, Massachusetts supported 26 known territorial pairs of bald eagles (Massachusetts Division of Fisheries and Wildlife 2009). Of these, 22 successfully fledged 33 chicks in that year (Massachusetts Division of Fisheries and Wildlife 2009). A review of confirmed nesting locations of bald eagles provided by the United States Geological Survey (USGS) Massachusetts Breeding Bird Atlas (Breeding Bird Atlas Explorer 2012a), shows that there are no confirmed

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[10] The official list of migratory birds protected under the MBTA and the international treaties that the MBTA implements are found at 50 CFR 10.13.

nests along the shoreline of Massachusetts, with all confirmed nests in the interior of the state. However, there are confirmed nests in both Bristol and Plymouth counties, which are coastal counties adjacent to the WEA. The bald eagle can also occur on the coastlines of Rhode Island and Massachusetts in every month of the year, in every year. There have been two bald eagle sightings on Block Island, Rhode Island, one in October 2008 and one in May 2009 (eBird 2011). During winter migration, the species is commonly associated with large waterbodies such as rivers, lakes, reservoirs, or estuaries.

Rhode Island and Massachusetts are not within the breeding range of the golden eagle (Kochert *et al.* 2012). The golden eagle is an occasional winter resident in Rhode Island and Massachusetts and typically concentrates in specific locations rather than occurring over a widespread area. Because the WEA for Alternative A is distant from the shore, no bald or golden eagles are expected to occur within the WEA. While bald eagle breeding has been confirmed in coastal counties in Massachusetts that are directly adjacent to the WEA, the confirmed nests are inland. Thus, bald eagles are not expected to breed in the harbor areas or bays that would be used by vessels associated with Alternative A. No observations of bald eagles or golden eagles were recorded during the land-based and open water bird surveys that were conducted as part of the evaluation of bird resources for the Rhode Island Ocean SAMP (Paton *et al*. 2010; Winiarski *et al.* 2011). Bald eagles occur on the coastline year-round; there is the potential for golden eagles to winter along the coastline of either state, and both species could occur in harbor areas or bays that would be used by the vessels associated with the site characterization and assessment activities related to Alternative A.

ESA-Listed Birds

Two species of federally listed threatened or endangered bird species are known to occur in and migrate through the coastal counties of both Rhode Island and Massachusetts—the federally listed as threatened piping plover (*Charadius melodus)* (USFWS 2012a) and the federally listed as endangered roseate tern (*Sterna dougallii dougallii*) (USFWS 2012b). Both species use coastal habitats, with the piping plover primarily using beaches, marshes, and intertidal wetlands and the roseate tern using beaches, intertidal wetlands, and open coastal waters. The red knot (*Calidris canutus ssp. rufa*), a candidate for listing under the ESA (USFWS 2012c), passes through the coastal habitats of Rhode Island and Massachusetts during spring and fall migration, with more birds passing through in the fall.

Piping Plover

The piping plover (*Charadius melodus*) is a small, stocky, sandy-colored bird resembling a sandpiper that inhabits wide, open beaches, alkali flats, and sandflats. It was listed as threatened in 1985 in most of its range (the Atlantic Coast population) except in the Great Lakes watershed (the Great Lakes Watershed population), where it is listed as endangered (50 FR 50726-50734). Alternative A has the potential to affect the Atlantic Coast population. In 1996, the USFWS completed the Revised Recovery Plan for the Atlantic Coast population (USFWS 1996). Critical wintering habitat has been established for the species along the coast of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (66 FR 36038-36143).

The nesting range of the Atlantic Coast population of piping plovers stretches from the shoreline of New Brunswick and Nova Scotia south to the shoreline of North Carolina. In

Massachusetts, the species is known to occur in Barnstable, Bristol, Dukes, Essex, Nantucket, Plymouth, and Suffolk counties, and in Rhode Island the species is known to occur in Newport and Washington counties (USFWS 2012a). The Atlantic Coast population (more than 1,000 birds) winters along the Atlantic Coast stretching from North Carolina to Florida, with some birds migrating to the Bahamas and West Indies to winter. Spring migration occurs during early April through mid-May, with the breeding season lasting until late August, when the species departs for its winter grounds (Elliott-Smith and Haig 2004). Although the Atlantic Coast population of piping plovers is under population pressure, these plovers are at little risk of near-term extinction (Plissner and Haig 2000). From 1989 to 2011, the New England portion of the Atlantic Coast population of breeding pairs has increased from 206 to 825 (preliminary) and has continued to increase in recent years (USFWS, 2011a, 2011b), while other portions of the population (New York-New Jersey, Eastern Canada, and Southern) have slightly decreased since 2007 from 1,185 to 934 (Hecht and Melvin, 2009; USFWS, 2011a, 2011b).

Even though the exact migration routes used by piping plovers are not well known, piping plovers typically stay within narrow coastal margins during migration, avoiding offshore areas (Burger *et al.* 2011). As such, piping plovers are not expected to occur in the WEA.

Roseate Tern

The distribution of the roseate tern (*Sterna dougallii dougallii*) ranges from North Carolina north to Canada and east to Bermuda. No critical habitat has been designated for this species (52 FR 42064-42068). The USFWS recently published a five-year status review of the roseate tern (USFWS 2010).

The roseate tern is pale, medium-sized (about 40 centimeters long), and black-capped, with light-gray wings and back (USFWS 2012b). During the breeding season, it has a rosy tinge on the chest and belly. It is a fast flier and a specialized plunge-diver, feeding on small marine fish in shallow water near shore over sandbars, shoals, inlets, or schools of predatory fish (Gochfeld, Burger, and Nisbet 1998; USFWS 2012b). Alternative A has the potential to affect the North American population of roseate terns, and only this population is discussed here.

In North America, the roseate tern breeds in two discrete areas—from Nova Scotia to Long Island, New York (northeastern population), and around the Caribbean Sea (including the Florida Keys). In 1998, a Revised Recovery Plan was completed for the northeastern U.S. portion of the United States population (birds that breed from Canada south to North Carolina; Northeast Roseate Tern Recovery Team 1998). The wintering range of roseate terns is poorly understood, with the northeastern population believed to winter on the coast of South America. This species is a long-distance migrant, and the northeastern population travels primarily over the open ocean to reach the West Indies and South America (Gochfeld, Burger, and Nisbet 1998). Although the precise route of migration is not firmly established, it is possible that roseate terns will pass through the WEA during spring and fall migration.

Both Rhode Island and Massachusetts are within the range of the northeastern population. In Massachusetts, the species is known to occur in Barnstable, Bristol, Dukes, Essex, Nantucket, and Plymouth counties, and in Rhode Island the species is known to occur in Bristol and Washington counties (USFWS 2012b). Breeding colonies occur in Plymouth, Barnstable, Nantucket, and Dukes counties, Massachusetts (USDOI, BOEM, OREP 2012b); there are currently no breeding populations in Rhode Island (Paton *et al.* 2010; Winiarski *et al.* 2011), although historically they did breed in the state (USFWS 2010). The largest breeding colony of roseate terns, with over 1,000 pairs, is located on Great Gull Island in Long Island Sound (NYSDEC 2012).

Although a group of several uncommon tern species (including roseate terns) is predicted to be in the northern parts of the project area near Martha's Vineyard and Nantucket islands (Figure 4-2) (Menza *et al.* 2012), very little roseate tern activity is expected to occur within the WEA during both nesting and post-breeding staging periods. The modeled results from Menza *et al.* (2012) are based on the relationship between terns (roseate, least, royal, Arctic, sooty, bridled, Caspian, and Forster's and unidentified species) and bathymetry, zooplankton biomass, and distance from shore (Menza *et al.* 2012 [Figure 6.29]). Tern observations from 97 independent surveys from March 1 to August 31 were used to build the model. The model predicts (in blue) that terns are virtually absent from the project area with high certainty. Caution should be exercised because the modeling analysis lumped observations of several tern species together which may add to uncertainty to the predicted distribution of roseate terns.

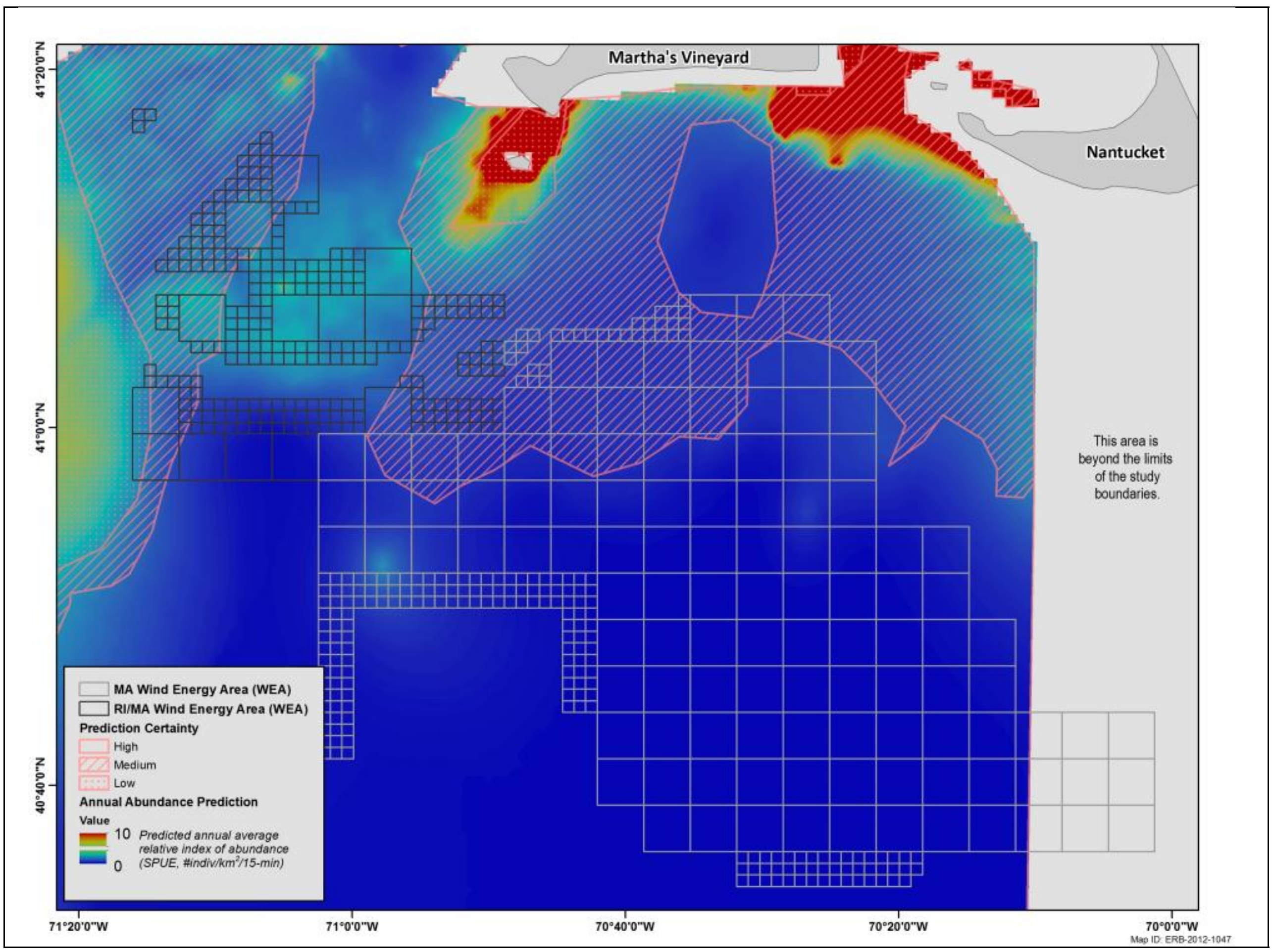


Figure 4-2. Predicted Annual Distribution and Relative Abundance of Several Less Common Tern Species in the Rhode Island and Massachusetts WEA.

Northeastern roseate terns breed in colonies on rocky offshore islands, barrier beaches, or salt marsh islands. They typically select dense vegetation, rocks, or other shelter and hide their nests, but also occasionally nest in open areas (Gochfeld, Burger, and Nisbet 1998). They arrive at their breeding grounds in April and begin to lay eggs in May, laying one or two eggs with chicks fledging after three to four weeks (USFWS 2012b). Roseate terns flock to specific areas in August for post-breeding dispersal and depart in mid-September for wintering grounds (USFWS 2012b). Many roseate terns congregate on Cape Cod during the post-breeding season for staging prior to southward migration (Northeast Roseate Tern Recovery Team 1998), and it is likely that many of the roseate terns in the vicinity of the WEA disperse from breeding colonies in Connecticut through Rhode Island and Massachusetts coastal waters on their way to Cape Cod (Winiarski *et al.* 2011 and 2012). Roseate terns were primarily identified in the northwest corner of the Ocean SAMP boundary area, in Block Island Sound, and up to 3 NM or more south of Block Island (Winiarski *et al.* 2011).

In the late 19th Century, the roseate tern suffered a drastic population decline in the U.S. due to hunting for their feathers. In addition, roseate terns have been displaced from their traditional colonies by gulls resulting in fewer nesting colonies and reduced population size (USFWS 1987). Given that roseate terns are ground nesters, their eggs and chicks are vulnerable to predation by red fox and Norway rat. Additionally, erosion is continuing to reduce the number of suitable nest sites and restricting the ability of the roseate tern to avoid nesting on islands that have high predation rates (Northeast Roseate Tern Recovery Team 1998).

Based on biological assessments conducted by BOEM and consultations with the USFWS about the federally endangered roseate terns, threatened piping plovers, and the candidate red knot for the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts, the USFWS noted in a response letter dated November 1, 2012, that based on models developed by Menza *et al.* (2012), the likelihood of roseate terns occurring in the action area has been determined to be extremely "low" as explained in the biological assessment for the USFWS (USDOI, BOEM, OREP 2012c). In addition, meteorological towers will be required to have visibility sensors to collect data on climatic conditions above and beyond wind speed, direction, and other associated metrics generally collected at meteorological towers. This information will assist BOEM and the USFWS with evaluating the impacts of future offshore wind facilities on threatened and endangered birds, migratory birds, and bats.

Red Knot

The red knot is a shorebird that breeds in the central Canadian arctic and winters as far south as Tierra del Fuego in South America. Each May, red knots congregate in Delaware Bay during their northward migration to feed on horseshoe crab eggs (*Limulus polyphemus*) prior to continuing their migration northward for breeding in the Arctic. In 2006, the USFWS designated the red knot as a candidate species for ESA listing (71 FR 53756 53835).

The red knot population has declined dramatically over the past 20 years from an estimated 100,000 to 150,000 down to 18,000 to 33,000 (Niles *et al.* 2008). The primary threat to this species is the reduced availability of horseshoe crab eggs in Delaware Bay resulting from an increase in the harvest of adult crabs for bait in the conch and eel fishing industries (Niles *et al.*

2008). Despite restrictions on crab harvest, the 2007 horseshoe crab harvest was still larger than that of 1990, and there has been no detectable recovery in the red knot population (Niles *et al.* 2009). Although the precise migration route of this species has not been firmly established (Niles *et al.* 2010), more recent research conducted by Burger *et al.* (2012) using geolocators suggests that red knots pass through WEA during migration. Results from the study further suggest that short-distance migrants spend a greater amount of time along the Atlantic Coast than long-distance migrants (Burger *et al.* 2012). Koch and Paton (2009) found that more migratory shorebirds, including red knots, pass through the region in the fall than in the spring. Little data are available on the flight altitudes of red knots during migration, though it is assumed to be very high (up to 9,843 feet [3,000 meters] in altitude) when weather conditions are favorable (Burger *et al.* 2011).

4.1.2.1.2 Birds: Impact Analysis of Alternative A

Impacts of Routine Activities and Events

Section 5.2.9.2 of the Programmatic EIS (USDOI, MMS 2007) discusses the potential impacts of the site characterization and assessment activities on birds. Migratory birds, including threatened and endangered species, could be affected by any of the Alternative A site characterization and assessment activities in the WEA and activities associated with vessel traffic to and from the WEA. No expansions of onshore facilities associated with site characterization and assessment are expected.

Discharge of Liquid Wastes, Hazardous Materials, Solid Wastes, or Fuel

Marine and coastal birds could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. Many species of marine birds (such as gannets and gulls, as noted in Winiarski *et al.* 2011) often follow ships and opportunistically forage in their wake on fish and other prey injured or disoriented by the passing vessel. In doing so, these birds may be affected by discharges of waste fluids (such as bilge water) generated by the vessels. However, operational discharges from construction vessels would be released into the open ocean, where they would be rapidly diluted and dispersed, or collected and taken to shore for treatment and disposal. Sanitary and domestic wastes would be processed through onboard waste treatment facilities before being discharged overboard. Thus, impacts on marine and coastal birds from waste discharges from construction vessels are expected to be negligible.

Coastal and pelagic birds may become entangled in or ingest floating, submerged, and beached debris. Entanglement may result in strangulation, the injury or loss of limbs, entrapment, or the prevention or hindrance of the ability to fly or swim, and all of these effects may be considered lethal (Gregory 2009; Ryan 1990). However, the discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by the Bureau of Safety and Environmental Enforcement (BSEE; 30 CFR 250.300) and the USCG (33 CFR 151) and entanglement in or ingestion of OCS-related trash and debris by marine and coastal birds is not expected. Because of the very limited amount of vessel traffic and construction activity that might occur with construction/installation and operation and maintenance of a meteorological tower, the release of wastes, debris, hazardous materials, or fuels would occur infrequently and would cease following completion of the planned activities. The likelihood of an accidental fuel release would also be limited to the active construction and decommissioning periods. Impacts on marine and coastal birds from the discharge of waste materials or the accidental release of fuels are expected to be negligible.

Vessel Activities

As stated above, many species of marine birds follow ships for the purpose of foraging; however, this activity does not pose a risk to bird species. Likewise, bird-vessel collisions are not anticipated to occur. Following vessel activity, some marine and coastal bird species avoid shipping lanes on a temporary basis (Schwemmer *et al.* 2011). In the North and Baltic Seas, loons actively avoided areas with high shipping intensity (Schwemmer *et al.* 2011). Flush distance (the distance from an approaching vessel at which a flock of birds flushes) was different among sea duck species and was also largest for the largest flocks of birds (Schwemmer *et al.* 2011). For example, common eider and long-tailed ducks returned to the area more quickly, generally within one to two hours after the disturbance, than did white-winged and common scoters (Schwemmer *et al.* 2011). Vessel activity levels in the WEA would not be as high as those present in shipping lanes and would be limited to periods associated with the performance of geological and geophysical surveys, the construction/installation, operation and maintenance, and decommissioning of meteorological towers and the placement/removal of meteorological buoys. As such, impacts to birds from vessel activities would be relatively low, ephemeral, and species-dependent and would be confined to the immediate area.

Offshore Construction

It is possible that some marine and coastal birds (i.e., loons, shearwaters, storm-petrels, gannets, sea ducks, gulls, terns, and alcids) may be temporarily displaced from offshore feeding habitats and staging and resting areas if meteorological towers and buoys are constructed and/or installed in such habitats. Birds may be disturbed by construction/installation vessel traffic as well as noise associated with pile-driving and construction of above-water portions of the towers. However, these impacts are expected to be minor due to the small number of meteorological towers and buoys that would be installed compared to the remaining nearby habitat that would be undisturbed and available for use by birds.

The season in which meteorological tower construction/installation and meteorological buoy installation occurs would determine the avian species with the potential to be impacted. For example, the number of marine and coastal birds belonging to the avian guilds—loons, gannet, sea ducks, jaeger, gulls, and alcids—is expected to be highest in the WEA during the spring and fall migratory seasons and the winter (Winiarski *et al.* 2011). Avian guilds that are present in higher numbers in the summer (as well as during the spring and fall migratory seasons) include shearwaters, storm-petrels, and terns (Winiarski *et al.* 2011; Menza *et al.* 2012).

Regardless of the season of construction/installation of meteorological towers and buoys, impacts to marine and coastal birds resulting from these activities are expected to be negligible to minor, depending on the habitats and birds affected by the location of the meteorological towers and buoys.

Meteorological Towers

It has been estimated that hundreds of millions of birds are killed each year in collisions with communication towers, windows, electric transmission lines, and other structures (Klem 1989, 1990; Dunn 1993; Shire, Brown, and Winegrad 2000). It is possible that some birds (i.e., loons, shearwaters, storm-petrels, gannets, waterfowl, shorebirds, jaeger, gulls, terns, alcids, and land birds) would pass through the WEA and be exposed to the meteorological towers. However, it is anticipated that marine animals would avoid fixed structures, such as meteorological towers and thus the risk of collisions is expected to be low.

Alternative A would include the installation of up to four meteorological towers. It is anticipated that the meteorological towers would be self-supported structures and would not require guy wires for support and stability. Guyed communication towers have been shown to result in significantly more bird deaths resulting from collision than un-guyed towers (Gehring *et al.* 2011).

Due to the small number of proposed meteorological towers, their distance from each other, and their distance from shore, potential impacts on marine and coastal bird populations from collisions, if any, are expected to be minor. Under good weather conditions, most migratory bird species in the vicinity of the proposed lease areas (at least 10 NM from shore) would be flying at an altitude higher than the anticipated meteorological towers, which are expected to range in height from 295 to 328 feet (90 to 100 meters) above mean sea level. Using radar, Mizrahi *et al.* (2010) found that migratory animals passed over Block Island during nocturnal fall migration with a peak altitude of 656 to 1,312 feet (200 to 400 meters) above sea level. However, some individuals, especially local birds or birds resting in the WEA, may fly lower (e.g., loons, shearwaters, storm-petrels, gannets, sea ducks, phalarope, gulls, terns, and alcids). The migratory flight heights of birds differ among taxonomic groups and are often associated with the height of favorable winds at the time of migration (Exo *et al.* 2003; Dokter *et al.* 2011).

Because up to four meteorological towers would be distributed throughout the WEA at distances of more than 10 NM from the coast, Alternative A is not expected to significantly affect pelagic species. Although the towers may occur within the flight range of pelagic species, they would present a very low level of risk of exposure due to their extremely small percent of area as compared to the annual habitat occupancy and geographic occurrence of these birds.

During the breeding season, terns may forage up to 14 NM from shore; however, this occurs infrequently when food source fish are not available inshore (J. Burger pers. comm. *as cited in* Burger *et al*. 2011). One study using radio telemetry documented that most roseate terns stayed within 4 NM of shore when foraging during the nesting season (Rock *et al*., 2007). During foraging flights, roseate terns typically remain at heights lower than 40 feet (12 meters; Burger *et al*. 2011). The migratory routes of roseate terns are not well understood, but it is presumed that they migrate well offshore or over pelagic waters (Hatch and Kerlinger 2004 *as cited in* Burger *et al*. 2011). At these times, it is assumed that roseate terns fly low over the water in a headwind and higher, but still below 164 feet (50 meters) in a tailwind (Hatch and Kerlinger 2004 *as cited in* Burger *et al*. 2011). Given the existing knowledge, it is likely that roseate terns will pass through the WEA during migratory flights and may occur at a flight height that will expose them to the meteorological towers. However, the four towers would present a very low level of risk of exposure due to their extremely small percent of area when compared to the annual habitat occupancy and geographic occurrence of roseate terns.

Under poor visibility conditions, all migratory species in the vicinity have the potential to collide with a meteorological tower (Huppop *et al.* 2006). Radar targets showed a lower flight altitude during nocturnal fall migration near Block Island with a decrease in temperature and air pressure and an increase in cloud cover, conditions that are typically associated with a low pressure system (Mizrahi *et al.* 2010). It is well known that certain types of lighting on tall structures during fog and rain can disorient birds flying at night (Huppop *et al.* 2006).For example, steadily burning lights can act as an attractant for birds when it is raining or foggy, occasionally resulting in mass-collision events. However, red flashing lights are commonly used at land-based wind facilities without any observed increase in avian mortality compared with unlit turbine towers (Kerlinger *et al.* 2010). Thus, red flashing lights would be used on the meteorological towers to reduce the risk of bird collisions on nights with poor visibility. Finally, it is anticipated that any additional lights (e.g., work lights) on towers and support vessels would be used only when necessary and would be hooded downward and directed when possible to reduce upward illumination and illumination of adjacent waters. Because the number of meteorological towers contemplated is small, would be a minimum of 10.0 NM from shore, and would be at heights usually lower than those of migrating birds, migratory (including pelagic) bird collisions with the meteorological towers would be possible but are expected to be rare.

Finally, terns may perch on tower equipment such as handrails, equipment sheds, etc.; however, lattice-type masts (*see* Figure 3-5) with numerous diagonal and horizontal bars are more likely to provide perching opportunities than a meteorological tower with a monopole mast (*see* Figure 3-4). Perching on these structures does not pose a threat to birds.

Meteorological Buoys

Meteorological buoys are closer to the water surface than meteorological towers. Many bird species fly higher than buoys, so the risk of collisions is unlikely. However, some individuals and species (e.g., loons, shearwaters, storm-petrels, gannets, sea ducks, gulls, terns, and alcids) that may fly lower than others could pass through the WEA and be exposed to the meteorological buoys. Due to their relatively small size, buoys hold less equipment than towers, so there would be fewer perching opportunities; even so, perching on buoys poses no threat to birds. Although there could potentially be more buoys than towers (*see* Table 3-3), the distance between individual buoys would be several nautical miles and they would be a minimum of 9 NM from shore. As a result, the potential impacts of buoys on birds are expected to be negligible.

Migratory Birds

Most migratory passerines would fly well above the buoys and towers during spring and fall migration, as supported by radar studies conducted on Block Island in 2009 (Mizrahi *et al.* 2010). Other migratory birds, including marine birds, coastal shore birds, and non-ESA-listed birds, would rarely encounter these structures due to the small footprint of the structures themselves, their distance from shore, and the distances between individual buoys and towers. Therefore, the towers and buoys, as well as vessel activities within the proposed lease areas, are not expected to affect migratory birds.

Bald and Golden Eagles

Bald and golden eagles migrate and forage over land, inland water bodies, and bays, but not the open ocean. As such, they are not expected to occur in the WEA, so activities in the proposed lease areas would not affect eagles. Because Alternative A would not require the expansion of existing onshore facilities and the vessel trips in coastal waters pose no threat to bald or golden eagles, impacts on them or their habitat are not expected.

Threatened and Endangered Birds

The ESA-listed roseate tern and piping plover, including the candidate species red knot, may fly within the WEA during spring and fall migration. These species would rarely encounter the small number of meteorological buoys and towers because the footprint of these structures would small, and they would be distant from shore and each other. Therefore, the meteorological towers and buoys and associated activities within the proposed lease areas are not expected to affect threatened or endangered birds.

4.1.2.1.3 Conclusions

While birds may be affected by Alternative A, site characterization and assessment activities in the WEA, and activities associated with vessel traffic to and from the WEA, there is no expected threat of significant impact on these species. The risk of avian collision with meteorological towers would be minor because of the small number of meteorological towers proposed and their distance from shore and each other. The impact of meteorological buoys on avian species is expected to be negligible because buoys do not pose a collision risk and would be similarly dispersed over a wide area. Impacts on marine and coastal birds from the discharge of waste materials or the accidental release of fuels are expected to be negligible, because of the very limited amount of vessel traffic and construction activity that might occur with construction/installation, operation, and decommissioning of a meteorological tower and buoy placement. In addition, no expansions of onshore facilities associated with site characterization and assessment are expected.

4.1.2.1.4 Bats: Description of the Affected Environment

Species of bats that currently or historically occur in Rhode Island and Massachusetts are listed in Table 4-2. The USFWS (2012d and 2012e) does not recognize the occurrence of any federally listed threatened or endangered bat species for Massachusetts or Rhode Island. Of the eight bat species that occur in either state, five of the species, big brown bat, tri-colored bat, eastern small-footed bat, little brown bat, and northern long-eared bat, hibernate in caves or mines (big brown bats also hibernate in buildings), do not migrate over the ocean, and therefore are not expected to occur in the WEA. Two of these non-migratory species, the eastern small-footed bat and the northern long-eared bat, are currently under status review by the USFWS with the potential to be listed as threatened or endangered (52 FR 38095-38106). The remaining three species—eastern red bat, hoary bat, and silver-haired bat—are tree-roosting bats that migrate long distances between breeding and wintering grounds.

Table 4-2
Bat Species of Rhode Island [1] and Massachusetts [1,2]

Common Name	Scientific Name
Big Brown Bat	*Eptesicus fuscus*
Eastern Red Bat	*Lasiurus borealis*
Hoary Bat	*Lasiurus cinereus*
Tri-colored Bat	*Perimyotis subflavus*
Silver-haired Bat	*Lasionycteris noctivagans*
Eastern Small-footed Bat [a]	*Myotis leibii*
Little Brown Myotis	*Myotis lucifugus*
Northern Long-eared Bat [a]	*Myotis septentrionalis*

Note:
(a) Currently under status review by the USFWS with the potential to be listed as threatened or endangered.

Sources:
(1) Harvey, Altenbach, and Best 1999.
(2) Massachusetts Division of Fisheries and Wildlife 2009.

The spring migration period is generally from early April to mid-June and the fall migration period is from mid-July through November (Cryan 2003). There is growing evidence that some migratory routes used by bats are located offshore (Ahlén, Baagøe, and Bach 2009). One study using acoustical monitors on research vessels traveling from Cape Hatteras, North Carolina, to Cape Cod, Massachusetts, recorded bat calls up to 8.6 NM off the coast (Sjollema, Gates, and Sherwell 2010). A similar study conducted off the shore of New Jersey detected 54 bat calls on eight nights in August, September, and October of 2009 with a mean distance from shore of 5.2 NM (maximum distance from shore of 10.4 NM; Geo-Marine, Inc. 2010). Bats were also detected moving over Mt. Desert Rock Island and Seguin Island, which are 17.3 and 2.2 NM offshore of Maine, respectively (Pelletier *et al.* 2010).

Smith and McWilliams (2012) acoustically monitored migrating bats on Rhode Island National Wildlife Refuges during the fall 2010 and 2011 migration periods. These acoustic studies found that densities of bats varied greatly across sites, but in general, the majority of bat activity occurred in the first half of the fall season (September to early October); in fact, the majority of a season's total activity occurred on a total of three to ten nights per season, depending upon the site. Across all of their study sites, a total of eight bat species were identified (eastern red bat, tri-colored bat, little brown bat, eastern small-footed bat, northern long-eared bat, silver-haired bat, hoary bat, and big brown bat); however, the eastern red bat and silver-haired bat were the most common high- and low-frequency species identified, respectively. It is important to note that throughout this study, no single-call sequences encountered suggested the presence of the federally endangered Indiana bat. The study concluded that bat densities on a daily basis were highly weather-dependent and therefore, patterns of activity varied greatly.

A bat monitoring study conducted on Block Island from June to November 2009 recorded bat calls over the island, which is approximately 8 NM south of Rhode Island and also recorded one bat call (a silver-haired bat) approximately 3 NM northeast of Block Island on August 27, 2009 (Svedlow, Ronan, and Myers 2009).

4.1.2.1.5 Bats: Impact Analysis of Alternative A

Only migratory bat species, including eastern red bat, hoary bat, and silver-haired bat, have the potential to migrate through the WEA. Impacts on bats resulting from site characterization and assessment activities within and to and from the WEA are expected to be negligible.

Impacts of Routine Activities and Events

Site Characterization Activities

If bats are present in the WEA, the impacts of site characterization are expected to be limited to avoidance or attraction responses to the vessels conducting surveys. Although more than 95 percent of the surveys projected under Alternative A would occur within the WEA, the presence of bats during those surveys is expected to be unlikely due to the distance of the WEA from shore. It is more likely that bats would be present during surveys closer to shore, such as those conducted for potential cable routes to shore for each of the four anticipated leaseholds. Less than 5 percent of the surveys projected under Alternative A would be associated with surveying potential transmission corridors. Bats may be affected by vessels traversing harbor or coastal areas on their way to or from the WEA, which may trigger attraction or avoidance responses resulting from noise or lighting. These potential avoidance and attraction responses, however, are not expected to have any effect on bats.

Site Assessment Activities

Bats are expected to be present in the WEA only rarely. Thus, impacts on bats are not expected during construction/installation, operation and maintenance, or decommissioning. Impacts on these species associated with tower construction noise, if any, would be short-term and temporary. It would take one to two days to install each of the eight meteorological buoys within the WEA. Noise has been shown to reduce bat foraging efficiency (Siemers and Schaub 2011). However, bats occurring in the WEA are expected to be migratory and not foraging. Noise effects could include avoidance or attraction responses to structures, but such effects would be difficult to distinguish from similar effects resulting from lighting or the visual presence of the structures. Unlike the large-scale wind turbines used at commercial wind facilities, the wind turbines that may be used for charging batteries on the meteorological towers and buoys are small (blade diameter $\leq$ 2 meters) and are not expected to impact bats, if present, more than 10 NM from shore.

Migrating bats could collide with the meteorological towers and buoys, possibly resulting in injury or mortality. Bats migrating through the WEA are expected to be at low risk for encountering meteorological towers or buoys because of the low number, density, and small footprints of the anticipated structures. There are no expected additive effects on bats from construction/installation of all meteorological towers and buoys. In addition to collecting meteorological and oceanographic data, the meteorological towers and buoys would provide platforms that would assist in conducting biological studies, including monitoring for the presence of bats.

Impacts of Non-Routine Events

It is rare but possible that migrating bats may be driven to OCS waters by a storm and subsequently into a tower. However, the land-based roosting, breeding, and foraging behavior of bats, as well as their echolocation sensory systems, suggest that the risk of being blown so far out of their habitat range, and the unlikelihood that a bat so blown off course could return from the open oceans above the WEA if it did not strike a tower, makes the expected likelihood of any impact due to the presence of the towers or buoys negligible.

4.1.2.1.6 Conclusions

No federally listed threatened or endangered bat species are expected to occur within the WEA. While it would be rare for bat species to migrate through the WEA, these mammals may on occasion be driven to the project area by prevailing winds and weather. In the event that bats are present, impacts would be expected to be limited to avoidance or attraction responses. Because of the distance between individual meteorological towers and buoys, there would be no additive effect on bats from constructing and installing all the anticipated towers and buoys. In fact, the data collection activities associated with the installation of these structures (e.g., biological surveys) may assist in future environmental analyses of the impacts of OCS activities on bats. To the extent that there would be any impacts on individuals, the overall impact of Alternative A on bats is expected to be negligible.

4.1.2.2 Coastal and Benthic Habitats

4.1.2.2.1 Description of the Affected Environment

The Rhode Island and Massachusetts WEA is located offshore of the Atlantic Coastal Plain, stretching from Cape Cod through the southeastern United States. A general description of coastal and benthic habitats in the WEA is found below and in Chapters 4.2.13 and 4.2.14 of the Programmatic EIS (USDOI, MMS 2007). The Rhode Island and Massachusetts WEA is located in the southern New England continental shelf (Codiga and Ullman 2011), on the northern end of the Mid-Atlantic Bight. This portion of the Mid-Atlantic Bight is also referred to as the Southern New England-New York Bight. Multiple marine protected areas representing natural and cultural heritage resources (NOAA n.d.) are within the coastal zones of Rhode Island and Massachusetts in the vicinity of Alternative A. The majority of these are National Wildlife Refuges with a primary conservation focus on natural or cultural heritage status.

Rhode Island

Rhode Island has roughly 400 miles (about 644 kilometers) of contiguous shoreline, including the waters of Narragansett Bay (Rhode Island Government n.d.). Coastal habitats in Rhode Island and southern Massachusetts near the WEA include exposed rocky shores or man-made structures, exposed wave-cut platforms in bedrock, sand and gravel beaches, and tidal mudflats (NOAA 2011). Coastal and benthic habitats of the North Atlantic Coast are constantly changing, with tidal currents being the dominant force (USDOI, MMS 2007). Eroding beaches and sand shoals on the inner continental shelf are the primary sources of sand.

Narragansett Bay is a large coastal estuary in the state of Rhode Island's waters covering 147 square miles (almost 381 square kilometers) (Save the Bay n.d.). Because of its large size and diversity of habitats—open water, salt marshes, subtidal bottom habitat, brackish water, various intertidal zones (sandy beaches, mud and sand flats, and rocky areas), and submerged aquatic vegetation (SAV) beds (Schwartz 2009)—the bay represents an important coastal habitat for both marine and water-dependent wildlife. Additional discussions of these coastal wetland resources are provided in Section 4.1.2.6, "Coastal Wetland Habitats and Ecosystems."

Narragansett Bay has been influenced by human actions for many years, beginning with early European settlers arriving in the area in pre-colonial times. During pre-colonial times, an estimated 53 percent of the salt marsh habitats in Narragansett Bay were destroyed (Save the Bay n.d.). Development in the watershed has contributed in large part to filling in many of the original salt marshes and coastal estuarine habitats. Dredging activities date back to the mid-1800s, when a portion of the Providence River was dredged to deepen the channel for navigation (ENSR 2008). Dredging has continued through the years, with various dredged materials being deposited in offshore areas (dredge disposal sites) near or in the WEA. In 2004, the Rhode Island Sound disposal site was created to accept upwards of 3.4 million cubic meters of sediment from the Providence River Navigational Dredging Project (ENSR 2008). The Rhode Island Sound disposal site is located in the navigational channel northwest of the WEA.

The waters off the coast of Rhode Island, i.e., Rhode Island Sound and Block Island Sound, are transitional waters that separate Narragansett Bay and Long Island Sound from the OCS (LaFrance *et al.* 2010). During development of the Rhode Island Ocean SAMP, a comprehensive survey of the benthic communities in the vicinity of the Rhode Island and Block Island Sounds was completed: one area surveyed (53.5 square miles [139 square kilometers]) is located in state waters to the south of Block Island, and the other area surveyed (68 square miles [176 square kilometers]) is located in federal waters in eastern Rhode Island Sound (the Federal [FED] study area), partially within the proposed WEA (*see* Figure C-12 in Appendix C of this EA). Data from the observations made within the FED study area, which is partially located in the northernmost section of the WEA, are summarized here.

Acoustic surveys in the southwestern portion of the Acoustic surveys in the southwestern portion of the FED study area showed water depths ranged from 30 feet (9.1 meters) to 179 feet (59.6 meters) deep and a steep slope area in the northern portion of the WEA. The FED study area, which overlaps with the northernmost portion of the WEA, showed water depths ranging from 74 feet (22.6 meters) to 145 feet (44.2 meters) deep and a steep slope. In addition, surface roughness was estimated to be highly heterogeneous. Medium-grained sand, followed by coarse and finer-grained sand (very fine-to fine-grained sands), was found to be the dominant sediment in the northern portion of the WEA during the LaFrance *et al.* (2010) field investigation. Previous studies of surficial sediments in the WEA have revealed coarse-grained bedload transport as a dominant process, along with more erosional areas in the eastern portion of the study area (LaFrance *et al.* 2010). Consequently, the unconsolidated nature of materials in these benthic habitats is continually subjected to physical dynamic processes that continually redistribute sediments. This continual shifting of materials creates variable bottom topography with sand ridges, silt/mud flats, and coarse-grained bedload pockets.

Benthic communities in these areas are adapted to survive in this ever-changing environment. In general, the benthic communities of the OCS areas are diverse with lower densities of organisms in the northern portion of the Mid-Atlantic Bight and in deeper areas of the OCS (USDOI, MMS 2007). Benthic communities in the WEA are dominated by various species of benthic tube-dwelling amphipods (Rhode Island CRMC 2010). According to the more recent analysis of the predominant benthic organisms in the FED study area, the three dominant phyla were Arthropoda (Crustacea), Mollusca, and Annelida (Polychaeta). LaFrance *et al.* (2010) found a positive correlation between macrofauna diversity and abundance, with a particularly high diversity in areas of tube-building organisms, suggesting that these tube-mats provide valuable habitats. Furthermore, a study of the relationship between benthic habitat complexity and demersal fish community diversity showed that the most complex habitats contained more diverse fish communities (Malek *et al.* 2010). This study also found a distinct relationship between fish communities and depths, with more abundant fish communities occupying deeper water habitats.

A 2007 side-scan sonar study in Rhode Island Sound revealed several areas covered with trawl marks (McMullen *et al.* 2007). The trawl marks probably indicate that commercially desirable fish feed in these areas and are likely target areas that harbor a high density of benthos prey organisms. These trawling areas were located in the southeastern portion of Rhode Island Sound, similar to locations excluded from Alternative A. A major proportion of the fisheries in the Northwest Atlantic are demersal and depend on benthic habitats for food, cover, and support for various life stages (Steimle, Burnett, and Theroux 1995).

One of the most notable benthic communities in the vicinity of the WEA is an area called Cox Ledge. In this area, a major change in depth creates upwellings that provide warmer water temperatures during the winter period. Consequently, this area provides unique food, shelter, and reproductive benefits for various fish species (USDOI, BOEM 2012b; *see* Appendix A). During the WEA evaluation process and the Area ID process, portions (edge and slope areas) of Cox Ledge were excluded from the proposed action area.

Massachusetts

The state of Massachusetts has over 1,500 miles (about 2,414 kilometers) of coastline (Commonwealth of Massachusetts 2012a), and its location at the intersection of two biogeographic regions, the Acadian Province to the north of Cape Cod and the Virginian Province to the south of Cape Cod, create unique and diverse coastal and benthic habitats. The Acadian Province, covered in glaciers during the last ice age, is influenced by the northern waters of the Gulf of Maine, whereas the majority of the Virginian Province remained unglaciated and is influenced by the southern waters of the Mid-Atlantic Bight. Because the majority of the coastal areas on the southern portion of Cape Cod were not affected by glacial activity, coastal habitats are dominated by sandy beaches and mudflats (Massachusetts Office of Coastal Zone Management [MA CZM] 2005). In addition, the largest contiguous beds of seagrass are located along the southern shore of Cape Cod. Seagrasses are one of the most productive marine habitat types, providing optimum water quality and physical structure for a variety of benthic and coastal organisms. Another productive coastal community is salt marshes. Buzzards Bay, which separates the Elizabeth Islands from the mainland, is the largest estuarine area in this portion of Massachusetts and is lined with salt marsh habitats (Massachusetts Ocean Management Task Force [MA OMTF] 2004b). Salt marshes are exposed to a range of tides and include inundated low marsh transitioning into high marsh areas that are infrequently inundated, creating a diverse and highly productive ecosystem (MA CZM 2005). Consequently, salt marshes provide important nursery grounds for a variety of marine species and habitat for water-dependent wildlife. Eelgrass beds are present throughout the southern Cape Cod coastal areas (MA OMTF 2004b), with the most productive areas being habitats that experience routine flushing, e.g., open coastline areas.

The benthic substrate of Buzzards Bay was described by Moore (1963 *as cited in* Murray and Infantino 1998) as dominated by coarse-grained sediments in the nearshore areas and fine-grained sediments in deeper portions of the bay. More recently, Buzzards Bay was categorized as a net depositional area (Murray and Infantino 1998), most likely based on its semi-enclosed basin, open only to the south. Historic disposal of dredge materials has been widespread in portions of Buzzards Bay, primarily in areas along the eastern edge, further influencing the nature and extent of benthic communities throughout the area.

Results of the Regional Sediment Resource Management workshop review of available sediment data for Massachusetts' coastal waters showed that the majority of the areas are dominated by sandy sediments, with pockets of muddy, gravelly sediments and hardbottom areas, particularly closer to the Rhode Island border and shoreline areas (Massachusetts Executive Office of Energy and Environmental Affairs 2008a). The best available data on grain size indicate that the majority of the sediments along the eastern portion of Massachusetts waters closest to the WEA are considered highly suitable for extraction and/or beneficial use.

A detailed study of biotic and abiotic variables in the coastal areas of Massachusetts, including habitat suitability of certain benthic organisms, showed that offshore habitats in the southwest corner of Martha's Vineyard are of low habitat value, except for Nomans Land Island National Wildlife Refuge, which was classified as of high to critical value (Massachusetts Executive Office of Energy and Environmental Affairs 2008b). The remaining areas off of Martha's Vineyard and the southern and southwestern edge of the Elizabeth Islands are considered of medium habitat value. The largest area of crucial habitat value off the southern coast of Massachusetts is located between the southwestern edge of the Elizabeth Islands and the mainland. The Rhode Island Ocean SAMP study provided a detailed examination of benthic conditions in a limited portion of the WEA.

4.1.2.2.2 Impact Analysis of Alternative A

The proposed WEA is located 10.4 NM from the nearest shoreline. Site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys in the proposed lease areas thus would have no direct impact on coastal habitats. However, benthic resources within Alternative A of the WEA would be exposed to direct disturbance from equipment used in surveying or the construction/installation, operation and maintenance, and decommissioning. Coastal vessel traffic associated with Alternative A and the use of existing coastal and port facilities have the potential to contribute to the impacts on both coastal and benthic habitats, as discussed below.

Impacts of Routine Activities and Events

Existing port facilities in Rhode Island, Massachusetts, and the adjoining states of Connecticut and New York would support site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys. No project-related construction or dredging activities that could impact benthic resources are expected at these facilities to support the proposed action.

Additional vessel traffic associated with routine activities could result in shoreline erosion and sedimentation in coastal areas associated with the increase in vessel wake activity. Wake erosion and sedimentation effects would be limited to approach channels and the coastal areas near the ports and bays used to support site characterization activities. Given current use of existing port facilities in Rhode Island, Massachusetts, and the adjoining states of Connecticut and New York, the relatively small number and size of vessels associated with site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys for Alternative A is expected to result in a negligible increase of wake-induced erosion of coastal channels.

Reasonably foreseeable impacts on benthic resources would primarily be the result of site assessment activities and direct contact of equipment with benthos or their habitats—crushing or smothering by anchors or through placement of piles to support meteorological towers and buoys. Sediment resuspension resulting from these construction-related benthic habitat disturbances could also have a short-term localized effect on benthos. On the other hand, the introduction of hard substrates (e.g., tower foundations) into benthic habitats may increase the area available for algae and filter-feeding epifauna (Dunagan *et al.* 2007). Most site assessment activities involve remote-sensing of the seafloor and are not expected to disturb benthic habitats. The majority of the disturbance of benthic habitats associated with the direct effects described above would be localized (small in extent) and short-term. Disturbance of soft-bottom areas would be expected to recover within one to three years, depending upon the actual species density and diversity in the immediate area of disturbance (USDOI, BOEM, OREP 2012b). For example, Dunagan *et al.* (2007) summarized the results of seven years of monitoring at the Horns Rev Wind Park in Denmark. No statistically significant changes occurred in the abundance or biomass of the majority of the designated benthic indicator organisms between two years of pre-construction data and three years of post-construction data. According to Jensen (2002 *as cited in* Leonhard, Stenberg, and Støttrup, 2011), it takes around five years before stable faunal communities are established after deployment of artificial hard structures. Since the impact study was conducted seven years after the construction of Horns Rev Offshore Wind Farm 1, with 80 wind turbines located in the North Sea 8.7 to 12.4 miles (14 to 20 kilometers) off the western coast of Denmark located in less than 65.6 feet (20 meters) in depth, it was assumed that a stable community was established. The study on short-term effects in the offshore wind energy facility off the Dutch coast showed only minor and non-significant effects upon fish assemblages and abundances post-construction when compared to baseline conditions (Hille Ris Lambers and ter Hofstede 2009 and Lindeboom *et al.* 2011 *as cited in* Leonhard, Stenberg, and Støttrup 2011). The fish community still appeared to be highly dynamic both in time and space and thus in line with the Jensen (2002) conclusion (Leonhard, Stenberg, and Støttrup 2011). The introduction of hard substrate and higher complexity relative to the homogenous sand banks characteristic of the North Sea resulted in minor changes in the fish community and species diversity (Jensen 2002 *as cited in* Leonhard, Stenberg, and Støttrup 2011).

Studies of the effects of offshore wind facilities on demersal fish were conducted at two locations in the southern part of the Strait of Kalmar (Baltic Sea) in southeastern Sweden: "Yttre Stengrund," approximately 3.1 miles (5 kilometers) from the mainland, with five turbines; and "Utgrunden," situated farther north, 7.5 miles (12 kilometers) from the mainland and 6.2 miles (10 kilometers) from the shore of Oland Island, with seven turbines (Wilhelmsson, Malm, and Ohman 2006). The shape of the wind turbines was similar at both locations—steel monopiles, 9.8 to 11.5 feet (3 to 3.5 meters) in diameter, driven into the sea floor on submerged glacial boulder ridges. The depth at both locations ranges between 19.7 and 26.2 feet (6 and 8 meters). According to Wilhelmsson, Malm, and Ohman (2006) the great abundance of fish on and near the monopoles strongly indicates that the turbines serve as artificial reefs and fish aggregation devices for demersal and semi-pelagic fish in the area.

Construction/installation effects from meteorological towers and buoys to the benthic environment are expected to be temporary and highly localized. Given the overall small footprint of any structures related to site assessment activities compared with the greater WEA and adjacent open water areas, any adverse effects are expected to be negligible. In addition, per BOEM policies, sensitive benthic areas would be avoided through the site assessment process, minimizing adverse effects.

Impacts of Non-Routine Events

Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (*see* Section 3.2.2, "Allisions and Collisions"). However, in the unlikely event that a vessel allision or collision occurred and that such an allision or collision resulted in a discharge, the most likely pollutant to be discharged would be diesel fuel. Non-routine events may include spills or allisions and collisions, which are not predictable but have a chance of occurring during vessel surveys and construction/installation, operation and maintenance, or decommissioning activities. Spills could occur in the vicinity of ports, en route to the meteorological towers, or at the location of site assessment activities. Coastal habitats could be adversely affected if a spill were to occur near shoreline areas. However, as noted in the Mid-Atlantic EA (USDOI, BOEM, OREP 2012b), the average spill size from 2000 to 2009 for vessels other than tank ships and barges was approximately 88 gallons. A spill of this size is not expected to result in significant adverse effects on coastal habitats. If a diesel spill occurred, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (*see* Section 3.2.3, "Fuel Spills"). In addition, vessels would comply with USCG requirements relating to prevention and control of oil or fuel spills.

Vessel collisions are unlikely to occur because project vessels are unlikely to be operating during adverse weather conditions, when the probability of a collision is greatest. The meteorological towers and buoy installations have a small footprint and would be located outside major navigational corridors and highly active fishing grounds, so vessel collisions with the towers and/or buoys are not expected. In addition, any new structures would comply with all USCG marking and lighting requirements, minimizing the likelihood of collisions.

Benthic habitats are not expected to be affected because the most likely pollutants associated with spills or collisions would remain mostly on the surface and would dissipate or biodegrade rapidly. Actual impacts observed would depend largely on the type of material that is spilled, the location and volume of the spill, and the meteorological conditions at the time of the spill. Diesel fuel is lighter than water, so any spills would be expected to dissipate rapidly and evaporate or biodegrade rapidly after a few days (USDOI, MMS 2007). Project vessels are not expected to contain large quantities of oil, so any oil spills likely would be relatively small in volume and have negligible short-term effects on coastal or benthic habitats.

In addition, BOEM's policy is to avoid sensitive benthic habitats (*see* BOEM's regulation 30 CFR 585.611(b)(5)) and to develop an adequate SAP. As discussed in BOEM, OREP (2012b), any site-disturbing activities associated with the proposed action—installation of meteorological towers or buoy anchors—would avoid sensitive benthic habitats such as rocky outcrops, shellfish habitats, or SAV beds by locating sensitive areas through the use of surveys and avoiding areas where they are identified. In addition, BOEM would coordinate review of the SAP with the NMFS through a consultation process to ensure that negligible effects of the proposed activities associated with Alternative A would be realized.

4.1.2.2.3 Conclusions

No direct impacts on coastal habitats would occur from routine activities in the WEA because the proposed site assessment activities would be located offshore. Existing ports are expected to be used to support the proposed action, with no expected expansion of facilities or dredging requirements. Direct impacts on benthic habitats would be limited to short-term disturbance with minimal long-term removal of available benthic habitat. Benthic communities could be smothered or crushed by direct contact with anchors, piles, or scour-protection devices. Any disturbance of soft-bottom communities would be expected to be localized and temporary, with recovery times typically within one to three years (USDOI, MMS 2007). In addition, per BOEM policies, sensitive benthic areas would be avoided through the site assessment process, minimizing adverse effects.

Indirect impacts on coastal and benthic habitats associated with routine activities may include wake erosion and increased sedimentation associated with the increase in vessel traffic. However, given the level of existing vessel traffic in these areas, a negligible increase, if any, in wake erosion may occur in the smaller, non-armored, coastal habitats as a result of the proposed action. Any potential impacts to coastal and benthic habitats associated with an accidental diesel fuel or oil spill that occur as a result of Alternative A are expected to be negligible, short-term, and small.

4.1.2.3 Finfish, Shellfish, and Essential Fish Habitat

4.1.2.3.1 Description of the Affected Environment

Fish

Several state and federal agencies manage fisheries resources in the New England region, including NMFS, the Massachusetts Division of Marine Fisheries (MA DMF), and the Rhode Island Division of Fish and Wildlife's Marine Fisheries Section. The New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) typically develop fishery management plans (FMPs) for fishery resources in Federal waters of the exclusive economic zone (EEZ), including within the proposed area. The Atlantic States

Marine Fisheries Commission (ASMFC) develops interstate FMPs for marine, estuarine, and anadromous fisheries, including American lobster that are implemented in state and federal waters as appropriate. NMFS is directly responsible for FMPs for Atlantic tunas, swordfishes, sharks, and billfishes in the Atlantic.

A description of fishing activities and economic values of fisheries is provided in Section 4.1.3.3, "Commercial and Recreational Fishing Activities." Additional information regarding fish habitat can be found on the NMFS website (http://www.nero.noaa.gov/hcd/).

Fisheries

The fisheries off the coasts of Rhode Island and Massachusetts include demersals, pelagics, and shark finfish assemblages. In addition, there are important shellfish and migratory pelagic finfish throughout the Southern New England-New York Bight. Important managed shellfish on the continental shelf include scallops, surfclams, and ocean quahogs.

Demersal species (groundfish) spend at least their adult life stage on or close to the ocean bottom. They are generally considered to be high-value fish and are sought by both commercial and recreational anglers. They are primarily taken in a mixed trawl fishery; however, many are caught with other gear such as gill nets, traps, and longlines. The principal groundfish sought for their food value in the region include winter flounder (*Pleuronectes americanus*), summer flounder (*Paralichthys dentatus*), witch flounder (*Glyptocephalus cynoglossus*), windowpane flounder (*Scophthalmus aquosus*), silver hake (*Merluccius bilinearis*), red hake (*Urophycis chuss*), yellowtail flounder (*Pleuronectes ferrugineus*), Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), and pollock (*Pollachius virens*). Other important commercial fish include white hake (*Urophycis tenuis*), monkfish (*Lophius americanus*), little skate (*Leucoraia erinacea*), ocean pout (*Macrozoarces americanus*), scup (*Stenotomus chrysops*), tilefish (*Lopholatilus chamaeleonticeps*), black sea bass (*Centropristis striata*), spot (*Leiostomas xanthurus*), weakfish (*Cynoscion regalis*), spiny dogfish (*Squalus acanthias*), and winter skate (*Leucoraja ocellata*).

Pelagic fishes are generally schooling fish that occupy the mid- to upper water column as juveniles and adults and are distributed from the nearshore to the continental slope. Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), butterfish (*Peprilus triacanthus*), and bluefish (*Pomatomus saltatrix*) are the principal commercial pelagic fish species but are also prized recreational species. Invertebrate species in the pelagic zone include the long-finned and short-finned squid (*Loligo pealeii* and *Illex illecebrosus*).

Major species of wide-ranging pelagic fish common to the region include Atlantic swordfish (*Xiphias gladius*), sailfish (*Istiophorus platypterus*), blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), Atlantic bluefin tuna (*Thunnus thynnus*), albacore (*Thunnus alalunga*), bigeye tuna (*Thunnus obesus*), blackfin tuna (*Thunnus atlanticus*), yellowfin tuna (*Thunnus albacares*), little tunny (*Euthynnus alletteratus*), skipjack tuna (*Katsuwonus pelamis*), bullet mackerel (*Auxis rochei*), and frigate mackerel (*Auxis thazard*). These diverse fishes are highly migratory and tend to spend their summers in the near-coastal and shelf surface waters of the Southern New England-New York Bight, taking advantage of the abundant prey in the warm surface waters.

Coastal migratory pelagics include fast-swimming schooling fishes that range from shore to the continental shelf edge and are sought by both recreational and commercial anglers. Included in this assemblage are king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculatus*), cobia (*Rachycentron canadum*), and dolphin fish (*Coryphaena hippurus*). These fish use the highly productive coastal waters of the more expansive Mid-Atlantic Bight during the summer months and migrate to deeper and/or distant waters during the remainder of the year.

Pelagic sharks that frequent the region include blue shark (*Prionace glauca*), thresher shark (*Alopias vulpinus*), bigeye thresher (*Alopias superciliosus*), oceanic whitetip shark (*Carcharhinus longimanus*), sixgill shark (*Hexanchus griseus*), porbeagle (*Lamna nasus*), shortfin mako (*Isurus oxyrinchus*), and longfin mako (*Isurus paucus*). Large coastal sharks include dusky shark (*Carcharhinus obscurus*), blacktip shark (*Carcharhinus limbatus),* spinner shark (*Carcharhinus bevipinna*), silky shark (*Carcharhinus falciformis*), bull shark (*Carcharhinus leucas*), night shark (*Carcharhinus signatus*), basking shark (*Cetorhinus maximus),* tiger shark (*Galeocerdo cuvier*), lemon shark (*Negaprion brevirostris),* whale shark (*Rhincodon typus*), scalloped hammerhead (*Sphyrna lewini*), great hammerhead (*Sphyrna mokarran*), smooth hammerhead (*Sphyrna zygaena*), sandbar shark (*Carcharhinus plumbeus*), and great white shark (*Carcharodon charcharias*). Small coastal sharks include finetooth shark (*Carcharhinus isodon*), Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), bonnethead shark (*Sphyrna tiburo*), and Atlantic angel shark (*Squatina dumeril*). The three groups—pelagic, large coastal, and small coastal—are managed under a single FMP due to lack of information on species-specific harvest rates and reproductive capacity. The reproductive capacity of any of these groups would sufficiently distinguish them so that species/group-specific plans could be developed.

Striped bass (*Morone saxatilis*) are common to the coasts of Rhode Island and Massachusetts, particularly in the summer. The striped bass is found along the western Atlantic coast from the St. Lawrence River in Canada to the St. Johns River in Florida. Generally, the species occurs primarily in inshore waters and is not usually found more than 5 miles (8 kilometers) from the coast. Some striped bass frequent coastal Rhode Island and Massachusetts in the summer and overwinter in the mouth of the Hudson River, while many spend winter along the New Jersey coast in the Delaware and Chesapeake Bays (MA DMF 2012a).

Several significant invertebrate fisheries occur within the Southern New England-New York Bight. American lobster (*Homarus americanus*), Atlantic sea scallop (*Placopecten magellanicus*), northern shortfin squid (*Illex illecebrosus*), and longfin squid (*Loligo pealeii*) are important resources of the Bight and support substantial commercial fisheries. Atlantic sea scallop is generally found from 130 to 650 feet (40 to 200 meters) in waters south of Cape Cod; it requires cooler water temperatures of 68°F (20°C) or less for survival. American lobster, another very important commercially harvested invertebrate, is distributed in coastal rocky habitats and muddy burrowing areas with sheltering habitats and offshore in the submarine canyon areas along the continental shelf edge. Cooper and Uzmann (1980) found the following substrates were used by lobsters: mud/silt, mud/rock, sand/rock, bedrock/rock, and clay. However, firm, complex, rocky substrate is the preferred habitat for all life stages of the lobster.

Post-larval and juvenile lobsters tend to stay in shallow, inshore waters (Lawton and Lavalli 1995), but adolescent and adult lobsters are highly adaptable in their choice of substrate and can be found on nearly all substrate types. Longfin inshore squid occur from Newfoundland to the Gulf of Venezuela; the principal concentrations exploited in the United States occur from Georges Bank to Cape Hatteras (Brodziak 1995). Northern shortfin squid use oceanic and neritic habitats, and adults are believed to make long-distance migrations between boreal, temperate, and subtropical waters. Data indicate that northern shortfin squid are distributed on the continental shelf of the U.S. and Canada, between Newfoundland and Cape Hatteras, North Carolina (USDOC, NOAA 2004).

Species of Concern

The Atlantic sturgeon (*Acipenser oxyrinchus*) is the most likely marine fish with federal listing status that can potentially occur off the coasts of Rhode Island and Massachusetts. Several other noteworthy species of concern that may occur in the WEA include the American eel (*Anguilla rostrata*), alewife (*Alosa pseudoharengus*), blueback herring (*A. aestivalis*), rainbow smelt (*Osemerus mordax*), Atlantic bluefin tuna (*Thunnus thynnus*), and Atlantic halibut (*Anarhichas lupus*). Also, five elasmobranchs, including four sharks (dusky shark [*Carcharhinus obscurus*], great hammerhead shark [*Sphyrna mokarran*], sand tiger shark [*Carcharias Taurus*]), and porbeagle shark [*Lamna nasus*], and one skate (thorny skate [*Amblyraja radiate*]), may occur in the WEA (NOAA Fisheries Office of Protected Resources 2012a).

Primary threats to Atlantic sturgeon include habitat degradation and loss, ship strikes, and general depletion from historical fishing (NOAA Fisheries Service 2012). Of the five distinct population segments (DPSs) designated by the NMFS, the DPS most likely to be present within the project area and its surrounding waters is the New York Bight DPS, as this encompasses all Atlantic sturgeon that spawn in watersheds that drain into coastal waters from Chatham, Massachusetts, to the Delaware/Maryland border on Fenwick Island (*see* 77 FR 5880). Within this range, Atlantic sturgeon have been documented from the Hudson and Delaware rivers as well as at the mouth of the Connecticut and Taunton rivers, and throughout Long Island Sound, with evidence to support that spawning occurs in the Hudson and Delaware rivers (Atlantic Sturgeon Status Review Team 2007). The NMFS determined that the Atlantic sturgeon New York Bight DPS is currently in danger of extinction throughout its range due to precipitous declines in population sizes and the protracted period in which sturgeon populations have been depressed; the limited amount of current spawning; and the impacts and threats that have and will continue to prevent population recovery (NMFS 2012d). In fact, Atlantic sturgeon aggregation areas in the New York Bight exhibit the highest abundance along the east coast of the U.S. and have been recommended as essential fish habitat (EFH), which could warrant either full time or seasonal closures (Dunton *et al.* 2010). But, based on the NMFS's opinion and current literature (Dunton *et al.* 2012), since there is the potential for offshore genetic mixing of stocks from other DPSs within areas associated with the project area, biological assessment for the proposed action (implementation of Alternative A) will consider impacts to all five DPSs including: the New York Bight DPS (endangered); the Gulf of Maine DPS (threatened); the Chesapeake Bay DPS (endangered); the South Atlantic DPS (endangered), and the Carolina DPS (endangered).

American eel are found in fresh, brackish, and coastal waters from the southern tip of Greenland to northeastern South America. American eels begin their lives as eggs hatching in the Sargasso Sea. They take years to reach freshwater streams where they mature, and then they return to their Sargasso Sea birth waters to spawn and die. They are the only species of freshwater eels in the western hemisphere. On September 29, 2011, the USFWS published a 90-day petition finding that listing may be warranted for the American eel under the ESA. The USFWS initiated a status review for the American eel and will make a 12-month finding on whether the species should be listed (76 FR 60431). Threats to American eel include habitat loss, including riverine impediments, pollution, nearshore habitat destruction, and fishing pressure (Greene *et al.* 2009).

Alewife and blueback herring are collectively referred to as 'river herring.' They are an anadromous species that leave coastal rivers in the spring to spawn. At sea they are a highly migratory, pelagic, schooling species. Due to the difficulties in distinguishing the two species, they are typically harvested similarly and thus managed together. On November 2, 2011, the NMFS published a 90-day finding that a petition to list alewife (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*) as threatened under the ESA may be warranted and the NMFS initiated a status review (76 FR 67652).

Rainbow smelt are an anadromous species, migrating to spawn in freshwater. They usually remain close to shore and in shallow water and most spend the entire year in estuaries (NOAA NMFS 2007). Although there is evidence that they migrate to sea, little is known about this part of their life history. There is limited understanding of what has caused population declines, but suspected factors include impediments to spawning habitat (i.e., dams and culverts) and chronic degradation of spawning habitats from storm water runoff (NOAA NMFS 2007).

Atlantic bluefin tuna is a highly migratory, pelagic species found from the Gulf of Mexico to Newfoundland in coastal and open ocean environments. Spawning is principally in the Gulf of Mexico and in the Florida Straits (NOAA NMFS 2011a). In May 2010, the Center for Biological Diversity submitted a petition to list Atlantic bluefin tuna under the ESA. The 90-day finding stated that the petition contained substantial information that the petitioned action may be warranted, but on May 27, 2011, after an extensive scientific review, the NMFS determined that Atlantic bluefin tuna currently do not warrant species protection under the ESA (76 FR 31556). NMFS did, however, commit to revisiting this decision no later than year 2013 once the Natural Resources Damages Assessment analyses are concluded to determine whether the *Deepwater Horizon* oil spill altered the status of the species.

Atlantic halibut are very large, with low to very low productivity (NOAA NMFS 2009a). The size of their population has fluctuated considerably since the 1960s, with a general overall decline (NOAA NMFS 2009a). Atlantic halibut are designated as an ESA species of concern but are noted as endangered by the International Union for Conservation of Nature (IUCN).

The dusky shark is found in the Southern New England-New York Bight, occurring from the surf zone to well offshore and from surface waters to depths of 1,300 feet (940 meters). The species migrates northward in summer and southward in fall. Initially, the decline of the species in the northwest and western central Atlantic was a result of a targeted recreational fishery that developed in the late 1970s, in addition to bycatch associated with the pelagic swordfish longline fishery. Although management actions appear to have led to an increase in the numbers of juvenile dusky sharks, adults still appear to be declining. Given the decline in abundance in this region, the IUCN assessed the species as endangered (Musick *et al.* 2009).

The great hammerhead shark is considered a circumtropical species. Within the western North Atlantic Ocean they can be found in coastal-pelagic and semi-oceanic waters extending from Massachusetts as their limiting northern extent to Uruguay, including the Gulf of Mexico and the Caribbean Sea (78 FR 24701). While they can be found in waters off Massachusetts, they are rarely found in U.S. waters north of North Carolina. Great hammerhead sharks are considered highly mobile and have been found to be seasonally migratory (78 FR 24701). The NMFS received two petitions to list the great hammerhead shark under the ESA. The petition received in December 2012 requested that the great hammerhead shark be listed under the ESA as threatened or endangered and that critical habitat be designated. The petition received in March 2013 requested that the Northwest Atlantic or range-wide population of the great hammerhead shark be listed under the ESA as threatened and that critical habitat be designated. The NMFS chose to combine these two petitions and on April 26, 2013, announced a 90-day finding that the petitions contained sufficient information that the petitioned actions may be warranted and that the great hammerhead shark is now considered a candidate species under the ESA (78 FR 24701).

Sand tiger sharks also are found off the coasts of Rhode Island and Massachusetts in the WEA. They are generally a coastal species, typically found from the surf zone to depths of about 75 feet (23 meters). Although fishermen have not been authorized to keep sand tiger sharks since 1997, they are still caught incidentally as bycatch with line fishing gear and by longline, bottom-set gillnets, and trawls. They are susceptible because they aggregate in large numbers during mating season in coastal areas. Given the decline in abundance in this region, the IUCN assessed the species as threatened (Pollard and Smith 2009).

Porbeagle sharks are pelagic and rarely enter shallow coastal waters. They are distributed in the water column from the surface down to depths of up to 1,000 feet (305 meters). On the Atlantic OCS, the species ranges from Maine to New Jersey with the primary concentration in the Gulf of Maine and Georges Bank. However, the NMFS has designated EFH for porbeagle sharks on the continental shelf in offshore waters, including the Rhode Island and Massachusetts WEA (NOAA NMFS 2011b).

Thorny skates (*Amblyraja radiate*) are most commonly found in offshore regions such as the Gulf of Maine and Georges Bank. They are less commonly found in inshore regions or in Southern New England (NOAA NMFS 2009b). Within their range, thorny skates can be found in a variety of substrates such as sand, broken shell, gravel, pebbles, and soft mud. They are found primarily in waters ranging from 20 to 3,900 feet (6 to 1,200 meters) (NOAA NMFS 2009b). A major reason for their decline in abundance is due to bycatch from other skate fisheries (NOAA NMFS 2009b).

Essential Fish Habitat

The Magnuson-Stevens Act requires fishery management councils (FMCs) to: 1) describe and identify EFH in their respective regions; (2) specify actions to conserve and enhance that EFH; and (3) minimize the adverse effects of fishing on EFH. The Magnuson-Stevens Act requires all federal agencies to consult with NMFS on all actions, or proposed actions, permitted, funded, or undertaken by the agency, that may adversely affect EFH designated in FMPs. Section 4.2.11.3 of the Programmatic EIS (USDOI, MMS 2007) also provides a broad overview of EFH in the Atlantic. The NMFS has taken a broad view of habitat as the area used by fish throughout their life cycle. Fish use habitat for spawning, feeding, nursery, migration, and shelter, but most habitats provide only a subset of these functions.

Species potentially occurring off the coasts of Rhode Island and Massachusetts in the WEA are managed by two FMCs, the NEFMC and the MAFMC. NOAA Fisheries Service Northeast Fisheries Science Center (NEFSC) has compiled available information on distribution, abundance, and habitat requirements for each of the species managed by both of the FMCs (NEFSC 2011). The Atlantic Highly Migratory Species (HMS) Management Division of the NMFS manages Atlantic HMS, including tunas, sharks, swordfish, and billfish. Management of HMS requires international cooperation, and rebuilding programs must reflect traditional participation in the fisheries by U.S. fishermen, relative to foreign fleets (NOAA Fisheries Office of Sustainable Fisheries n.d.). Along with the Magnuson-Stevens Act, U.S. fisheries management must be consistent with the requirements of other laws, including the Atlantic Tunas Convention Act, the MMPA, and the ESA.

Additionally, FMCs identify habitat areas of particular concern (HAPCs) within FMPs. HAPCs are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. Under the proposed action (Alternative A), the WEA does not overlap with any currently designated HAPCs. The glacial moraines that are contained within the northern portion of the WEA, as identified by LaFrance *et al.* (2010), do not qualify as HAPCs as designated by the council because the WEA falls outside of state waters. BOEM has determined that EFH has been designated for the species listed in Table 4-3 for one or more life stages in the WEA.

Table 4-3
Species with Essential Fish Habitat Potentially Occurring in the Wind Energy Area for the Proposed Action (Alternative A)

Species Managed by the NEFMC		
Atlantic Herring	Monkfish [(a)]	Witch Flounder
Atlantic Sea Scallop	Ocean Pout	Yellowtail Flounder
Atlantic Cod	Red Hake	Winter Flounder
Haddock	Silver Hake	Windowpane Flounder
Little Skate	American Plaice	Winter Skate
Species Managed by the MAFMC [(b)]		
Atlantic Mackerel	Surfclam	Spiny Dogfish
Black Sea Bass	Monkfish	Summer Flounder
Bluefish	Ocean Quahog	Shortfin Squid
Butterfish	Scup	Longfin Squid
Tilefish		
(continued on next page)		

Table 4-3. Species with Essential Fish Habitat Potentially Occurring in the Wind Energy Area for the Proposed Action (Alternative A) (continued)

Atlantic Highly Migratory Species [(c)]		
Albacore Tuna	Basking Shark	Longbill Spearfish
Blue Shark	Bluefin Tuna	Common Thresher Shark
Dusky Shark	Sand Tiger Shark	Sandbar Shark
Shortfin Mako Shark	Tiger Shark	White Shark
Skipjack Tuna	Yellowfin Tuna	Smooth Dogfish

Notes:
(a) Managed by both the NEFMC and the MAFMC.
(b) Species list based on review of USDOC NOAA EFH source documents: http://www.nefsc.noaa.gov/nefsc/habitat/efh/ and NEFMC 2010.
(c) Species list based on data from NOAA 2009: http://www.nmfs.noaa.gov/sfa/hms/EFH/shapefiles.htm.

4.1.2.3.2 Impact Analysis of Alternative A

Impacts of Routine Activities and Events

Acoustic Effects

Fish have evolved a diversity of sound-generating organs and acoustic signals of various temporal and spectral contents. Myrberg (1980 *as cited in* USDOI, BOEM, OREP 2012b) states that members of more than 50 fish families produce some kind of sound using special muscles or other structures that have evolved for this role, or by grinding teeth, rasping spines and fin rays, burping, expelling gas, or gulping air.

Fish produce sounds that are associated with behaviors that include territoriality, mate search, courtship, and aggression. It has also been speculated that sound production may provide the means for long-distance communication and communication under poor underwater visibility conditions (Zelick *et al.* 1999 *as cited in* USDOI, BOEM, OREP 2012b), although the fact that fish communicate at low-frequency sound levels where the masking effects of ambient noise are naturally highest suggests that very long distance communication would rarely be possible.

Ladich (2000) measured the hearing sensitivities of closely related species that use different channels (acoustic vs. non-acoustic) for communication. Major differences in auditory sensitivity were indicated but they did not show any apparent correspondence with the ability to produce sounds. Fish sounds vary in structure, depending on the mechanism used to produce them. Generally, fish sounds are predominantly composed of low frequencies (<3 kHz). Most of the sounds are probably produced in a social context that involves interaction among individuals (i.e., communication). One of the most common contexts of sound production by fish is during reproductive behavior (Hawkins 1993). Research in Canada investigated the reproductive function of sound production by Atlantic cod (Rowe and Hutchings 2004). Other studies on cod sound production (e.g., Finstad and Nordeide 2004; Rowe and Hutchings 2004) concluded that sound production by cod could potentially be important to spawning behavior by acting as a sexually selected indicator of male size, condition, and fertilization potential.

Although the hearing sensitivities of very few fish species have been studied to date, it is becoming obvious that the intra- and inter-specific variability is considerable (Coombs and

Popper 1979). A non-invasive electrophysiological recording method known as 'auditory brainstem response' is now commonly used in the production of fish audiograms (Yan 2004). Generally, most fish have their best hearing (lowest auditory thresholds) in the low frequency range (i.e., <1 kHz). Even though some fish are able to detect sounds in the ultrasonic frequency range, the thresholds at these higher frequencies tend to be considerably higher than those at the lower end of the auditory frequency range. This generalization applies to the fish species occurring in the WEA under the proposed action (Alternative A).

With respect to elasmobranch sound detection, most of the limited work done to date has involved sharks. Measurements have shown that sharks are sensitive to the displacement or kinetic component of sound. Since sharks lack any known pressure-to-displacement transducers, such as the swimbladder, they presumably rely on the displacement sensitivity of their mechano-receptive cells. It has also been shown that sharks are sensitive to low frequencies (i.e., <300 Hertz [Hz]). The upper range of behavioral sensitivity in some sharks has been measured at around 600 to 800 Hz (Corwin 1981). Kelly and Nelson (1975) investigated the hearing thresholds of horn sharks using both conditioning and heart-rate techniques. The sharks responded at a frequency range of 20 to 160 Hz, with the lowest pressure threshold at 40 Hz (approximately 142 decibels referenced to 1 microPascal [dB re 1 μPa]) and the lowest particle motion threshold at 80 Hz. Casper (2006) provided a comprehensive review of the acoustical biology of elasmobranchs. Using two different methods, auditory brainstem response and behavioral conditioning, Casper, Lobel, and Yan (2003) determined the hearing sensitivity of the little skate (*Raja erinacea*). Their findings were in agreement with Corwin's hypothesis that hearing sensitivity is correlated with feeding behavior. That is, bottom-dwelling elasmobranchs (e.g., little skate) appear to have less sensitive hearing than free-swimming raptorial elasmobranchs like lemon sharks and bull sharks (Kritzler and Wood 1961). The most common elasmobranchs identified near the WEA include little skate, winter skate, thorny skate, and spiny dogfish.

Literature relating to the impacts of sound on marine fish species can be conveniently divided into the following categories: (1) pathological effects, (2) physiological effects, and (3) behavioral effects. Pathological effects include lethal and sub-lethal physical damage to fish; physiological effects include primary and secondary stress responses; and behavioral effects include changes in exhibited behaviors of fish. Behavioral changes might be a direct reaction to a detected sound or as a result of the man-made sound masking natural sounds that the fish normally detect and to which they respond. The three types of effects are often interrelated in complex ways. For example, some physiological and behavioral effects could potentially lead to mortality, the ultimate pathological effect. Popper and Hastings (2009) recently reviewed what is known about the effects of sound on fishes and identified studies needed to address areas of uncertainty relative to measurement of sound and the responses of fishes.

Hastings *et al.* (1996) suggested that sounds 90 to 140 decibels (dB) above a fish's hearing threshold may potentially injure the inner ear of a fish. Hastings *et al.* (1996) exposed Oscar fish (*Astronotus ocellatus*) to synthesized sounds with characteristics similar to those of commonly encountered man-made sources. The only damage observed was in fish exposed for one hour to 300 Hz continuous tones at 180 dB re 1 μPa at 1 meter (unidentified measure type [UMT]), and sacrificed four days post-exposure. Enger (1981) provided the earliest evidence of the potential of loud sounds to pathologically affect fish hearing. Enger demonstrated that the sensory cells of the ears of Atlantic cod (*Gadus morhua*) were damaged after one to five hours of exposure to continuous synthesized sounds with a source sound pressure level (SPL) of 180 dB re 1 μPa at 1 meter (UMT). The frequencies tested included 50, 100, 200, and various frequencies between 300 and 400 Hz. The cod were exposed at less than 1 meter from the sound source. Chapman and Hawkins (1973 *as cited in* USDOI, BOEM, OREP 2012b) found that ambient noise at higher sea states in the ocean have masking effects in cod, haddock, and pollock. Additionally, sound could also produce generalized stress (Wysocki *et al.* 2006 *as cited in* USDOI, BOEM, OREP 2012b). Thus, it appears that, based on these limited data, masking and stress may occur in fish exposed to this level of sound.

HRG Survey Acoustic Effects

The impact of HRG survey noise on marine fish that could occur in the Rhode Island and Massachusetts WEA is not well understood (*see* Section 3.1.2.1, "High-Resolution Geophysical Surveys" for more detail regarding a proposed scenario for HRG surveys). Estimated SPLs during HRG surveys are expected to range from 201 to 220 dB re 1μPa root-mean-squared (RMS) at 1 meter. Generally, noise generated by HRG surveys may have physical and/or behavioral impacts on fish in close proximity to the area where the HRG survey activities are being conducted.

Impacts on local fish populations are generally expected to be limited to avoidance of the area around the HRG survey activities and short-term changes in behavior. The region of best hearing in the majority of fish for which data are available is from 100 to 200 Hz up to 800 Hz. Therefore, the fish species of most concern from an endangered species perspective, the Atlantic sturgeon, is only expected to be able to perceive the noise associated with the boomer (see "Acoustic Effects of HRG Surveys," Table 4-6, in Section 4.1.2.4.2). The mobility of adult fish and their innate tendency to quickly leave a disturbed area should result in limited impacts. Although an HRG survey may disturb more than one individual, surveys associated with Alternative A are not expected to result in population-level effects. Individuals disturbed by a survey would likely return to normal behavioral patterns after the survey has ceased or after the animal has left the survey area.

Fish are not expected to be exposed to SPLs that could cause hearing damage. Fish hearing data indicate that side-scan sonar, which uses a low-energy, high-frequency signal, is not expected to impact fish. Because of the limited immediate area of ensonification and duration of individual HRG surveys that may be conducted during site assessment, few fish may be expected in most cases to be present within the survey areas. Thus, potential population-level impacts on fish from HRG surveys are expected to be negligible.

Geotechnical Sampling Acoustic Effects

Acoustic impacts from borehole drilling are expected to be below 120 dB. Previous estimates of source sound levels submitted to BOEM for geotechnical drilling did not exceed 145 dB at a frequency of 120 Hz (Kurkul 2009). Previous submissions to BOEM also indicated that boring sound should attenuate to below 120 dB by the 150-meter isopleth. Fish are expected to be able to sense the sound, but the impacts are anticipated to be negligible due to short duration, low sound levels, and the ability of the fish to leave the immediate drilling area.

Meteorological Tower Pile-Driving Acoustic Effects

Meteorological tower construction noise could disturb normal behaviors (e.g., feeding) of marine fish (*see* Section 3.1.3.1, “Meteorological Towers and Foundations” for proposed scenarios regarding pile-driving). Depending upon various factors, including the sound source and physical oceanographic features, behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range (Madsen *et al.* 2006a). As discussed under the “HRG Survey Acoustic Effects” text above, behavioral reactions may include avoidance of or flight from the sound source and its immediate surroundings, disruption of feeding behavior, and generalized stress (Wysocki *et al.* 2006 *as cited in* USDOI, BOEM, OREP 2012b).

The SOCs required by BOEM, including implementation of a “soft start” procedure, are intended to reduce or eliminate the potential for adverse impacts on marine mammals and sea turtles and would also benefit fish. The “soft start” procedure would be included as a condition to any lease and/or SAP issued or approved under this proposed action. It is expected that by using a “soft start” the majority of juvenile and adult fish would leave the area during the period of disturbance but would return to normal activity in the area post-construction. Fish that do not leave the immediate action area during the pile-driving procedure could be exposed to lethal SPLs. However, significant impacts on fish populations are not anticipated due to the short duration of activity and the majority of juveniles and adults that would leave the area.

Benthic Effects

Benthic effects from implementing Alternative A that would impact fish and fish habitat are anticipated to be temporary and limited to the immediate area surrounding the activity. Therefore, it is not anticipated that effects to benthic communities would be significant enough to impact fish populations (*see* Section 4.1.2.2 for a discussion of benthic resources and impacts of Alternative A on those resources).

Geotechnical Sampling

As noted in Section 4.1.2.2, “Coastal and Benthic Habitats,” the geotechnical sampling would result in a negligible temporary loss of some benthic organisms (i.e., an area less than 1 foot in diameter would be disturbed in core sampling locations) and a localized increase in disturbance caused by turbidity from vessel activity, including noise and anchor cable placement and retrieval. This activity could impact adult marine fish by removing a small amount of forage items for these species; however, the footprint of the core sampling location would be small (i.e., an area less than 1 foot in diameter would be disturbed in these locations), the activity would be temporary, and similar benthic habitat would most likely be available around the sampling location. Therefore, it is expected that this activity would have negligible effects to benthic communities and are not expected to impact federally managed fish species that occur in the Rhode Island and Massachusetts WEA.

Meteorological Tower/Buoy Installation

Installation of a meteorological buoy and/or construction/installation of a meteorological tower would have temporary benthic impacts. Construction/installation of the tower would result in direct effects on benthic invertebrates by burying or crushing them. It also is expected that sediment would become suspended around deployed anchoring systems and around monopoles during the installation activity, but this sediment would quickly disperse and settle onto the surrounding seafloor. Depending upon the currents, benthic organisms could be smothered. However, the Southern New England-New York Bight is considered a high-energy environment where sediment transport occurs under normal conditions. Any sedimentation that would occur around an installed tower or buoy would result in minor temporary impacts on the benthic communities and thus food availability for fish species.

The loss of benthic habitat as a result of scour and/or scour-control systems around foundations and moorings is discussed in Section 4.1.2.2, "Coastal and Benthic Habitats." Sessile marine invertebrates, including molluscan shellfish, would be lost in the footprint of the foundation/mooring and any scour-control system. However, a single meteorological tower or buoy within a lease area is not expected to result in significant changes in the availability of habitat and forage items for fish in the WEA.

Meteorological Tower/Buoy Operation

It is expected that installing meteorological towers and large anchoring systems in soft sediments would introduce an artificial hard substrate that opportunistic benthic species that prefer such substrate could colonize. In addition, minor changes in species associated with softer sediments could occur due to scouring around the pilings (Hiscock, Walters, and Jones 2002). Certain fish species (e.g., tautog, black sea bass, Atlantic striped bass) would likely be attracted to the newly formed habitat complex, and fish densities in the immediate vicinity of the anchors and monopoles are likely to be higher than in surrounding waters away from the structures. However, a single meteorological tower or buoy within a leasehold is not expected to result in significant changes in local community assemblage and diversity or in the availability of habitat and forage items in the Rhode Island and Massachusetts WEA.

Discharge of Waste Materials and Accidental Fuel Leaks

Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (*see* Section 3.2.2, "Allisions and Collisions"). However, in the unlikely event that a vessel allision or collision occurred and that such an allision or collision resulted in a discharge, the most likely pollutant to be discharged would be diesel fuel. If a diesel spill occurred, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (*see* Section 3.2.3, "Fuel Spills"). It is expected that pelagic fish and larval fish that are found high in the water column would be negatively impacted by such a spill. However, these impacts are not expected to be significant because such a spill would be temporary and the area of the spill would be limited. Overall impacts on fish and shellfish resources from diesel fuel spills resulting from collisions, if they occurred, are expected to be minor.

Fish and shellfish could be exposed to operational discharges or accidental fuel releases near construction sites and construction vessels and to accidentally released solid debris. Operational discharges from construction vessels would be released into the open ocean where they would rapidly dilute and disperse or be collected and taken to shore for treatment and disposal. Sanitary and domestic wastes would be processed through on-site waste treatment facilities before being discharged overboard. Thus, waste discharges from construction vessels would not be expected to directly impact fish or their habitat.

Fish also can be adversely impacted by ingesting or becoming entangled in solid debris. Fish that have ingested debris such as plastic may experience intestinal blockage, which in turn may lead to starvation, while toxic substances present in the ingested materials (especially in plastics) could lead to a variety of lethal and sub-lethal toxic effects. Entanglement in plastic debris can result in reduced mobility, starvation, exhaustion, drowning, and constriction of and subsequent damage to limbs. However, discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by the USCG (33 CFR 151). Thus, entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations.

Because of the limited duration and area of vessel traffic and construction activity that might occur with construction/installation, operation and maintenance, and decommissioning of a meteorological tower and/or meteorological buoy, the release of liquid wastes would occur infrequently. Accidental fuel release during site characterization activities is expected to be minimal. Thus, overall impacts on fish and their habitat from the discharge of waste materials or the accidental release of fuels and lubricants during site assessment and site characterization activities are expected to be minor.

Meteorological Tower and Buoy Decommissioning

Decommissioning of meteorological towers and buoys is described in Section 3.1.3.1, "Meteorological Towers and Foundations." Upon completion of site assessment activities, the meteorological tower would be removed and transported by barge to shore. During this activity, fish may be impacted by noise and operational discharges similar to those of meteorological tower construction/installation. Piles would be removed by cutting them (using mechanical cutting or high-pressure water jet) at a depth of 15 feet (4.6 meters) below the mudline. Fish could be impacted by noise produced by pile-cutting equipment, although cutting produces less intense noise than pile-driving. Only fish in the immediate vicinity of the site (those that had not moved away from the area upon arrival of decommissioning vessels) would be expected to be impacted during tower removal and transport and pile-cutting. Disturbance of fish during decommissioning is expected to be minor, resulting in negligible impacts.

Impacts of Non-Routine Events

A vessel colliding with the meteorological structures or with other vessels could result in spills of diesel fuel, oil-based lubricants, or hydraulic oil. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills and any spills are not projected to have significant impacts due to the small size of a possible spill. A vessel spill could occur while en route to and from a specific leasehold within the WEA, but this is considered unlikely. If a spill occurred, either inside or outside the WEA, the estimated spill size would be small. From 2000 to 2009, the average spill size for vessels similar to those anticipated to be used during activities associated with Alternative A was 88.36 gallons (334.5 liters) (U.S. Department of Homeland Security, USCG 2011 *as cited in* USDOI, BOEM, OREP 2012b). Vessel allision with a meteorological buoy containing a diesel-powered generator could also occur. It is estimated that a buoy generator could contain 240 gallons (908.5 liters) of diesel fuel (Fishermen's Energy of New Jersey LLC 2011 *as cited in* USDOI, BOEM, OREP 2012b). If a diesel spill of this size occurred, it would be expected to dissipate rapidly in the water column of the open ocean, then evaporate and biodegrade within a few days (*see* Section 3.2.3, "Fuel Spills").

The meteorological towers and buoys could attract fish, which in turn would attract recreational fishermen to the area. Therefore, there is some potential for collisions with recreational fishing boats and accidental release of diesel fuel.

Storms may cause allisions and collisions that could result in a spill, yet the storm conditions would cause the spill to dissipate faster than calm weather. As a result, impacts on fish populations that could result from an oil spill, if one occurred, would be expected to be both minor and temporary.

Larger vessels, such as tankers or container ships, could potentially collide with meteorological structures within the Rhode Island and Massachusetts WEA. Such a collision is considered unlikely because these structures would be sparsely placed on the OCS offshore of Rhode Island and Massachusetts and would be lit and marked for navigational purposes (*see* Section 3.1.3.1, "Meteorological Towers and Foundations"). If a larger vessel collided with a meteorological facility, a large spill would be extremely unlikely (*see* Section 3.2.2, "Allisions and Collisions"). Thus, the largest spill that could result in the unlikely event that a larger ship collided with a meteorological facility is on the order of 240 gallons (908 liters)—the estimated amount of generator fuel that could be present on the meteorological facility (assuming that a generator is present on the facility).

4.1.2.3.3 Conclusions

Alternative A and the potential effects of HRG survey noise on marine fish and shellfish are generally expected to be limited to avoidance around the HRG survey activities and to short-term changes in behavior. Thus, potential population-level impacts on fish resulting from HRG surveys are expected to be negligible.

Meteorological tower construction/installation noise could disturb normal behavior, including avoidance of or flight from the sound source. Fish that do not flee the immediate action area during pile-driving activities could be exposed to lethal SPLs. However, while the SOCs, including implementing a "soft start" procedure, would minimize the possibility of exposure to lethal sound levels, there would still be a potential for minor to adverse effects to individual fish. The NMFS concurred with this determination regarding threatened and endangered Atlantic sturgeon in their April 10, 2013, Biological Opinion (*see* Section 5.2.1, "Endangered Species Act").

Because the geotechnical sampling footprint would be small, it is expected this activity would have negligible benthic effects that could impact federally managed fish species that may occur in the WEA. Impacts related to construction/installation, operation and maintenance, and decommissioning of the meteorological towers and buoys are expected to be minor and are not expected to result in changes in local community assemblage and diversity.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and from accidentally released solid debris. However, the entanglement in or ingestion by fish of project-related trash and debris would not be expected during normal operations. Impacts on fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor because the number of structures and vessels involved with structure construction/installation, operation and maintenance, and decommissioning would be limited. Thus, direct and indirect impacts from site assessment and site characterization activities to fish are expected to be negligible. Similarly, impacts to EFH are expected to be temporary in nature (in the case of acoustic disturbance and re-suspended sediment during pile-driving and mooring placements). Although moorings and meteorological tower foundations would adversely affect EFH, their overall footprint is small, and thus, would not significantly affect the quality and quantity of EFH in the Rhode Island and Massachusetts WEA. There are no EFH HAPCs in the action area.

4.1.2.4 Marine Mammals

4.1.2.4.1 Description of the Affected Environment

Approximately 38 species of marine mammals occur in the Atlantic OCS between Maine and Florida. Species vary in their ranges throughout the Atlantic OCS from those with limited habitats to those with a more widespread habitat range extending from the coastal region out to the continental slope or from the North Atlantic region to the South Atlantic region. The abundance of these species throughout the Atlantic OCS also varies. Many species have seasonal distributions throughout the OCS while others remain at the same location throughout the year (Waring *et al.* 2011). The action area for Alternative A is the coastal and continental shelf habitats offshore of Rhode Island and Massachusetts WEA. This area is considered part of the North Atlantic. The marine mammal species found in the action area are discussed below. A more detailed description of these species may be found in the Programmatic EIS (USDOI, MMS 2007).

The marine mammals found along the Atlantic coast comprise three taxonomic orders (Cetacea, Pinnipedia, and Sirenia). Order Cetacea can be divided into two sub-orders—the mysticetes and the odontocetes. The mysticetes are the baleen whales, which represent many of the world's large whale species. The odontocetes are the toothed whales, which are represented by the dolphins, porpoises, beaked whales, and the sperm whale. In the U.S. northeast Atlantic, order Pinnipedia (technically a sub-order of the Order Carnivora) is represented by four species. Order Sirenia is represented by the West Indian manatee, which is most common in the South Atlantic; however, rare, individual sightings have been made up the East Coast of the U.S. into New England waters. Table 4-4 lists the marine mammal species that are likely to occur in the North Atlantic and their typical habitat. Only those species located in the "coastal" and "shelf" habitats have the potential to be affected by the proposed action (Alternative A). No activities associated with Alternative A would occur in the "Slope/Deep" habitat and those species that occur solely in this habitat are not discussed further in this document.

This description of the marine mammal environment has been developed based on recent studies and literature syntheses that specifically focus on areas encompassing the waters of the greater New England region, southern New England, the Rhode Island and Massachusetts WEA, and the areas around the WEA that could be affected by the proposed action. These studies include the NMFS marine mammal stock assessment reports, the Rhode Island SAMP (and its accompanying appropriate technical reports), preliminary data from the *2010 Atlantic Marine Assessment Program for Protected Species* (AMAPPS) (Palka 2010), and the 1982 Final Report from *A Characterization of Marine Mammals and Sea Turtles in the Mid- and North Atlantic Areas of the U.S. Outer Continental Shelf* (Cetacean and Turtle Assessment Program [CETAP] 1982).

The technical report *Marine Mammals and Sea Turtles of Narragansett Bay, Block Island Sound, Rhode Island Sound, and Nearby Waters: An Analysis of Existing Data for the Rhode Island Ocean Special Area Management Plan (SAMP)* (Kenney and Vigness-Raposa 2010) used available sources of information on the occurrence of marine mammals and sea turtles within the Rhode Island Ocean SAMP study area, which encompasses the WEA for the proposed action. The Rhode Island Ocean SAMP study mapped the spatial and temporal distributions and relative abundances of all marine mammals known to occur within the Rhode Island study area (Kenney and Vigness-Raposa 2010). The AMAPPS surveys are the result of an interagency agreement between BOEM and the NMFS to assess the abundance and spatial distribution of marine mammals and sea turtles along the U.S. East Coast. Surveys were conducted by the NEFSC and the Southeast Fisheries Science Center (SEFSC). Preliminary data for this program were collected by NEFSC during on-effort aerial line-transect abundance surveys of over 9,210 kilometers of the Atlantic continental shelf between Cape May, New Jersey, and the Gulf of St. Lawrence, Canada. These surveys were conducted between August 17 and September 26, 2010 (Palka 2010). The preliminary data from this survey were used to support conclusions about the summer distribution of marine mammal species within the New England region, particularly in the WEA and its surrounding waters. The NEFSC's North Atlantic Right Whale Sightings Advisory System and Duke University's Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Population database were also used for information regarding recent sightings of North Atlantic right whales within the region.

Table 4-4
Marine Mammals in the North Atlantic

Species	Status	General Occurrence	Typical Habitat			Occurrence in the Rhode Island/ Massachusetts Wind Energy Area
		North Atlantic	Coastal	Shelf	Slope/ Deep	
Order Cetacea						
Suborder Mysticeti (baleen whales)						
Family Balaenidae						
North Atlantic Right Whale (*Eubalaena glacialis*)	E/D	Year-round	X	X	X	Common
Family Balaenopteridae						
Blue Whale (*Balaenoptera musculus*)	E/D	Summer		X	X	Rare
Fin Whale (*Balaenoptera physalus*)	E/D	Year-round	X	X	X	Common
Humpback Whale (*Megaptera novaeangliae*)	E/D	Year-round	X	X	X	Common
Minke Whale (*Balaenoptera acutorostrata*)		Spring/Summer	X	X	X	Common
Sei Whale (*Balaenoptera borealis*)	E/D	Spring/Summer		X	X	Rare
Suborder Odontoceti (toothed whales and dolphins)						
Dwarf Sperm Whale (*Kogia sima*)		Late Spring/ Summer [(a)]			X	Rare
Pygmy Sperm Whale (*Kogia breviceps*)		Late Spring/ Summer [(a)]			X	Rare
Sperm Whale (*Physeter macrocephalus*)	E/D	Spring/Summer/ Fall		X	X	Possible
Family Ziphiidae						
Blainville's Beaked Whale (*Mesoplodon densirostris*)		Late Spring/ Summer [(a)]			X	Rare
Cuvier's Beaked Whale (*Ziphius cavirostris*)		Late Spring/ Summer [(a)]			X	Rare
Gervais' Beaked Whale (*Mesoplodon europaeus*)		Late Spring/ Summer [(a)]			X	Rare
True's Beaked Whale (*Mesoplodon mirus*)		Late Spring/ Summer [(a)]			X	Rare
Sowerby's Beaked Whale (*Mesoplodon bidens*)		Late Spring/ Summer [(a)]			X	Rare
Family Delphinidae						
Short-Beaked Common Dolphin (*Delphinus delphis*)		Year-round		X	X	Common
Pantropical Spotted Dolphin (*Stenella attenuata*)		Late Spring/ Summer [(a)]			X	Rare
Bottlenose Dolphin (*Tursiops truncatus*)	D	Year-round		X	X	Common

(continued on next page)

Table 4-4. Marine Mammals in the North Atlantic (continued)

Species	Status	General Occurrence	Typical Habitat			Occurrence in the Rhode Island/ Massachusetts Wind Energy Area
		North Atlantic	Coastal	Shelf	Slope/ Deep	
Atlantic White-Sided Dolphin (*Lagenorhynchus acutus*)		Year-round		X		Common
White-Beaked Dolphin (*Lagenorhynchus albirostris*)		Late Spring/ Summer [(a)]		X		Rare
Killer Whale (*Orcinus orca*)		Late Spring/ Summer [(a)]		X	X	Rare
Atlantic-Spotted Dolphin (*Stenella frontalis*)		Year-round		X	X	Rare
Short-Finned Pilot Whale (*Globicephala macrorhynchus*)		Late Spring/ Summer [(a)]			X	Rare
Long-Finned Pilot Whale (*Globicephala melas*)		Year-round		X	X	Common
Risso's Dolphin (*Grampus griseus*)		Year-round			X	Rare
Striped Dolphin (*Stenella coeruleoalba*)		Year-round			X	Rare
Harbor Porpoise (*Phocoena phocoena*)		Year-round	X	X		Common
Order Carnivora **Suborder Caniformia** **Family Phocidae**						
Harbor Seal (*Phoca vitulina*)		Year-round	X	X		Common
Grey Seal (*Halichoerus grypus*)		Year-round	X	X		Common
Harp Seal (*Pagophilus groenlandicus*)		Winter/Spring	X	X		Common
Hooded Seal (*Cystophora cristata*)		Winter/Spring		X	X	Rare

Note:

(a) Due to insufficient sighting data and information on these species, the best available information for the season of general occurrence in the North Atlantic corresponds with survey effort.

Key:
E = Endangered.
D = Depleted (under the Marine Mammal Protection Act).
RI/MA WEA = Rhode Island/Massachusetts Wind Energy Area (*see* Kenney and and Vigness–Raposa 2010)

Source: Waring *et al.* 2011; Waring *et al.* 2007; Kenney and Vigness-Raposa 2010.

Non-ESA-Listed Marine Mammals

Most of the marine mammals that would be present in the WEA off the coasts of Rhode Island and Massachusetts are not listed as threatened or endangered under the ESA, but they are protected under the MMPA. The following information was gathered from the sources listed in Table 4-4, among others, on the species that are most likely to occur off the coasts of Rhode Island and Massachusetts in the WEA or its surrounding waters.

Atlantic White-Sided Dolphin

The Atlantic white-sided dolphin (*Lagenorhynchus acutus*) can be found throughout temperate and sub-arctic waters in the North Atlantic (Waring *et al.* 2011). They are most commonly observed inshore of the 328-foot (100-meter) depth contour and can be found within a wide range of temperatures (43º F to 68 º F [6º to 20ºC]) (CETAP 1982; Waring *et al.* 2011). In the North Atlantic, the white-sided dolphin can be found from Hudson Canyon north to Georges Banks and the Gulf of Maine and is characterized as the Gulf of Maine population (Waring *et al.* 2011). They are most commonly found in groups that average approximately 50 marine mammals, and groups are often multispecies aggregations, which are commonly associated with large whales (CETAP 1982). On average, sightings data indicate this species displays a seasonal distribution throughout their range. Greater numbers of white-sided dolphins are found from June through September through Georges Bank and north to the Gulf of Maine, but the numbers of white-sided dolphins decrease from January throughout much of this same area. Low densities of white-sided dolphins can also be found from southern Georges Bank to Hudson Canyon year-round (Waring *et al.* 2011). White-sided dolphins inhabit the continental shelf in the southern New England region, and the WEA in particular. They are most common off the coasts of Rhode Island and Massachusetts during the spring, during which time they tend to occupy the shallower waters of the region (Kenney and Vigness-Raposa 2010).

Bottlenose Dolphin

Bottlenose dolphins (*Tursiops truncatus*) are distributed globally in both tropical and temperate waters (Waring *et al.* 2007). Within U.S. waters, there are two morphologically and genetically distinct morphotypes of bottlenose dolphins: coastal and offshore (Waring *et al.* 2007). Of these two types, bottlenose dolphins found in southern New England waters and, in particular, in the WEA, are likely from the western North Atlantic offshore stock (Kenney and Vingess-Raposa 2010). During the CETAP surveys, they were the most commonly observed species of small cetacean in the study area. On average, they were sighted in groups of approximately 15 marine mammals and were less likely to be part of multi-species aggregations; however, they were often sighted with one other species, pilot whales (*Globicephala* sp.) (CETAP 1982). In the northeast region of the study area, bottlenose dolphins were more often sighted along the continental shelf edge (CETAP 1982). Within the New England region, bottlenose dolphins can be found throughout the year, but they are most common in the WEA during the summer and least common in the winter (Kenney and Vigness-Raposa 2010).

Long-finned Pilot Whale

Pilot whales (long-finned [*Globicephala melas melas*] and short-finned whales [*Globicephala macrorhynchus*]) are widely distributed throughout the world's oceans. Both species of pilot whales can be found throughout the U.S. Atlantic EEZ waters. The two species are difficult to differentiate during surveys. Along the Atlantic Coast, however, the two species tend to occupy different geographic regions. Long-finned pilot whales are found from North Carolina north to the Gulf of Maine, and short-finned pilot whales are found from New Jersey south to Florida. The two species tend to overlap between New Jersey and North Carolina (Waring *et al.* 2011). During the CETAP surveys, they were most commonly observed in groups of approximately 20 marine mammals. When observed in association with other species, they were most commonly observed with bottlenose dolphins (CETAP 1982). Within the North Atlantic, they are most commonly observed over the continental shelf and inshore of the 328-feet (100-meter) depth contour (CETAP 1982). The long-finned pilot whale can be found in the waters off New England in winter and early spring (CETAP 1982). They are known to move off Georges Bank in late spring (Waring *et al.* 2011). According to Kenney and Vigness-Raposa (2010), pilot whales can be found off the coast of Rhode Island in all four seasons and are most abundant during the spring. This may be related to the inshore spawning of their prey, long-fin squid (*Loligo pealei*). Therefore, they are likely to be found off the coasts of Rhode Island and Massachusetts in the WEA and its surrounding waters.

Minke Whale

The minke whale (*Balaenoptera acutorostrata*) is a broadly distributed species throughout the northern hemisphere and can be found throughout temperate and tropical waters (Waring *et al.* 2011; Kenney and Vigness-Raposa 2010). The minke whale is one of the more common baleen whales within the U.S. EEZ as well as one of the most common of the baleen whales in the continental shelf waters of New England (Waring *et al.* 2011). Like many large whales, they are usually observed alone, although they have been seen in groups with up to 15 other minke whales (CETAP 1982). They are usually seen in water temperatures between 43ºF and 68ºF (6ºC and 20ºC) and inshore of the continental shelf in depths of 59 to 1,988 feet (18 to 606 meters) (CETAP 1982). Minke whales can be found in New England waters during all four seasons, although they are most abundant during the spring and summer (Waring *et al.* 2011). Kenney and Vigness-Raposa (2010) used historical and recent survey data and sightings reports to estimate minke whale abundance in the coastal waters of Rhode Island and Massachusetts, including the WEA. The abundance estimates, similar to previous studies, indicate that minke whales can be found in parts of the WEA in greater abundance during the spring and summer months. They can be found in nearshore water out to the slope; however, they are generally thought to occupy the continental shelf proper rather than the continental shelf edge (Kenney and Vigness-Raposa 2010; Waring *et al.* 2011). Due to their common occurrence throughout New England waters, minke whales are likely to occur off the coasts of Rhode Island and Massachusetts in the WEA and its surrounding waters during all four seasons, but with a higher probability during the spring and summer months.

Short-Beaked Common Dolphin

Short-beaked common dolphins (*Delphinus delphis*) can be found in the tropical and temperate waters of the world's oceans. In the North Atlantic, they mainly inhabit the area between the 100-meter and 2,000-meter contours of the continental shelf (Waring *et al.* 2011). Off the northeast coast of the U.S. they can be found in high abundance on Georges Bank and east towards 71ºW during the fall, and they reach peak abundance during the winter months from Virginia north (Kenney and Vigness-Riposa 2010). They are most commonly found in groups averaging approximately 55 marine mammals; these groups are not often found in aggregations with other species (CETAP 1982). While short-beaked common dolphins are more likely to be found in waters deeper than 197 feet (60 meters), there have been occasional sightings of common dolphins in Narragansett Bay and Providence River. These sightings are most often during the winter months (Kenney and Vigness-Riposa 2010). Abundance estimates based on historical and recent survey and sightings data for the southern New England region indicate that short-beaked common dolphins are likely to be present off the coasts of Rhode Island and Massachusetts in the WEA and its surrounding waters during all seasons, with peak abundance during the winter (Kenney and Vigness-Riposa 2010).

According to Kenney and Vigness-Raposa (2010), the short-beaked common dolphin is the most commonly stranded delphinid, and the second most frequently stranded cetacean species, within the Rhode Island study area. Most recently, 178 common dolphins were stranded in Wellfleet, Massachusetts, between January 12 and February 16, 2012 (NOAA Fisheries Office of Protected Resources 2012b).

Harbor Porpoise

Harbor porpoises (*Phocoena phocoena*) are most commonly found in shallow continental shelf and coast waters (Kenney and Vigness-Raposa 2010; CETAP 1982). During the CETAP surveys, harbor porpoises were the second most commonly sighted small cetacean (CETAP 1982). On average, they were observed in groups of three marine mammals, but they have been seen in groups of up to 75 (CETAP 1982). Harbor porpoises have been sighted with other species, but they are the least likely cetacean to be found in multispecies aggregations. They most commonly occupy continental shelf waters within the 328-foot (100-meter) depth contour and are found predominantly in the New England region (CETAP 1982). In the Rhode Island/Massachusetts area, the presence of harbor porpoises is strongly seasonal. They are found in greatest abundance in this area during the spring (Kenney and Vigness-Raposa 2010).

Harbor porpoises in southern New England are highly susceptible to mortality due to the commercial gillnet fisheries off the coastal New England states. To address this, the Harbor Porpoise Take Reduction Plan has developed closure and management areas with specific seasonal restrictions. In the WEA, these are the Cape Cod South Closure Area (where gillnet fishing is closed in March), and the Southern New England Management Area (where acoustic deterrent pingers are required on all nets from December 1 through May 31) (NOAA Fisheries Service 2010).

Harbor Seal

The harbor seal (*Phoca vitulina*) can be found in nearshore waters of the North Atlantic Ocean as well as adjoining seas, primarily above 30ºN (Waring *et al.* 2011). Along the eastern continental United States, they can be found along the entire New England coastline to New Jersey and occasionally as far south as the Carolinas (Waring *et al.* 2011). Throughout their western North Atlantic range, they can be found seasonally from Massachusetts to their southern limits and year-round along New Hampshire and Maine (Waring *et al.* 2011). Within New England waters, the harbor seal is the most abundant marine mammal.

Harbor seals move from their year-round habitats into southern New England waters beginning in September, where their numbers increase until April, followed by a drastic departure in May when pupping season starts in the northern waters (Waring *et al.* 2011; Kenney and Vigness-Raposa 2010). Pupping is not expected to occur in southern New England waters, and at this time no pupping areas are known to occur in this region (Waring *et al.* 2011). Within Rhode Island and southern Massachusetts waters, harbor seals can be found in open ocean areas such as Rhode Island Sound as well as inland bays, rivers, and streams (Kenney and Vigness-Raposa 2010).

Identifying seals during aerial surveys is difficult, so they are most often observed at their haul-out sites rather than in the water. Most recently 21 haul-out sites were identified throughout the Rhode Island coast. Six haul-out sites were identified on Block Island (Kenney and Vigness-Raposa 2010). Other haul-out sites have been identified on the eastern portion of Long Island, Cape Cod, and Nantucket during all four seasons. Survey data collected by the NMFS and the Provincetown Center for Coastal Studies indicated areas of moderate abundance between eastern Long Island and Buzzards Bay and into Vineyard Sound during the winter (Kenney and Vigness-Raposa 2010).

Harbor seals are likely to be found in the waters off the coasts of Rhode Island and Massachusetts in the WEA as well as its surrounding waters. They are known to be within southern New England waters between September and May, although more recently they have been documented during all four seasons. Several haul-out sites on Block Island are close to the western portion of the Rhode Island and Massachusetts WEA.

Harp Seal

Harp seals (*Phoca groenlandica*) can be found throughout much of the North Atlantic and Arctic Oceans (Waring *et al.* 2011). The Western North Atlantic stock of harp seals is divided into two known breeding herds: the front herd located off Nova Scotia and Labrador and the Gulf herd located around the Magdalen Islands in the Gulf of St. Lawrence (Waring *et al.* 2011). This highly migratory species spends their breeding season (February through April) within their whelping locations and then migrate north to Arctic feeding grounds during the summer months (Waring *et al.* 2011).

Historically, the harp seal was uncommon in U.S. waters, but recent observations of this species from Maine to as far south as New Jersey have increased (Waring *et al.* 2011). According to the Rhode Island SAMP, all the current records of harp seals in the Rhode Island region are from stranding records, which primarily occurred in spring and winter (Kenney and Vigness-Raposa 2010). Harp seals have been the most commonly stranded seal species in the region since 1995 (with the exception of 2003) (Kenney and Vigness-Raposa 2010).

There are no known haul-out or breeding locations in the Rhode Island and southern Massachusetts area because these locations do not form pack ice, which is vital to the harp seal life cycle. Harp seals strand throughout southern New England waters, but there are no recently documented sightings in the Rhode Island and southern Massachusetts region because this is the extralimital extent of their range. Therefore, the harp seal is unlikely to occur off the coasts of the Rhode Island and Massachusetts in the WEA as well as its surrounding waters.

Grey Seal

Grey seals are found only in the North Atlantic Ocean, occurring in three populations: eastern Canada, northwestern Europe, and the Baltic Sea (Waring *et al.* 2011). The western North Atlantic stock of grey seals (*Halichoerus grypus*) ranges from New York to Labrador, Canada (Waring *et al.* 2011). The stock is based around two breeding concentrations located at Sable Island and the Gulf of St. Lawrence in Canada (Waring *et al.* 2011). In eastern continental U.S. waters, grey seals can be found from Maine to southern Massachusetts and Rhode Island year-round and seasonally (September to May) in New York and New Jersey waters (Waring *et al.* 2011).

The Massachusetts population of grey seals is reported to be in recovery, with an increase in the species in southern New England waters (Kenney and Vigness-Raposa 2010). The largest haul-out site of grey seals in U.S. waters is located in southern New England on Monomoy Island (USDOI, USFWS 2005). There are three established breeding colonies along the U.S. coastline, one of which is on Muskeget Island, approximately 30 miles (about 48 kilometers) east of the WEA. The grey seal does not exhibit migration behavior in southern New England and the species could likely be present year-round (Waring *et al.* 2011).

Grey seals are not as common in the waters of Rhode Island as harbor seals, but sightings of the species have occurred (Kenney and Vigness-Raposa 2010). Grey seals observed around Rhode Island likely were primarily juveniles dispersing after weaning from their mothers (Kenney and Vigness-Raposa 2010). Because the population of grey seals in waters off the coasts of Rhode Island and Massachusetts in the WEA and its surrounding waters is expanding, grey seals could be present in or surrounding the WEA. Their presence is more likely during the winter and spring months, although year-round occurrence is possible considering the expanding populations and nearby breeding and haul-out locations in southern Massachusetts.

ESA-Listed Threatened and Endangered Marine Mammals

Six cetacean species in the North Atlantic are federally listed as endangered: the North Atlantic right whale (*Eubaleana glacialis),* fin whale (*Balaenoptera physalus),* humpback whale (*Megaptera novaengliae),* blue whale (*Baleanoptera musculus*), sei whale (*Balaeonoptera borelais*), and sperm whale (*Physeter macrocephalus*) (*see* Table 4-4). Of these six species, only three—right, fin, and humpback whales—are most likely to occur in and around the WEA. Two others—sei and sperm whales—are less common within the waters surrounding the WEA. All five species are expected to occur in the region during all times of the year, but they are more prevalent in some seasons than others. Although blue whales occur in the North Atlantic, sightings indicate that they are more likely to be found offshore in deeper waters closer to the continental slope region (Greene *et al.* 2010; Waring *et al.* 2011). Therefore, this species is not likely to be found off the coasts of Rhode Island and Massachusetts in the WEA as well as its surrounding waters.

Manatees are federally listed as endangered (USDOI, USFWS 2008). Individual, occasional sightings of manatees have occurred in the New England region during the summer months. However, because there is no regular occurrence of this species within the region during any season, they are not discussed further in this document.

North Atlantic Right Whale

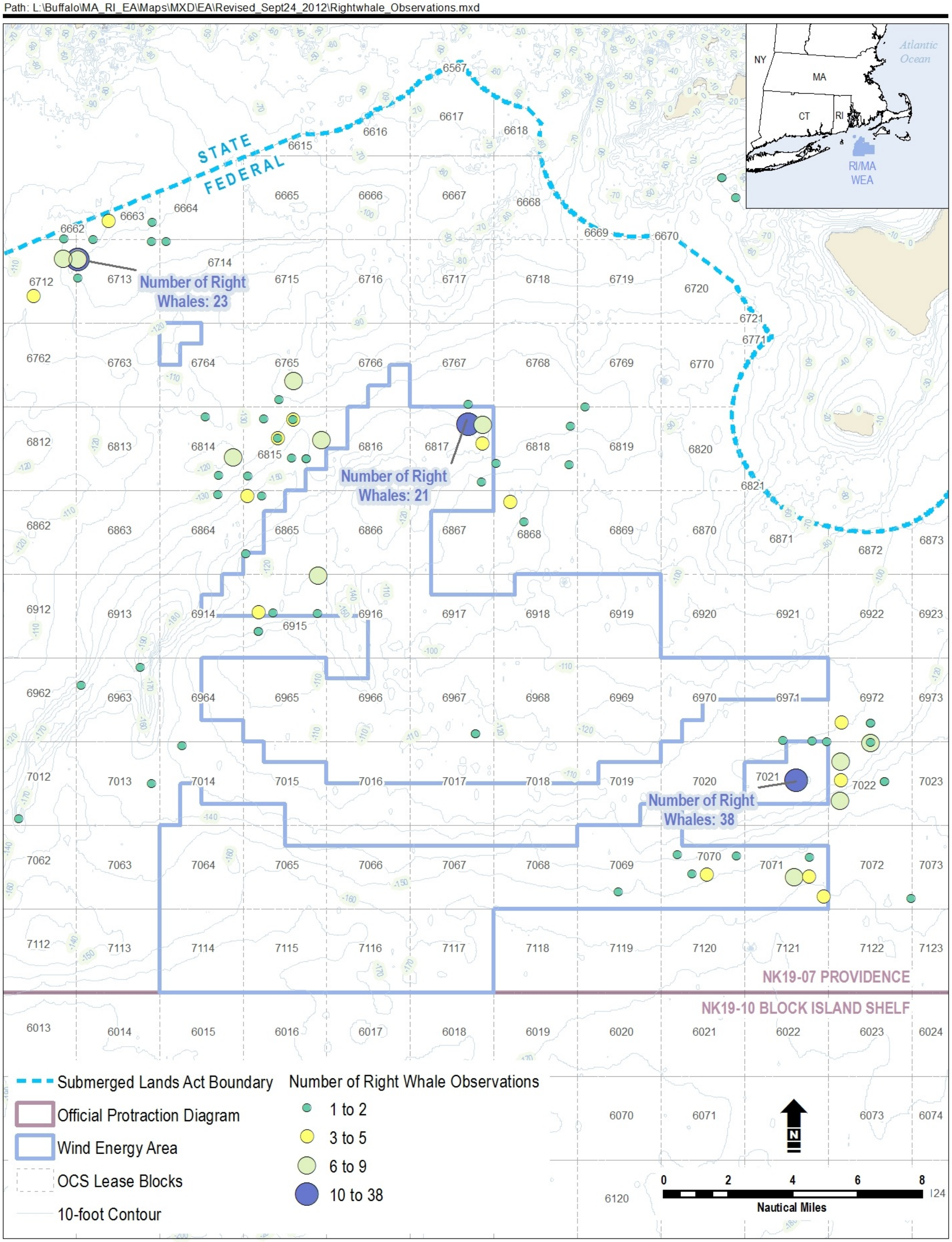
North Atlantic right whales can be found in U.S. waters spanning the entire East Coast from the Gulf of Maine to the waters off northeast Florida (Waring *et al.* 2011; Kenney and Vigness-Raposa 2010). This is primarily a coastal and continental shelf species, likely because of the availability and distribution of their preferred prey item—late-stage juvenile and adult copepods [*Calanus finmarchicus*]) (USDOC, NOAA, NMFS 2004; Kenny and Vigness-Raposa 2010).

The species migrates every year from winter calving grounds in the southern latitudes of its range to spring and summer feeding grounds in the higher latitudes of its range. During the winter, North Atlantic right whales can be found in the nearshore waters of northeast Florida and Georgia, where reproductive females reportedly return annually to calve (USDOC, NOAA, NMFS 2004; Kenney and Vigness-Raposa 2010). During the spring and summer months, the North Atlantic right whales migrate north to the productive waters of the northeast region to feed and nurse their young. Within the northeast region, feeding grounds have been identified off the coast of Massachusetts, Georges Bank, the Great South Channel, in the Gulf of Maine, and over the Scotian Shelf (Waring *et al.* 2011). These feeding and calving habitats are considered high-use areas for this species.

While high-use areas have been established for the North Atlantic right whale, frequent travel along the East Coast of the U.S. is common. Satellite tags have shown North Atlantic right whales to make round-trip migrations to an area off the southeastern U.S. and back to Cape Cod Bay at least twice during the winter (Waring *et al.* 2011).

North Atlantic right whales have been observed within and around the Rhode Island and Massachusetts WEA during all seasons of the year (Kenney and Vigness-Raposa 2010). They are most common during the spring and winter when they migrate between the feeding and calving grounds. According to Kenney and Vigness-Raposa (2010), the highest occurrence of right whales within the Rhode Island Ocean SAMP study area (from the middle of Long Island to outer Cape Cod and south to 39°15’) was in the spring (58 percent of all sightings), with less in the winter (19 percent) and summer (16 percent), and relatively low occurrence in the fall (4.5 percent). This seasonal occurrence is supported by recent aerial surveys near the WEA (Kraus *et al.* 2013). They occur less often during the summer months, indicating that this area is not a target feeding region. However, an aggregation of 18 North Atlantic right whales was observed feeding off Rhode Island in April 1998, and 98 North Atlantic right whales were observed feeding near Rhode Island Sound on April 20, 2010 (Kenney and Vigness-Raposa 2010; USDOI, NOAA, NMFS, NEFSC n.d.[a]; USDOI, NOAA, NMFS, NEFSC 2010; Halpin *et al.* 2009) (Figure 4-3). Both of these incidents are assumed to be episodes of opportunistic feeding. In 2011, North Atlantic right whales were observed in the waters off Rhode Island and Martha’s Vineyard from March to May. The sightings consisted of between 1 and 14 individuals and most occurred within the Rhode Island and Massachusetts WEA (USDOC, NOAA, NMFS, NEFSC n.d.[b]). One such sighting on April 22, 2011, consisted of 57 individual North Atlantic right whales (Dawicki 2011). The sighting included four mother/calf pairs. During the sighting, the animals were observed actively surface feeding (Dawicki 2011). In 2012, North Atlantic right whales were spotted in waters off Rhode Island and southern Massachusetts from January to April. The sightings consisted of between 1 and 7 individuals and occurred in the northern section of the WEA and the surrounding waters (USDOC, NOAA, NMFS, NEFSC n.d.[c]).

Path: L:\Buffalo\MA_RI_EA\Maps\MXD\EA\Revised_Sept24_2012\Rightwhale_Observations.mxd



Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; RI Ocean SAMP 2009; NEFSC NARS Sighting Survey 2010, Halpin et al. 2009

Figure 4-3. North Atlantic Right Whale Observations within the WEA – April 2010.

Whether any of the sightings in 2011 or 2012 were episodes of feeding was not reported. Although sporadic feeding behavior has recently been reported within and near the WEA (Kraus *et al.* 2013), the closest known feeding grounds in regular use by North Atlantic right whales are in the Great South Channel which is located approximately 75 NM east of the WEA and has been designated as critical habitat for the species.

As noted above, the North Atlantic right whale is known to occur within the waters of Rhode Island and southern Massachusetts during all four seasons; however, because they are more likely to occur in the area during spring and fall migrations, the area just south of Block Island between the eastern end of Long Island and the Western end of Martha's Vineyard has been designated as a Seasonal Management Area (SMA) between November 1 and April 20 (USDOC, NOAA, NMFS, NEFSC n.d.[d]). Therefore, it is likely that the North Atlantic right whale could occur in the Rhode Island and Massachusetts WEA and its surrounding waters.

Humpback Whale

Humpback whales can be found in U.S. waters spanning the entire East Coast from the Gulf of Maine to the waters off Florida (Waring *et al.* 2011). They are known to feed in waters north of the Gulf of Maine such as the Gulf of St. Lawrence during the spring, summer, and fall (Waring *et al.* 2011). During winter months, humpback whales from all of the northern feeding locations migrate south to the West Indies to mate and calve (Waring *et al.* 2011).

The distribution of humpback whales in the northeast is thought to greatly depend on the distribution of its Gulf of Maine prey species, herring (*Clupea sp.)* and sand lance (*Ammodytes sp*.) (Kenney and Vigness-Raposa 2010). Shifts in prey abundance have been correlated with shifts in humpback distribution between the Gulf of Maine and Cape Cod Bay/east of Cape Cod (Kenney and Vigness-Raposa 2010).

Humpback whales are known to occur within and around the WEA during all seasons of the year (Kenney and Vigness-Raposa 2010). They are most common during the spring and summer months and appear to move further offshore and out onto the continental shelf during the winter and fall months (Kenney and Vigness-Raposa 2010). Therefore, it is likely that humpback whales could occur in the Rhode Island and Massachusetts WEA and its surrounding waters.

Fin Whale

Fin whales are widely distributed throughout the North Atlantic. In U.S. waters, they can be found from the Gulf of Maine to the Gulf of Mexico (Office of Protected Resources 2010), primarily between the Gulf of Maine and Cape Hatteras (Waring *et al.* 2011). Fin whales are one of the most commonly observed large whales. During surveys conducted between 1978 and 1982, fin whales accounted for 46 percent of the large whales observed (CETAP 1982; Waring *et al.* 2011). Mass migratory movements along a defined migratory corridor have not been supported by sightings (Office of Protected Resources 2010). However, acoustic data have indicated a "southward flow pattern" occurring in the fall from the Labrador/Newfoundland area, past Bermuda, and to the West Indies (Office of Protected Resources 2010a).

Off the coast of the eastern United States, fin whales are generally centered over the 100-meter isobath but have been sighted in shallower and deeper water, including submarine canyons off the continental shelf (Office of Protected Resources 2010a). In the northeast region, fin whales are primarily found from spring through the fall months because New England is a major feeding habitat for the population (Hain *et al.* 1992 *as cited in* Kenney and Vigness-Raposa 2010; Waring *et al.* 2011).

According to Kenney and Vigness-Raposa (2010), fin whales are the most common large whale found within the Rhode Island area. They are known to occur within and around the WEA during all four seasons, with a high occurrence both in the inner shelf area and farther offshore near the continental shelf break (Kenney and Vigness-Raposa 2010). Therefore, it is likely that fin whales could occur in the Rhode Island and Massachusetts WEA and its surrounding waters.

Sei Whale

Sei whales can be found in northeastern U.S. waters, primarily the Gulf of Maine, Georges Bank and Stellwagen Bank. The Nova Scotia stock of sei whales is distributed across the continental shelf waters from the northeast U.S. coast to south of Nova Scotia (Waring *et al.* 2011) and is typically sighted on the U.S. Atlantic mid-shelf and the shelf edge and slope. Predominantly a deep water species, most commonly observed over the continental slope, shelf breaks, and deep ocean basins situated between banks (Office of Protected Resources 2011). Sei whales are also known to come inshore into more shallow waters episodically (Schilling *et al.* 1992). According to Olsen *et al.* (2009), sei whale movements appear to be associated with oceanic fronts, sea surface temperatures, and specific bathymetric features. Along the U.S. Atlantic seaboard, in spring and early summer, sei whales are frequently observed in areas with North Atlantic right whales in the Great South Channel and southern Gulf of Maine (Office of Protected Resources 2011). Major changes have been noted in sei whale distribution and movements over the last few decades in the North Atlantic.

According to Kenney and Vigness-Raposa (2010), though sightings in southern New England are considered rare with only 35 records in the Rhode Island Ocean SAMP study area, most sightings occurred in the spring (83 percent). Two locations of note are in the vicinity of the WEA. South of Montauk and Block Island, there was a small cluster of inshore sightings of individual whales during July 1981 on different days: one in August 1982 and one in May 2003. Another noteworthy sighting was on May 7, 2001, when 23 sightings of a total of 112 whales were observed on the mid-shelf area south of Nantucket (Kenney and Vigness-Raposa 2010). There have been three reports of sei whale strandings or mortalities in the northeast U.S. area: (1) On November 17, 1994, a sei whale carcass came in on the bow of a container ship as it docked in Boston, Massachusetts; (2) in May 2001, a sei whale slid off the bow of a ship arriving in New York Harbor; and (3) a sei whale was found off Deer Island, Massachusetts, with ship strike identified as the primary cause of death (Waring *et al.* 2011; Kenney and Vigness-Raposa 2010). There are no known sei whale strandings in Rhode Island in recent years (Kenney and Vigness-Raposa 2010). Therefore, the occurrence of sei whales within the Rhode Island and Massachusetts WEA and its surrounding waters, is possible, but would be rare.

Sperm Whale

The overall distribution of sperm whales along the U.S. East Coast is centered along the shelf break and over the slope (Office of Protected Resources 2010b). Sperm whales tend to inhabit offshore waters, usually in depths of 1,968 feet (600 meters), and are uncommon in waters less than 984 feet (300 meters) deep (NOAA Fisheries Office of Protected Resources 2013). The exception to this distribution pattern is found with a relatively high number of sightings in the shallow continental shelf waters of southern New England (Scott and Sadove 1997). Geographic distribution may be linked to their social structure, with females and juveniles generally found in tropical and subtropical waters, and males ranging more widely (Waring *et al.* 2011).

Within the northeast U.S., this species occurs in all seasons, but is found in higher numbers in the spring and summer, with fewer in the fall and winter (Kenney and Vigness-Raposa 2010). Within the Rhode Island Ocean SAMP study area, *"sperm whales are predicted to be present in all four seasons, but in scattered and low abundance"* (Kenney and Vigness-Raposa 2010). There have been occasional sperm whale strandings in Massachusetts: two whales from 2001 to 2005 (Waring *et al*, 2011) and none in Rhode Island in the past decades (Kenney and Vigness-Raposa 2010). Therefore, the occurrence of a sperm whale within the Rhode Island and Massachusetts WEA and surrounding waters is possible; however, it would be rare.

4.1.2.4.2 Impact Analysis of Alternative A

Impacts of Routine Activities and Events

Activities associated with site characterization and assessment that may affect marine mammals include: (1) HRG surveys; (2) construction and/or installation of meteorological observation platforms (i.e., towers and buoys); (3) vessel traffic; (4) discharges of waste materials and accidental fuel releases; and (5) meteorological observation platform decommissioning. The potential effects on marine mammals from these activities can be grouped into the following categories: (1) acoustic effects; (2) benthic habitat effects; (3) vessel collision effects; and (4) other effects (e.g., contact with waterborne pollution). It should be noted that all activities described below would be evaluated by the NMFS under the MMPA if and when a lessee proposes to conduct site characterization and assessment. Accordingly, lessees would need to consult with the NMFS to ensure that necessary authorizations (such as IHAs) are obtained when applicable.

Acoustic Effects on Marine Mammals

The information provided in this section is derived from previous ESA consultations issued by the NMFS and BOEM for Atlantic WEA projects, e.g., the recent final Mid-Atlantic EA (USDOI, BOEM, OREP 2012b) as well as the most relevant information on marine mammal hearing sensitivity.

Sound is a major component of marine mammal survival. It is used for communication (of social and survival importance), foraging, and navigation. It is also thought that marine mammals use sound to gather information about their surrounding environment; the sound can originate from natural sources such as sounds produced by other animals (inter- or intra- specific species), or naturally occurring phenomena such as wind or rain or naturally occurring seismic activity such as earthquakes (Richardson *et al.* 1995). Manmade noise in the marine environment is increasing and has led to growing concern about the effects of such sound on marine mammals. Marine organisms can be affected behaviorally, acoustically, and physiologically by exposure to noise (Richardson *et al.* 1995).

Behavioral reactions can include a flight response, a change in response to predators, changes in diving patterns, changes in foraging, changes in breathing patterns, avoidance of important habitat or migration areas, and disruption of social relationships and interactions (Tyack 2009; Nowacek *et al.* 2007; Richardson *et al.* 1995). Acoustic responses to human noise can include masking (the decreased ability for a marine mammal to detect relevant sounds due to an increase in background noise), changes in call rates, and changes in call frequency. Physiological responses can include temporary threshold shift (TTS), permanent threshold shift (PTS), increased stress, and direct or indirect tissue damage (such as hemorrhaging or gas bubbles developing in body fluids) (Nowacek *et al.* 2007; Southall *et al.* 2007; Wright *et al.* 2007; Richardson *et al.* 1995).

Impacts on marine mammals from acoustic sources are measured by levels of sounds that have been determined to cause behavioral harassment and physiological damage or injury. The NMFS has established harassment thresholds based on the RMS metric. These thresholds have been developed using limited experimental studies of captive odontocetes, controlled field experiments on wild animals, behavioral observations of wild animals exposed to man-made sounds, inferences from marine mammal vocalizations, and inferences on hearing studies in terrestrial animals.

Received levels of 180 dB re 1 µPa or greater pose a potential for injury to cetaceans, and levels of 190 dB re 1 µPa pose potential injury to pinnipeds in water; 160 dB re 1 µPa is the threshold for causing behavioral disturbance/harassment of pinnipeds in water and cetaceans from non-continuous /impulsive noise; 120 dB re 1 µPa is the threshold for causing behavioral disturbance/harassment of pinnipeds in water and cetaceans from continuous noise (70 FR 1871, *Marine Mammal Hearing).*

Table 4-5 summarizes the most current understanding of marine mammals hearing as reported in Southall *et al.* 2007. In order for sound to elicit some form of response or create an impact on a marine mammal, the sound produced must be within the auditory range of that marine mammal, meaning that the marine mammal must be able to perceive the sound at the given frequency and SPL (Gotz *et al.* 2009).

Table 4-5
Functional Hearing Groups, Estimated Auditory Bandwidth, and Genera Represented for Each Marine Mammal Group

Functional Hearing Group	Estimated Auditory Bandwidth	Genera Represented (number of species/subspecies)
Low-frequency cetaceans	7 Hz to 22 Hz	*Balaena, Caperea, Eschrichtius, Megaptera, Balaenoptera* *(13 species / subspecies)*
Mid-frequency cetaceans	150 Hz to 160 kHz	*Steno, Sousa, Sotalia, Tursiops, Stenella, Delphinus, Lagenodelphis, Lagenorhynchus, Lissodelphis, Grampus, Peponocephala, Feresa, Pseudorca, Orcinus, Globicephala, Orcaella, Physeter, Delphinapterus, Monodon, Ziphius, Beradius, Tasmacetus, Hyperoodon, Mesoplodon* (57 species / subspecies)
High-frequency cetaceans	200 Hz to 180 kHz	*Phocoena, Neophocaena, Phocoenoides, Platanista, Inia, Kogia, Lipotes, Pontoporia, Cephalorhynchus* (20 species / subspecies)
Pinnipeds in water	75 Hz to 75 kHz	*Arctocephalus, Callorhinus, Zalophus, Eumetopias, Neophoca, Phocartos, Otaria, Erignathus, Phoca, Pusa, Halichoerus, Histriophoca, Pagophilus, Cystophora, Monachus, Mirounga, Leptonychotes, Omnatphoca, Lobodon, Hydrurga, and Odobenus* (41 species / subspecies)
Pinnipeds in air	75 Hz to 30 kHz	Same species as pinnipeds in water (41 species/subspecies)

Key:
Hz = Hertz.
kHz = kilohertz.

Source: Southall *et al.* 2007.

Acoustic Effects of HRG Surveys

HRG surveys would be used to characterize ocean-bottom topography and subsurface geology. The HRG surveys would also investigate potential benthic biological communities and archaeological resources. The HRG surveys would be used to characterize the potential site of the meteorological tower and to gather information necessary to submit a SAP and a COP in the future. HRG surveys associated with Alternative A involve shallow penetration of the seafloor. Therefore, renewable energy-related HRG surveys involve far less energy (and therefore, far less sound introduced into the environment) than do deep-type penetrating HRG surveys.

Section 3.1.2.1, "High-Resolution Geophysical Surveys," provides details on the potential scenarios for HRG surveys in the WEA and details a reasonably foreseeable scenario for HRG surveys. The survey would likely consist of a vessel towing an acoustic source (boomer and/or

CHIRP) about 82 feet (25 meters) behind the ship and a 1,969-foot (600-meter) streamer cable with a tail buoy. The survey area is assumed to include the entire footprint of the Rhode Island and Massachusetts WEA. HRG survey time is conservatively estimated at 4,500 hours for all of the WEA (which would involve 17,500 NM of surveys). HRG survey equipment expected to be used is noted in Section 3.1.2.1.

The sound source in an HRG survey is directed vertically in the water column. While the majority of the energy is directed vertically, propagation in the horizontal direction still occurs at depths below the surface. Madsen *et al.* (2006b) reported that sperm whales in the Gulf of Mexico received SPLs of 150 to 160 dB re 1 μPa (peak to peak) at 1,312 to 1,640 feet (400 to 500 meters) depth and 7.5 miles (12 kilometers) away from the HRG source, indicating that the strength of the sound pulses can be equally as strong near the source as it is at great distances. However, how this sound propagates depends on the environment and physical characteristics of the water column and the bottom structure (Richardson *et al.* 1995).

The sound levels at the source (i.e., the boomer, CHIRP survey vessel) would depend on the type of equipment used for the survey. An example of the type of equipment to be used is listed in Section 3, Table 3-2. Acoustic energy generated by these survey instruments is directed downward and may be fanned at the seafloor rather than directed horizontally. The surveys would likely use the full daylight hours available, approximately 8 to 10 hours per day. However, the time that any particular area would experience elevated sound levels would be significantly shorter because the vessel would be ensonifying a limited area along each transect. Since marine mammals would not be exposed continuously as the vessel is transiting a given area, vessel noise is not considered a continuous noise source.

The sub-bottom profilers (e.g., boomers, sparkers, and CHIRPs) generate sound within the hearing thresholds of most marine mammals that may occur in the action area. The CHIRP has an average sound source level of 201 dB re 1 μPa RMS with a typical pulse length of 32 milliseconds and a pulse repetition rate of 4 per second. A typical boomer has a sound source level of around 205 dB re 1 μPa RMS with a pulse duration of 150 to 200 microseconds and a pulse repetition rate of 3 per second. However, actual specifications may vary by manufacturer and the environment where it is to be deployed. Actual HRG survey method source levels and pulse lengths were used to model threshold radii for the various profiler methods for the *Atlantic OCS Proposed Geological and Geophysical (G&G) Activities Mid-Atlantic and South Atlantic Planning Areas Draft Programmatic Environmental Impact Statement* (referred to herein as the OCS G&G DPEIS [USDOI, BOEM 2012a]). These profilers include a boomer, side-scan sonar, CHIRP sub-bottom profiler, and a multi-beam depth sounder. Three of the four profiler methods have operating frequencies that are within the range of cetacean hearing (Table 4-6). The pulse length and peak source level that were used for each profiler method modeling scenario are found in Table 4-6 and can be assumed as representative of profiler sources that could be used for the proposed action.

Table 4-6
Summary of Peak Source Levels for High-Resolution Geophysical Survey Activities and Operating Frequencies within Cetacean Hearing Range

Source	Pulse Length	Operating Frequencies	Broadband Source Level (dB re 1 µPa at 1 m)	Operating Frequency within Cetacean Hearing Range?
Boomer	180µs	200 to 16 kHz	212	Yes
Side-scan sonar	20 ms	100 kHz	226	Yes
		400 kHz		No
CHIRP sub-bottom Profiler	64 ms	3.5 kHz	222	Yes
		12 kHz		Yes
		200 kHz		No
Multi-beam depth sounder	225 µs	240 kHz	213	No

Key:
µs = microsecond.
CHIRP = compressed high-intensity radar pulse.
dB re 1 µPa at 1 m = decibels referenced to 1 microPascal at 1 meter.
kHz = kiloHertz.
ms = millisecond.

Source: USDOI, BOEM 2012a.

The modeling scenarios run for the OCS G&G DPEIS captured environmental and oceanographic conditions at about 98 feet (30 meters) and 328 feet (100 meters), during three of four seasons. Only two of the multiple study sites modeled in the OCS G&G DPEIS (Sites 16 and 17 [*see* USDOI, BOEM 2012a, Appendix D]) were chosen to be representative of the WEA based on depth and their location outside of the Gulf Stream. Using these locations was an attempt to capture water temperatures that would represent sound velocity profiles similar to those found in southern New England during the same seasons. Based on these modeling results, threshold radii for each HRG survey method potentially used for the proposed action are displayed in Table 4-7. As displayed in the modeling results, the threshold radii for 180 dB re 1 µPa RMS from any of the survey methods is not expected to be greater than 656 feet (200 meters). Therefore, this is the exclusion zone that has been developed for all cetaceans, including North Atlantic right whales. However, vessels must maintain a 500-meter (1,640-foot) separation distance for right whales to avoid potential vessel strikes (*see* Appendix B). The 656-foot (200-meter) exclusion zone is based on preventing any cetaceans from experiencing Level A, injurious harassment from noise under the MMPA. However, some cetaceans may experience Level B behavioral harassment within the 160 dB re 1 µPa RMS threshold radii as the maximum radii for all three HRG survey methods extends out far past the 200-meter range. Lessees could also modify the exclusion zone following several principles: a) the lessee may utilize a type of survey equipment whose sound profile was not captured within the range of the modeled acoustic impacts and the lessee would like to consult with BOEM to initiate modification of the exclusion zone based on field verification of the survey equipment; b) equipment specifications submitted to BOEM with the lessee's plan documents indicate a sound profile that exceeds BOEM's modeled area of ensonification at the 180 dB level; and c) the lessee may wish to expand the exclusion zone to encompass the 160-dB level if it can be effectively monitored in order to reduce the potential for needing an IHA issued under the MMPA (*see* the SOCs in Appendix B for details).

Table 4-7
Estimated Ranges for Level A and Level B Harassment of Cetaceans for High-Resolution Geophysical Survey Methods Based on the National Marine Fisheries Service 180-dB and 160-dB Criteria

			180-dB Radius (meters)	160-dB Radius (meters)
	Number of Scenarios Modeled	Pulse Duration	Calculated Using Nominal Source Levels	Calculated Using Nominal Source Levels
Boomer	14	180 µs	38 to 45	1,054 to 2,138
Side-Scan Sonar	14	20 ms	128 to192	500 to 655
CHIRP Sub-bottom Profiler	14	64 ms	32 to 42	359 to 971
Multibeam Depth Sounder	7	225 µs	27	147 to 156

Notes:
(a) The value is the radius (Rmax) for the maximum received sound pressure level (USDOI, BOEM 2012a).

Key:
µs = microseconds.
dB = decibels.
ms = milliseconds.

Source: USDOI, BOEM 2012a.

It should be noted that while the modeling scenarios are based on sites offshore North Carolina, the bottom sediment is similar (sand), the depth range is similar, and the sound velocity profiles are expected to be the most representative of the Rhode Island and Massachusetts WEA as opposed to the other modeling scenario sites available. See Appendix D in the OCS G&G PDEIS for a full explanation of the threshold radii modeling.

It is expected that marine mammals would avoid the area around the HRG survey activities, thereby limiting potential effects. It is also anticipated that any effects that could occur would be short-term changes in behavior. As cetaceans and pinnipeds are highly mobile species, they have the ability to move away from the sound if disturbance occurs. Di Iorio and Clark (2010) reported that blue whales may be exhibiting a “compensatory behavior” related to local seismic activity by increasing the consistency of their calls while the surveying was occurring. Ljungblad *et al.* (1988) reported a number of behavioral responses with four geophysical survey vessels in the Alaska Beaufort Sea. They consisted of shorter surfacing and diving bouts, fewer blows while at the surface, and changes in surfacing behavior. More recently, McCauley *et al.* (2000) reported that humpback whales in Western Australia were avoiding seismic air guns at received sound levels averaging 140 dB re 1 µPa RMS. Less information is available for pinniped reactions to pulsed sounds such as those produced by HRG surveys. Harris, Miller, and Richardson (2001) reported that during seismic surveys in Beaufort Sea, Alaska, ringed seals avoided the area of activity when the surveys were operating at full array and behavior identified as "swimming away" was observed more when the full area was in operation than when it was not. On the other hand, seals in water have been reported to stay in an area and tolerate strong pulsed noise when feeding opportunities are present (Richardson *et al.* 1995).

While the surveys may disturb individual marine mammals, these surveys would be conducted at various times and locations over a five-year period. It is expected that this timing, coupled with the primarily localized sound of the surveys, would not have population-level effects. It is expected that individual marine mammals disturbed by a survey would return to normal behaviors after the survey had left the area. Once an area has been surveyed, it probably would not be surveyed again, therefore reducing the likelihood of repeated HRG-related impacts within the WEA and surroundings. Based on the short time of the survey operation within the WEA, BOEM does not expect that HRG operations would prevent any marine mammals from returning to use an area after the survey vessel has transited through the area.

The SOCs (*see* Appendix B), including reasonable and prudent measures to protect endangered species required by the NMFS through the ESA consultation (*see* Section 5.2.1, "Endangered Species Act"), are a part of Alternative A and would be required by BOEM in the lease instrument and/or conditions of approval for any SAP. In addition, the lessee's surveys would likely require an IHA from the NMFS, which would very likely require that similar or additional measures be implemented. Specifically, the SOCs include requirements for field verification of the sounds emitted by HRG survey equipment operating at frequencies below 200 kHz (the high end of the range for marine mammal hearing), clearance of an exclusion zone for 60 minutes, ramp-up of the sound source, and shutdown of the electromechanical survey equipment if an infraction of the exclusion zone by an endangered marine mammal is observed by the trained protected species observer. Due to their documented curiosity and voluntary approach of seismic sound sources (air guns) in the Gulf of Mexico (Barkaszi *et al*. 2012), a shutdown of the active sound source for pinnipeds and delphinoid cetaceans was deemed not appropriate for these species. If, however, a delphinoid cetacean or pinniped is sighted at or within the exclusion zone, the electromechanical survey equipment must be powered down to the lowest power output that is technically feasible.

No population-level impacts on marine mammals from HRG surveys are expected as a result of HRG surveys. BOEM does not expect that HRG survey activities would result in either individual or cumulative effects that could cause serious harm or death to any marine mammals. The NMFS concurred with this determination in their April 10, 2013, Biological Opinion.[11]

Acoustic Effects of Geotechnical Sampling

The majority of geotechnical sampling would be via CPTs and, to a more limited extent, vibracoring, which does not require deep borehole drilling. However, some geologic

[11] *See* http://www.nero.noaa.gov/protected/section7/bo/actbiops/boem_ocs_wind_energy_april_2013.pdf.

conditions may prevent sufficient data being acquired from vibracores and CPTs and would instead necessitate obtaining a geologic profile via a borehole.

Acoustic impacts from borehole drilling are expected to be below the 120-dB threshold established by the NMFS for marine mammal harassment from a continuous noise source. Previous estimates submitted to BOEM for geotechnical drilling showed source sound levels not exceeding 145 dB at a frequency of 120 Hz (Kurkul 2009). Previous submissions to BOEM also indicated that boring sound should attenuate to below 120 dB by the 150-meter isopleth. According to BOEM's SOCs for the project, there would be a 200-meter default exclusion zone for marine mammals that may be modified if the lessee conducts field verification measurements (*see* Appendix B.4.2, "Requirements for Geotechnical Sampling"). The total drilling time would depend on the target depth and substrate that would be drilled.

According to the NMFS, drilling is considered a continuous, non-pulse, noise source. Therefore, sound levels from a drilling source in excess of 120 dB would be considered behavioral (Level B) harassment under the MMPA. Marine mammals in the area disturbed by the noise created by drilling or noise generated during drilling set-up would be able to avoid the area and therefore avoid potential harassment. Other geotechnical sampling activities, such as CPT or vibracoring, are expected have only minor acoustic effects, which would be primarily from vessel engine noise.

Effects of geotechnical sampling are expected to be minor and temporary throughout the duration of the work. Geotechnical sampling, such as borehole drilling, could displace local flora and fauna in the work zone. Temporary sedimentation of benthic organisms that may serve as forage items for marine mammals could also occur. The acoustic impacts of these geotechnical sampling activities are expected to be minor and would create only a small ensonified area that must be monitored by a protected species observer (see Appendix B).

Effects of Pile-Driving Noise

As with any sound in the marine environment, the type and intensity of the sound depends on multiple factors and can vary greatly. These factors include the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact hammer (Madsen *et al.* 2006a). Although there is a potential for variance because of differences in location and equipment, the range of acoustic impacts from pile-driving can be delineated.

Studies have reported that pile-driving can generate sound levels greater than 200 dB with a relatively broad bandwidth of 20 Hz to greater than 20 kHz (Madsen *et al.* 2006a; Thomsen *et al.* 2006; Nedwell and Howell 2004; Tougaard, Madsen, and Wahlberg 2008). Noise modeling for the Cape Wind Energy Project (USACE 2004[12]) indicated that the underwater noise levels from pile-driving may be greater than the NMFS threshold for behavioral disturbance/harassment from a non-continuous source (i.e., pulsed at 160 dB re 1 μPa) within approximately 2 miles (3.4 kilometers) from the noise source (USACE 2004). Actual measures of underwater sound levels during the construction of the Cape Wind meteorological tower in 2003 were reported between

[12] See Appendix 5.11-A at http://www.nae.usace.army.mil/projects/ma/ccwf/deis.htm.

145 and167 dB at 1,640 feet (500 meters). Peak energy was reported around 500 Hz (USDOI, BOEM, OREP 2012b).

Modeling was also conducted for proposed meteorological tower sites located offshore of New Jersey and Delaware under Interim Policy leases by Bluewater Wind, LLC (now NRG Bluewater Wind). The 160 dB re 1 μPa isopleth was modeled at 4 miles (6,600 meters or over 6 kilometers) offshore of New Jersey and 4.5 miles (7,230 meters or about 7 kilometers) offshore of Delaware (USDOC, NOAA, NMFS, 2010a *as cited in* USDOI, BOEM, OREP 2012b). It is expected that pile-driving for the proposed action (Alternative A) would last four to eight hours per pile, dependent on the sediment type. Generally, pile-driving blows are delivered at one-second intervals (Madsen *et al.* 2006a). The modeled areas for the Cape Wind Energy Project (USACE 2004) and the Bluewater Wind Interim Policy Lease (USDOC, NOAA, NMFS 2010a *as cited in* USDOI, BOEM, OREP 2012b) are good representations of the potential range of ensonified area at both the 180 dB re 1 μPa and 160 dB re 1 μPa sound levels (Table 4-8). However, it should be noted that the sources are different sizes, the monopile diameters differ, and the environmental characteristics are likely different, causing the isopleths to vary.

Table 4-8
Modeled Areas of Ensonification from Pile-Driving

Project (modeled)	Additional Info	180 dB re 1μPa (RMS)	160 dB re 1μPa (RMS)
Bluewater Wind (Interim Policy Lease offshore Delaware)	3.0-meter diameter monopile; 900 kJ hammer	760 meters	7,230 meters
Bluewater Wind (Interim Policy Lease offshore New Jersey)	3.0-meter diameter monopole; 900 kJ hammer	1,000 meters	6,600 meters
Cape Wind Energy Project (Lease in Nantucket Sound)	5.05-meter monopole; 1,200 kJ hammer	500 meters	3,400 meters

Key: kJ = kilojoule.

Source: USDOI, BOEM, OREP 2012b.

During this project, pulsed noises with sound levels less than 160 dB re 1 μPa (i.e., pile-driving) could cause temporary behavioral disturbance/ harassment (four to eight hours over three days per lease) during meteorological tower construction/installation. As noted above, acoustic interference and disturbance could cause behavioral changes as well as masking of inter- and intra-species calls, changes in call rates, and avoidance of the area, among others (Richardson *et al.* 1995). The potential for behavioral disturbances extends out many miles (Madsen *et al.* 2006a; Tougaard, Madsen, and Wahlberg 2008). Physiological effects such as TTS and PTS could occur at close range to the source (Richardson *et al.* 1995; Madsen *et al.* 2006a). Currently, the biological consequences of hearing loss or behavioral responses to construction noise are not known (Tougaard *et al.* 2008), and there is little information regarding short-term and long-term impacts to marine mammal populations. A recent study in a large embayment (Moray Firth) in Northeast Scotland suggested that mid- and low-frequency cetaceans, such as minke whales and bottlenose dolphins, could experience behavioral disturbance (at 160 dB re 1 μPa or greater according to NMFS MMPA criteria) up to approximately 30 NM (50 kilometers) away from the source and potential injury such as PTS or TTS (at 180 dB re 1 μPa or greater according to NMFS MMPA criteria) within 328 feet (100 meters) of the source (Bailey *et al.* 2010). It is important to note, however, that the geology of Moray Firth and the size of the piles (5MW wind turbine foundations) used in this study are not directly transferable to meteorological tower construction/installation in the Southern New England/New York Bight Project Area.

While individual marine mammals could potentially be affected, effects on populations of marine mammals as a result of construction noise are not expected. Some species of marine mammals would leave the area when construction vessels arrive and begin their activities, which would greatly reduce their exposure to the pulsed noise source. Species that remain in the ensonified region may be disturbed by the noise, but it is anticipated that they would likely return to normal behavior patterns following the completion of the work (i.e., three days) or after they leave the survey area.

It is expected that disturbance/harassment (Level B) levels of sound (i.e., 160 dB re 1 μPa) would occur within approximately 4 miles (approximately 7 kilometers), and injurious Level A harassment (180 dB re 1 μPa) would occur within 3,280 feet (1,000 meters) of the activity. BOEM anticipates that no cetaceans or pinnipeds would be exposed to sound levels greater than 180 dB, because, pursuant to the SOCs enforced in the lease, the lessee cannot conduct pile-driving if a whale is within the 3,280-feet (1,000-meter) radius exclusion zone of the active source. Due to the fact that construction and installation activities would take a relatively short time, BOEM does not expect that pile-driving activities would result in either individually or cumulatively causing serious injury or death of any marine mammals.

BOEM has considered using vibratory hammers as a way to reduce exposure to disturbing levels of noise and does not discourage the use of vibratory hammers because their use would reduce the duration of exposure to the higher SPLs associated with impact hammers. However, using vibratory hammers could increase the total installation time and thus the total duration of noise exposure. Other noise-reduction measures for pile-driving, primarily cofferdams and foam sleeves (*see* Nehls 2007 and USDOI, BOEMRE 2010 *as cited in* USDOI, BOEM, OREP 2012b), also have been shown to be effective. However, the feasibility of requiring these technologies in the offshore environment needs further investigation and may be appropriate on a case-by-case basis for full commercial-scale construction projects where the total duration of pile-driving activities would be greater than that for a single meteorological tower.

The SOCs (*see* Appendix B), which incorporate the reasonable and prudent measures to protect endangered species required by the NMFS through the ESA consultation (*see* Section 5.2.1, "Endangered Species Act"), are expected to reduce potential impacts on marine mammals from these activities. Specifically, the SOCs will require: a prohibition of pile-driving from November 1 to April 30 and during active Dynamic Management Area (DMA) periods; the establishment and monitoring of an exclusion zone during pile-driving; acoustic monitoring of pile-driving activity, and shut down of pile-driving when an incursion by protected species into the exclusion zone is observed.

If a whale is identified in the project area or immediate vicinity during meteorological tower installation, the SOCs (*see* Appendix B) would be followed. BOEM also would require soft start procedures as conditions of the lease or SAP approval (*see* details in Appendix B). Additional operating requirements may be imposed by the NMFS in an IHA issued to the lessee (*see* NMFS MMPA Proposed Notice of Incidental Harassment Authorization for the Cape Wind Project [76 FR 56735]).

Construction/installation of meteorological towers would occur over a relatively short time and would be limited to up to four locations within the WEA (*see* Section 3.1.3.1, "Meteorological Towers and Foundations"). Additionally, each of these four structures could be constructed at any time within a five-year period. Because the timing of the construction/installation would be spatially and temporally dispersed, and it is expected that any marine mammals would leave the area during construction/installation activities, the total project area or immediate vicinity would be minor in relation to the larger regional area and habitat of the species. Therefore, impacts on marine mammals are expected to be limited in duration and intensity.

Effects of Vessel Traffic Noise

Marine mammals may be affected by noise generated by surface vessels traveling to and from the WEA as well as operating in the WEA. Underwater noise associated with vessel traffic is attributed to the low-frequency reverberation of the engines and its propellers. As the propeller moves through the water small bubbles are produced and collapse (a process known as cavitation). As these bubbles collapse, a low-frequency sound is produced (Jasney *et al.* 2005). The intensity of the cavitation depends on the age of the vessel/propeller, the size and shape of the ship, its length and capacity, the load it carries, and the speed it is traveling. Overall, the greater the volume of the vessel, the greater the acoustic intensity and output would be (Jasney *et al.* 2005).

Larger vessels, such as commercial container ships, produce sounds at approximately 180 to 190 dB re 1 µPa RMS and less than 200 to 500 Hz (Thomsen *et al.* 2009; Jasney *et al.* 2005). Smaller vessels produce less intense sounds at 160 to 180 dB re 1 µPa RMS and less than 1,000 Hz (Thomsen *et al.* 2009). Vessel noise attributed to vessels associated with Alternative A are anticipated to produce sounds within the range of 150 to170 dB re 1 µPa RMS at less than 1,000 Hz. As vessels would mainly be traveling to and from the WEA with limited activity within the WEA, it is expected that exposure of marine mammals to vessel noise would be transient. Because individual vessels produce unique acoustic signatures (Hildebrand 2009), and the physical characteristics of the marine environment determine how that sound travels (Richardson *et al.* 1995), the intensity of noise from various vessels can differ greatly; therefore, individual marine mammal exposures to noise can differ as well.

Marine mammals can exhibit various reactions when exposed to vessel noise. Reportedly, cetacean interaction with small vessels may mask sound and can reduce communication range in both shallow water and deeper waters (Jensen *et al.* 2009; Lesage *et al.* 1999). It has also been observed that cetaceans can temporarily change their breathing patterns, heading during travel, and swimming speed when interacting with smaller vessels (Nowacek, Wells, and Solow 2001; Richardson *et al.* 1995). Cetaceans can avoid vessels in some instances, which would be beneficial for preventing collision, but such avoidance could also cause negative effects by displacing a marine mammal from a foraging location (Evans *et al.* 1993 *as cited in* USDOI, BOEM, OREP 2012b; Nowacek, Wells, and Solow 2001; Richardson *et al.* 1995). However, exposure to individual vessel noise in the WEA or in the surrounding waters would be transient and temporary as vessels passed through the area, and marine mammal behavior and use of the habitat would be expected to return to normal following the passing of a vessel. Therefore, it is unlikely that short-term effects created by individual vessels traveling to and from the WEA and during construction/installation would have long-term, population-level impacts on local marine mammals. Impacts from vessel noise are expected to be short-term and negligible.

Benthic Habitat Effects

Marine mammals do not generally use the benthic environment, and the impacts on the benthos itself are expected to be limited (*see* Section 4.1.2.2, "Coastal and Benthic Habitats"). Benthic effects from implementing Alternative A that would impact marine mammals thus are expected to be negligible. As some benthic organisms act as forage for some marine mammal species, it is expected that some of these may become unavailable during geotechnical sampling and tower and buoy installation and operation, as described below.

Geotechnical Sampling

As noted in Section 4.1.2.2, geotechnical sampling would result in a negligible temporary loss of some benthic organisms (i.e., less than a 1-foot [0.3-meter] diameter area would be disturbed in the core sampling locations) and a localized increase in disturbance due to vessel activity, including noise and anchor cable placement and retrieval. This activity could impact marine mammals by removing a small amount of otherwise available forage items. However, due to the small footprint, the temporary nature of the action, availability of similar benthic habitat regionally, and the limited use of the benthic environment, it is expected that Alternative A would have negligible effects on the benthic environment that could affect marine mammals.

Meteorological Tower/Buoy Construction/Installation

Construction/installation of a meteorological tower would result in direct effects on benthic invertebrates by burying or crushing them. Also, it is anticipated that sediment would become suspended around deployed anchoring systems and around monopoles during installation. However, this sediment would quickly disperse and settle onto the surrounding seafloor. Depending on the local currents, this sedimentation could smother some benthic organisms, but the Southern New England-New York Bight is considered a high-energy environment where sediment transport occurs regularly. Therefore, these activities would have only minor temporary effects that could impact marine mammal habitat in the water column and/or availability of forage items for marine mammals.

Meteorological Tower/Buoy Operation

It is expected that up to four meteorological towers and up to eight buoys constructed by any lessee would not result in a significant change to the local community assemblage or to the availability of forage items for marine mammals in the WEA or the surrounding waters.

Collision Effects

Collisions with vessels and/or structures associated with Alternative A could result in injury to the marine mammals and/or damage to the vessel or structure. BOEM anticipates that marine mammals would avoid fixed structures such as meteorological towers, reducing the risk of collisions with these structures.

Vessels used for site characterization and assessment activities could collide with marine mammals present in the area during transit. Two main factors in marine mammal and vessel collisions are marine mammal location and abundance and the speed of vessels (Merrick and Cole 2007). The amount of vessel traffic and navigational visibility are also factors. BOEM will require as stipulations of its lease that the lessee abide by vessel strike avoidance measures that are based on the NMFS's Vessel Strike Avoidance Measures and Reporting for Mariners. These measures have become standard means to protect marine mammals and sea turtles by maintaining a vigilant watch for these species and reducing speed and/or course to reduce or eliminate the potential for injury. These measures shall be applicable to all vessel activity conducted under the authorizations provided in the lease.

According to Laist *et al.* (2001), 11 species of whales throughout the world's oceans are known to have been struck by a vessel. Of these, the most frequently struck species is the fin whale, followed by the North Atlantic right whale, humpback whale, sperm whale, and grey whale (Laist *et al.* 2001). Of these, the fin whale, North Atlantic right whale, humpback whale and sperm whale are of concern for potential encounters with vessels in the WEA and its surrounding waters. Vessel strikes in New England waters have been determined to be the cause of death in some pinniped strandings (Waring *et al.* 2011).

Whale strikes can occur with any size vessel, from large tankers to small recreational boats. However, most of the lethal interactions are associated with vessels longer than 260 feet (80 meters) (Jensen and Silber 2004), and vessels associated with Alternative A are generally anticipated to be smaller. Strikes have also been reported for vessels traveling between 2 and 50 knots, with most lethal or severe injuries occurring when vessels are traveling 14 knots (16 miles per hour) or more (Jensen and Silber 2004; Laist *et al.* 2001; Vanderlaan and Taggart 2006).

If a marine mammal is sighted within the minimum separation distance, vessels must take precautionary avoidance measures if safety permits, based on the SOCs required by BOEM (*see* Appendix B.2 for details). BOEM will require the lessee to abide by seasonal speed restrictions associated with SMAs for North Atlantic right whales. This requirement would be effective from November 1 through July 31 each year for vessels 65 feet (19.8 meters) or greater in overall length. Vessels must follow NMFS speed restrictions (73 FR 60173) in all SMAs, DMAs, and WEAs in order to reduce the probability of striking North Atlantic right whales. The current regulatory measures in place and the intermittent travel of vessels associated with Alternative A would greatly reduce the potential for a vessel strike. Therefore, no significant impacts from vessel collisions are anticipated.

BOEM currently supports the use of PAM and the development of efficient PAM techniques. BOEM requires the submission of a survey plan for BOEM's consideration of the use of PAM in order to conduct operations in low visibility or nighttime operations.

Discharge of Waste Materials and Accidental Fuel Leaks

Pollutants such as diesel fuel potentially could be discharged if a collision or allision occurred. If a diesel fuel spill occurred, it would be expected to be small and dissipate quickly, then evaporate and biodegrade within a few days (*see* Section 3.2.3, "Fuel Spills"). Sanitary and domestic wastes would be processed through onboard waste treatment facilities before being discharged overboard. Thus, waste discharges from construction vessels would not be expected to directly affect marine mammals.

Marine mammals could be adversely impacted by the presence of pollutants or solid debris accidentally released into the water column. Both pollutants and solid debris could be ingested by the animals. Ingestion of solid debris (e.g., plastics) could lead to internal blockage and later starvation, damage the stomach lining, or lessen the drive to forage and feed (Laist 1987). Ingested plastics could contain or be composed of toxic substances that could have lethal or sub-lethal effects on the marine mammal. Solid debris could cause entanglement that could lead to drowning, abrasions (which could be lethal), reduced mobility, and reduced ability to forage and avoid predators (Laist 1987). However, the discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by the USCG (33 CFR 151), so the risk of ingestion of or entanglement in solid debris during implementation of Alternative A would not be expected under normal circumstances.

During site characterizations and site assessments, vessel traffic and offshore activity associated with surveys and the construction/installation of meteorological tower/buoys would be minimal and the release of liquid wastes would be infrequent. Collisions leading to accidental discharges would be more likely to occur during active construction/installation or decommissioning periods. During this time, more than one vessel would be present and they would be operating close to each other. Collisions are less likely during surveys because only one vessel traveling at slow speeds would operate at any one time. Therefore, impacts on marine mammals from the discharge of liquid and solid waste or the accidental release of fuel are expected to be minor.

Meteorological Tower and Buoy Decommissioning

Section 3.1.3.1 describes the decommissioning of meteorological towers and buoys. Upon completion of site assessment activities, the meteorological tower or buoy would be removed and transported by barge to shore. During decommissioning, marine mammals may be affected by sounds and/or operational discharges similar to those produced during meteorological tower construction/installation. Piles would be removed by cutting the pile (using mechanical cutting or high-pressure water jets) at a depth of 15 feet (4.6 meters) below the mudline (30 CFR 585.910). Marine mammals could be affected by noise produced by pile-cutting activities; however, sound levels produced by these activities have not yet been tested for Atlantic wind energy projects. Despite this lack of information, it is expected that pile-cutting would produce less noise than pile-driving. Only marine mammals within the immediate vicinity of pile-cutting (i.e., those that had not left the area upon the arrival of decommissioning vessels) would be expected to be affected during tower removal, transport, and pile-cutting. Disturbance of marine mammals is expected to be lower than during construction/installation activities, and impacts from vessel disturbance associated with decommissioning are expected to be similar to impacts during construction/installation and similarly minor.

4.1.2.4.3 Conclusions

Alternative A is not expected to result in any significant individual or population-level effects on marine mammals in the WEA or in surrounding waters. The proposed activities, when considered with the SOCs that BOEM will require of the lessee to reduce the potential for vessel strike and harassing levels of noise exposure, may result in minor to adverse effects. The NMFS concurred with this determination regarding threatened and endangered marine mammals in their April 10, 2013, Biological Opinion (*see* Section 5.2.1, "Endangered Species Act"). These potential effects on individuals are expected to be temporary and localized. Population-level impacts are not expected to occur due to the limited spatial and temporal extent of the activities. The primary potential impacts on marine mammals associated with Alternative A are harassment of individual marine mammals from noise or the risk of vessel collisions. Thus, these impacts are not anticipated to result in any population-level impacts to marine mammals.

4.1.2.5 Sea Turtles

4.1.2.5.1 Description of the Affected Environment

Six species of sea turtles can be found in the offshore waters of the U.S. Of these six species, four could occur in the Rhode Island and Massachusetts WEA or its surrounding waters: the Northwest Atlantic loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*). All four species are listed as either threatened or endangered under the ESA (Table 4-9). On September 22, 2011, a final listing determination was made designating the Northwest Atlantic Ocean DPS, the South Atlantic Ocean DPS, the Southeast Indo-Pacific Ocean DPS, and the Southwest Indian Ocean DPS as threatened. The Northeast Atlantic Ocean DPS, Mediterranean Sea DPS, North Indian Ocean DPS, North Pacific Ocean DPS, and South Pacific Ocean DPS were designated as endangered (76 FR 58868) as of October 24, 2011. The DPS of loggerhead sea turtle likely to be present in the Rhode Island and Massachusetts WEA is the threatened Northwest Atlantic DPS.

Little density information is available for sea turtle species in the northeastern region of the U.S. and, in particular, southern New England where the WEA is located. Some useful information is available from a few sources. One such source, Shoop and Kenney (1992) used information from the University of Rhode Island's CETAP and other survey data to develop abundance and seasonal distribution estimates of loggerhead and leatherback sea turtles. Another source (Kenney and Vigness-Riposa 2010) gathered historical records of sea turtle observations to compare with the CETAP observations to determine species seasonal presence in their Rhode Island study area, which is close to the WEA. Preliminary data from the 2010 AMAPPS survey were also considered in order to determine the presence of sea turtle species in the WEA and surrounding waters.

Table 4-9
Sea Turtle Species of the Western North Atlantic

Species	Status	General Occurrence North Atlantic	Occurrence in the Rhode Island / Massachusetts Wind Energy Area [(a)]
Order Testudines Family Cheloniidae			
Northwest Atlantic Loggerhead Sea Turtle (*Caretta caretta*)	Threatened	Seasonal	Common
Green Sea Turtle (*Chelonia mydas*)	Threatened	Seasonal	Possible
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	Endangered	Seasonal	Possible
Order Testudines Family Dermochelyidae			
Leatherback Sea Turtle (*Dermochelys coriacea*)	Endangered	Seasonal	Common

Note:
(a) The occurrence category is based upon historical sightings data compiled in the Rhode Island Ocean Special Area Management Plan (Rhode Island CRMC 2010) and Kenney and Vigness-Raposa 2010.

The CETAP survey program, which was the basis of the data synthesized in Shoop and Kenney (1992), was conducted between 1978 and 1982 and it provided the first comprehensive look at sea turtle distribution in the North Atlantic from Nova Scotia, Canada, to Cape Hatteras, North Carolina. The program consisted of both aerial and shipboard surveys. Overall, the authors were able to determine seasonal distributions of loggerhead and leatherback sea turtles, the two most commonly sighted turtles during the survey. The sightings data allowed them to determine the density of the two species per square kilometer. The density of loggerheads was estimated at 0.00164 to 0.510 per square kilometers, and the density for leatherbacks was estimated at 0.00209 to 0.0216 per square kilometer. It should be noted that these density estimates were averaged for the entire survey range. Therefore, individual abundance estimates within the WEA will not necessarily reflect these data. However, the survey was useful in providing information on the seasonal distribution of the species and the general sighting locations, indicating the presence of both loggerhead and leatherback sea turtles within southern New England. This information, coupled with the Rhode Island Ocean SAMP (Rhode Island CRMC 2010) and the preliminary AMAPPS data, provided information on the potential occurrence of sea turtles in the WEA and surrounding waters.

Northwest Atlantic Loggerhead Sea Turtle

Loggerhead sea turtles occur in temperate and tropical waters of the Atlantic, Pacific, and Indian Oceans (USDOC, NOAA, NMFS and USDOI, USFWS 2008). They are the most common sea turtle species along the U.S East Coast. In the eastern U.S., the majority of loggerhead sea turtle nesting occurs from North Carolina through southwest Florida. Some nesting also occurs in southern Virginia and along the Gulf of Mexico coast westward into Texas (USDOC, NOAA, NMFS and USDOI, USFWS 2008). Despite its northern nesting limit of Virginia, the loggerhead sea turtle can be found in waters as far north as the Gulf of Maine

(Shoop and Kenney 1992). Non-breeding adults and juveniles are commonly observed within the Long Island Sound region and the waters of southern New England (Shoop and Kenney 1992; Thompson 1988).

Loggerhead presence within the U.S. is potentially influenced by both water temperature and depth. During the CETAP aerial surveys, loggerhead turtles were most frequently observed in waters between approximately 72 and 160 feet (22 and 49 meters) deep, and approximately 84 percent of the sightings occurred in waters less than 262 feet (80 meters) deep, suggesting that loggerheads prefer shallower waters (Shoop and Kenney 1992). Loggerhead sightings occurred most frequently in surface water temperatures between approximately 44ºF and 86ºF or 7ºC and 30ºC (Shoop and Kenney 1992).

In southern New England, loggerhead sea turtles can be found seasonally, primarily during the summer and fall months (Kenney and Vigness-Raposa 2010). Loggerheads are absent from southern New England during winter months (Kenney and Vigness-Raposa 2010; Shoop and Kenney 1992). During the CETAP surveys, one of the largest aggregations of loggerheads was observed along the continental shelf northeast of Long Island (Shoop and Kenney 1992). According to preliminary data from AMAPPS, the loggerhead was the most frequently observed sea turtle species in the Northeast region between August and September (29 sightings of single animals) (Palka 2010). It is likely that the number of loggerheads in New England waters is greatly underestimated because it is highly likely that large numbers of juveniles, which would be too small to be easily detected during surveys, occur in embayments and bays in the southern New England region (Kenney and Vigness-Raposa 2010).

Stranding data for Cape Cod Bay indicate that loggerheads are relatively common in southern New England waters. Of 1,381 sea turtles stranded in Cape Cod Bay from 1979 to 2003, 20.3 percent were loggerheads (Dodge *et al.* 2003). Among the 279 loggerheads known to have stranded in Massachusetts from 1986 to 2007, ten were stranded on Martha's Vineyard (NMFS SEFSC 2012). An additional 31 loggerhead turtles were stranded in Rhode Island during the same time period (NMFS SEFSC 2012).

Loggerhead sea turtles are frequently seen in waters off Rhode Island and southern Massachusetts seasonally. Most recently, the AMAPPs aerial survey observed loggerheads within Rhode Island Sound, directly offshore of Point Judith, Rhode Island, and in the waters adjacent to the WEA (Palka 2010). Because of their documented occurrence and use of southern New England waters, particularly within the vicinity of the WEA, it is likely that loggerhead sea turtles could occur within the WEA or its surrounding waters during the summer and fall; however, it is unlikely that concentrations of these animals would be found in the WEA, as observations indicated that these animals are generally single and widely dispersed throughout the area (Kenney and Vigness-Raposa 2010; Palka 2010).

Leatherback Sea Turtle

The leatherback sea turtle is the most globally distributed sea turtle, occupying habitats in tropical and subtropical waters as well as cold-temperate waters (USDOC, NOAA, NMFS and USDOI, USFWS 1992). They are considered the most pelagic sea turtle even though they are often reported in coastal waters off the U.S. continental shelf (USDOC, NOAA, NMFS and

USDOI, USFWS 1992). Leatherbacks have been sighted along the entire coast of the eastern U.S. from the Gulf of Maine in the north and south to Puerto Rico, the Gulf of Mexico, and the U.S. Virgin Islands (USDOC, NOAA, NMFS and USDOI, USFWS 1992). The CETAP aerial survey reported leatherbacks to be present throughout their study area (the OCS between Cape Hatteras and Nova Scotia), with the greatest concentrations seen between Long Island and the Gulf Maine (Shoop and Kenney 1992).

The leatherback sea turtle is not known to nest as far north as Rhode Island and Massachusetts. Nesting occurs in lower latitudes along the eastern continental U.S., primarily southeastern Florida, where minor nesting colonies are known to exist (USDOC, NOAA, NMFS and USDOI, USFWS 1992; Eckert *et al.* 2006). Other locations of leatherback nesting within U.S. waters have been identified as rare in Texas, Georgia, South Carolina, and North Carolina. They can also be found nesting throughout the Caribbean (USDOC, NOAA, NMFS and USDOI, USFWS 1992). Mating often occurs in the waters adjacent to nesting beaches and along the migratory pathway. Following nesting, leatherback turtles that have nested along Florida beaches often head north toward feeding grounds in higher latitude and colder waters (Eckert *et al.* 2006; James *et al.* 2006). The migration north is driven by foraging habitat present in colder waters, allowing the leatherback to feed on its preferred prey of jellyfish and other gelatinous plankton (James *et al.* 2006; USDOC, NOAA, NMFS and USDOI, USFWS 1992).

In southern New England, leatherback sea turtles are generally observed during summer and fall (Kenney and Vigness-Raposa 2010). Sightings data indicate that leatherback occurrence in the offshore and coastal areas of Rhode Island and Massachusetts is more dispersed, with no concentration areas noted in the WEA or surrounding waters.[13] Although it is not known why leatherbacks spend time in southern New England waters, leatherbacks were observed during the CETAP aerial surveys off the Rhode Island coast in association with aggregations of *Cyanea sp.* (Shoop and Kenney 1992). Most recently, the AMAPPS aerial survey observed leatherbacks in Block Island Sound to the west of the WEA during August and September (Palka 2010).

Leatherback sea turtle strandings have been recorded for Rhode Island and Massachusetts. However, unlike most other sea turtles, the strandings in this case were not likely due to cold-stunning because of this species' thermoregulatory abilities. Leatherback sea turtles are the most common species to strand in Rhode Island with 144 records from 1986 to 2007 (NMFS SEFSC 2012). Among the 159 leatherbacks known to have stranded in Massachusetts from 1986 to 2007, 29 were stranded on Martha's Vineyard (NMFS SEFSC 2012).

Because of their documented occurrence and use of southern New England waters, particularly within the vicinity of the WEA or surrounding waters, it is likely that leatherback sea turtles could occur within the WEA during the summer and fall. However, it is not likely that concentrations of these animals would be found in the WEA or its surrounding waters because observations also indicated that these animals are widely dispersed throughout the area (Kenney and Vigness-Raposa 2010).

[13] However, a concentration area of leatherbacks was noted south of central Long Island during the CETAP aerial surveys (Shoop and Kenney 1992).

Green Sea Turtles

The green sea turtle can be found globally, most often in tropical and subtropical waters. Some individuals are also known to occur in cooler, temperate regions (NMFS and USFWS 1991). They can be found throughout the Caribbean and in continental U.S. waters from Texas to Massachusetts (NMFS and USFWS 1991).

The green sea turtle is not known to nest as far north as Rhode Island and Massachusetts. Along the eastern continental U.S., nesting occurs in large numbers in the lower latitudes, primarily southeastern Florida, and more specifically Brevard, Indian River, St. Lucie, Martin, Palm Beach and Broward Counties (NMFS and USFWS 1991). They can generally be found feeding in shallow waters of reefs, bays, inlets, lagoons, and shoals that are abundant in algae or marine grass, such as eel grass (NMFS and USFWS 2007b).

In southern New England, green sea turtles are rare, yet when they are observed it is generally during summer months due to the limiting factor of water temperature (CETAP 1982). Should green sea turtles be present within the area, they would mostly likely be juveniles, as this is the life stage that is most often reported in New England waters. Within southern New England, green sea turtles are known to be found in the waters of Cape Cod Bay and Block Island and Long Island Sounds (CETAP 1982).

Within the WEA, one green sea turtle sighting was confirmed in 2005 (Kenney and Vigness-Raposa 2010). Two strandings were reported in Connecticut and Rhode Island between 1987 and 2001, however the exact locations and dates of the strandings are unknown (Kenney and Vigness-Raposa 2010). More recently, the AMAPPS aerial survey observed a single green sea turtle southwest of the WEA in August 2010 (Palka 2010). The survey did not indicate whether it was an adult or a juvenile. Aerial surveys flown twice a month, between October 9, 2011 and September 17, 2012, over an area east of the WEA, identified three species of sea turtles in the area (leatherback, loggerhead, and Kemp's ridley) and on three different days, reported nine unidentified turtles. No green sea turtles were detected (Kraus *et al.* 2013). Due to the infrequent occurrence of green sea turtles within waters of southern New England, and their preference for the shallow waters of Long Island Sound when in southern New England waters, green sea turtles are unlikely to occur within the WEA or its surrounding waters.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is found most commonly in the Gulf of Mexico and along the U.S. Atlantic Coast. However, a few records have reported them near the Azores, Morocco, and in the Mediterranean Sea. It is a nearshore species and rarely ventures into waters deeper than 160 feet (50 meters), primarily occupying the neritic zone which contains muddy or sandy bottoms where their prey can be found (NMFS and USFWS 2007a).

Their nesting is mostly limited to the Western Gulf of Mexico, primarily Tamaulipas and Veracruz, Mexico. Ninety-five percent of Kemp's ridley nesting occurs in Tamaulipas, Mexico, where females arrive onshore in large aggregations to nest during what is called the "arribada". Some nesting also occurs in Texas and irregularly in a few other U.S. states and occasional nests along the U.S. Atlantic Coast have been identified as far north as Virginia. Juvenile Kemp's ridley sea turtles are known to travel north to New England waters seasonally for foraging habitat found in Long Island Sound, New York (NMFS, USFWS, and SEMARNAT 2011).

In southern New England, juvenile Kemp's ridley sea turtles are known to occur both in Long Island Sound and Cape Cod Bay (CETAP 1982). Many of the reports of juvenile Kemp's ridley sea turtles in Long Island Sound are those of cold shock turtles, and the only records in the Rhode Island area are during summer and fall months (Kenney and Vigness-Raposa 2010). Data from the Sea Turtle Stranding and Salvage Network indicated that reported strandings near the WEA are low, with two on Martha's Vineyard and four in Rhode Island from 1986 to 2007 (NMFS SEFSC 2012).

Strandings of Kemp's ridley in Cape Cod Bay increased dramatically from 1999 to 2003 in proportion to the number of hatchlings released from the head start program from nesting beaches in the southern U.S. two years earlier (Dodge *et al.* 2003). In the headstart program, hatchlings are caught just as they begin to swim offshore (to enable "imprinting" on the ocean) and brought to a facility to develop, where they can avoid the high predation rate (1% survival for neonates; NMFS, USFWS, and SEMARNAT 2011). During this time period, they are tagged and subsequently released at variable ages. An additional dataset of sea turtle strandings by state can be found at the NMFS Sea Turtle Stranding and Salvage Network. This dataset includes sea turtle stranding data for Massachusetts and Rhode Island from 1986 through 2007, including species, year, month, and location by county. NMFS, Southeast Fisheries Science Center (SEFSC) has verified all data through 2005 and may make changes as needed for 2006 and 2007 data. Although the numbers of Kemp's ridleys strandings are relatively high (1,156) in Massachusetts (more specifically Cape Cod Bay), the stranding numbers are low near the Rhode Island and Massachusetts WEA , with two on Martha's Vineyard, one on Nantucket, and four in Rhode Island from 1986 to 2007 (NMFS SEFSC 2012).

There is little visual sighting data information for this species, as it is a small species and is difficult to sight during aerials surveys. Also, the majority of ocean-based surveys do not take into account bays and estuaries; therefore, they are less likely to encounter Kemp's ridley turtles as they are more commonly found in these protected areas within southern New England. Despite the common occurrence of Kemp's ridley turtles in Long Island Sound and Cape Cod Bay, they are not as common in Rhode Island and southern Massachusetts waters. It is expected that this area does not have suitable habitat for the juvenile turtles; therefore, Kemp's ridley turtles are expected to be rare within the WEA or its surrounding water. There is the potential that they may transit through the area occasionally while traveling between Long Island Sound and Cape Cod Bay during summer months (Kenney and Vigness-Raposa 2010). This is supported by data collected during aerial surveys using vertical camera imaging that were flown twice a month over an area east of the WEA, between October 9, 2011, and September 17, 2012. These surveys identified leatherback (93 sightings) and loggerhead (76 sightings) sea turtles, six sightings of Kemp's ridley sea turtles, and nine sightings of unidentified sea turtles in the area, predominantly in late August and September (Kraus *et al.* 2013).

4.1.2.5.2 Impact Analysis of Alternative A

Impacts of Routine Activities and Events

Section 5.2.12.2 of the Programmatic EIS (USDOI, MMS 2007) discusses the impacts of site characterization activities on sea turtles. Appendix B in this EA includes BOEM's SOCs for the proposed project. Activities associated with site characterization and assessment that may affect sea turtles include: (1) HRG surveys; (2) construction and/or installation of meteorological observation platforms (i.e., towers and buoys); (3) vessel traffic; (4) discharges of waste materials and accidental fuel releases; and (5) meteorological observation platform decommissioning. The potential effects on sea turtles from these activities can be grouped into the following categories: (1) acoustic effects; (2) benthic habitat effects; (3) vessel collision effects; and (4) other effects (e.g., contact with waterborne pollution). All activities described below would be subject to evaluation by the NMFS if and when a lessee proposes to conduct them. Accordingly, lessees would need to consult with NMFS to ensure necessary authorizations, such as IHAs, when necessary.

This section summarizes the currently existing information on sea turtle sensitivity to noise and potential noise resulting from site characterization and assessment activity in the Rhode Island and Massachusetts WEA. The information is derived from previous ESA consultations issued by the NMFS and BOEM for Atlantic wind energy projects, e.g., the recent Mid-Atlantic WEA Final EA (USDOI, BOEM, OREP 2012b), and from the most relevant published sources of information on sea turtle hearing sensitivity. Much of the general discussion regarding sound and communication for marine organisms is presented in Section 4.1.2.1, "Marine Mammals," and so is not repeated here.

Acoustic Effects

The hearing capabilities of sea turtles are not as well-studied or as well-known as those of marine mammals. Experimental studies exploring the hearing ranges of sea turtles are limited and potential hearing ranges cannot be inferred based on frequencies of vocalizations because sea turtles do not vocalize. The information that does exist is based on studies that explore the physiological and behavioral reactions of sea turtles exposed to various sounds as well as direct hearing measurement. Ridgeway *et al.* (1969) reported that Pacific green sea turtles displayed hearing sensitivity in air from 30 to 500 Hz with an effective hearing range of 60 to 1,000 Hz. Lenhardt (1994) expanded on this in-air sensitivity by suggesting that in-water sensitivity for sea turtles was 10 dB less than air. Using auditory-evoked potentials, Bartol, Musick, and Lenhardt (1999) found that juvenile loggerheads exhibit an effective hearing range of 250 to 750 Hz, with peak sensitivity at 250 Hz. This is similar to what Lenhardt (1994) found by invoking a startle response from loggerhead sea turtles using a low-frequency source. He determined that sea turtles have an effective hearing range of 200 to 800 Hz with an upper limit of 2,000 Hz. Most recently, Ketten and Bartol (2006) reported hearing ranges similar to these previous studies but noted some minor differences when comparing juveniles and adults and across species. They found that the smallest of their turtles tested, which were loggerhead hatchlings, had the greatest range (100 to 900 Hz), and the largest turtles tested—sub-adult green sea turtles—had the narrowest range (100 to 500 Hz). This limited research indicates that sea turtles are capable of hearing low-frequency sounds with some variation depending on size, age, and species of turtle.

Because the hearing frequencies of sea turtles fall within the frequencies produced by construction and survey activities, these animals may be affected by exposure. Ridgeway *et al.* (1969) reported that 110 to 126 dB re 1 µPa were required for animals to hear sounds. Further, McCauley *et al.* (2000) reported that source levels of 166 dB re 1 µPa were required to evoke behavioral reactions from captive sea turtles. Based on this and the best available information, the NMFS assumes that sea turtles may experience behavioral disturbance when exposed to underwater noise greater than 166 dB re 1 µPa RMS. However, because the NMFS has not established acoustic injury thresholds for sea turtles as it has for marine mammals, this discussion also uses the 180 dB re 1 µPa RMS threshold for marine mammals to discuss potential injury to sea turtles for activities associated with Alternative A.

HRG Survey Acoustic Effects

As discussed in Section 3.1.2.1, HRG surveys would be used to characterize the potential site of the meteorological tower and possible placement of wind turbines in the future. As previously noted in Section 4.1.2.4.2, HRG surveys and sub-bottom profiling tools for wind turbine siting require only shallow penetration of the seafloor, resulting in relatively low energy (sound) introduced into the environment.

The HRG surveys would use only electromechanical sources such as side-scan sonar, boomer and CHIRP sub-bottom profilers, and multibeam depth sounders. Based on their operating frequencies as summarized in Table 4-6, the side-scan sonar, CHIRP sub-bottom profiler, and multi-beam depth sounder are unlikely to be detectable by sea turtles, whose best hearing is mainly below 1,000 Hz. The boomer has an operating frequency range of 200 to 16 kHz, and so may be audible to sea turtles. However, it has a very short pulse length (120, 150, or 180 microseconds) and a very low source level, with a 180 dB radius ranging from 125 to 148 feet (38 to 45 meters) and the 160 dB radius ranging from 3,458 to 7,014 feet (1,054 to 2,138 meters) (Table 4-7) Therefore, sea turtles could hear the boomer within approximately 7,000 feet (approximately 2,100 meters).

If surveys occur between June and November, listed sea turtles would likely be in the WEA and surrounding waters and could be exposed to acoustic impacts. A survey vessel would not typically travel faster than 4.5 knots while surveying, and it is expected that sea turtles would swim away from the vessel if it came within a range where they would perceive the sound disturbance. As previously noted in Section 4.1.2.4.2, potentially disturbing levels of noise (i.e., greater than 160 dB) would be experienced only within approximately 7,000 feet (2,100 meters) of the survey equipment. It is not expected that sea turtles would swim towards the noise source, given evidence that they exhibit behavioral responses (e.g., increased swimming rates), indicating an attempt at avoidance when exposed to 166 dB re 1 µPa (McCauley *et al.* 2000). It is unlikely that sea turtles would be exposed to injurious levels of noise because they are likely to avoid areas with disturbing sound levels (O'Hara and Wilcox 1990) and, like marine mammals, sea turtles whose behavior is affected by disturbing sounds would be expected to resume normal behavior after cessation of those activities.

If sea turtles were present and feeding or resting in an area where HRG survey vessels were passing through, it is expected that they could find alternative forage and resting locations within the WEA and surrounding waters. Additionally, if sea turtles were migrating through the area, they likely would avoid disturbing noises within the WEA, therefore decreasing the potential for impacts from the survey activities. Sea turtles are not expected to be excluded from large areas because HRG surveys would be temporary and there would be only a minor impact on foraging, migrating, or resting individual sea turtles that would not result in injury or overall behavioral impairment.

Previous ESA consultations for geological and geophysical activity near the action area concluded that, if the geological and geophysical survey activities occurred between June and November, listed sea turtles could be exposed to acoustic impacts from the survey. BOEM is requiring through the SOCs (*see* Appendix B) that the applicant maintain an approximately 656-feet (200-meter) exclusion zone during the surveys where one or more acoustic sound sources is operating at frequencies below 200 kHz and that this exclusion zone be monitored for at least 60 minutes prior to ramp up of the survey equipment. The normal duration of sea turtle dives ranges from 5 to 40 minutes depending on species, with a maximum duration of 45 to 66 minutes depending on species (Spotila 2004). As sea turtles typically surface at least once every 60 minutes, it is reasonable to expect that monitoring the exclusion zone for at least 60 minutes would allow the protected species observer to detect any sea turtles that may be submerged in the exclusion zone. The 200-meter exclusion zone is extremely conservative for sea turtles given that they would only perceive the low frequencies of the 115 boomer, whose 180-dB level is not expected to exceed 45 meters from the sound source. Various factors, including the simplification for exclusion zone monitoring, were considered in applying the 200-meter zone. Prior to beginning either HRG or geotechnical surveys, the exclusion zone must be clear of all sea turtles. This would ensure that these species are far enough from the sound source prior to the activity that harassment would not occur. After the initial startup of the sound source, shutdown of either electromechanical or geotechnical survey equipment would be required only for non-delphinoid cetaceans and sea turtles. This is primarily a precautionary measure targeted at endangered species.

Because the immediate area of ensonification and the duration of individual HRG surveys that may be conducted during site assessment would be limited, few sea turtles may be expected in most cases to be present within the survey areas. Major shifts in habitat use, interruption of foraging, or major displacement of migration pathways are not expected. Therefore, population-level impacts on sea turtles from HRG surveys are not expected.

Geotechnical Sampling Acoustic Effects

If animals within the area are disturbed by the noise created by drilling or noise generated during drilling set-up, they would be able to avoid the area and therefore avoid potential disturbance. Sea turtles could be exposed to sound levels between 120 and 145 dB re 1 µPa. It is expected that other geotechnical sampling activities, such as CPT or vibracoring would have only minor acoustic effects, which would be primarily from vessel engine noise (*see* Section 3.1.2.2, “Geotechnical Sampling,” for details of the proposed action scenario for Alternative A and acoustic effects of sub-bottom profiling).

All four species of sea turtles known to be present within the North Atlantic (loggerhead, green, Kemp’s ridley, and leatherback) are likely to occur between June and November. If construction/installation occurs during this time period, sea turtles in the WEA and surrounding waters may be exposed to construction-related noise. As pulsing noise has been reported to initiate behavioral responses from sea turtles, it is likely that pile-driving could disturb normal behaviors such as feeding or cause avoidance of the WEA and surrounding waters. (As noted above, the biological importance of behavioral responses in marine animals to construction is not fully understood at this time, nor is much information available indicating short-term or long-term impacts on sea turtle populations as a result of behavioral changes.) During construction/installation, impacts on individual animals likely could occur. However, population-level impacts are not expected because the area and time of the activities are limited. For these same reasons, individual impacts from construction/installation activities associated with Alterative A would be minor.

Meteorological Tower Pile-Driving Effects

As with any sound in the marine environment, the type and intensity of the sound depends on multiple factors and can vary greatly. These factors include the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact hammer. Actual sounds produced would vary by project and location (*see* "Acoustic Effects of Pile-Driving Noise" above for a full description of the range of pile-driving sounds).

As noted above, sea turtles are likely to actively avoid disturbing levels of sound (O'Hara and Wilcox 1990; McCauley *et al.* 2000). While avoidance may help reduce exposure to disturbing sounds, it may also result in the alteration of normal behaviors such as migration and foraging. However, these alterations are expected to be localized and temporary. In addition, sea turtles would be exposed to disturbing sounds from pile-driving activities only if those activities occur between June and November when sea turtles are more likely to be present in the Rhode Island and Massachusetts WEA and its surrounding waters.

Sea turtles would be expected to resume normal behaviors following the cessation of pile-driving activities. Pile-driving activities would occur for approximately four to eight hours a day over a three-day period (pile-driving for each meteorological tower installation is anticipated to be completed within a three-day period), so sea turtles would likely avoid areas with disturbing levels of sound for at least this period each day.

If sea turtles were present and feeding or resting in an area where pile-driving occurred, it is expected that they could find alternative forage and resting locations within the WEA and surrounding waters. Additionally, if sea turtles migrated through the area, they would likely avoid disturbing noises within the WEA, thereby decreasing the potential for impacts from the survey activities. Exclusion from large areas during pile-driving activities associated with Alternative A are not expected, therefore only a minor impact on foraging, migrating, or resting individual sea turtles that would result and no overall behavioral impairment. Major shifts in habitat use, interruption of foraging, or major displacement of migration pathways are not expected.

As noted above in "Effects of Pile-Driving Noise," sound levels during pile-driving are expected to dissipate below 160 dB within approximately 4 miles (about 7 kilometers) from the source. Sea turtles present within approximately 4 miles (about 7 kilometers) of the source therefore could be subject to harassing levels of sound. It is expected that alterations in individual behavior would be short-term and would not result in population-level effects. In addition, SOCs (*see* Appendix B) which incorporate the reasonable and prudent measures to protect endangered species required by the NMFS through the ESA consultation (*see* Section 5.2.1, "Endangered Species Act") would reduce potential injurious impacts on sea turtles from pile-driving activities. The SOCs are similar to those listed in Section 4.1.2.4.2 for marine mammals.

BOEM has considered using vibratory hammers as a way to reduce exposure to disturbing levels of noise and does not discourage the use of vibratory hammers because their use would reduce the duration of exposure to the higher SPLs associated with impact hammers. However, it should be noted that using vibratory hammers could result in an increase in the total installation time and thus the total duration of noise exposure. Other noise-reduction measures for pile-driving, primarily cofferdams and foam sleeves (*see* Nehls 2007 and USDOI, BOEMRE, 2010 *as cited in* USDOI, BOEM, OREP 2012b), have also been shown to be effective. However, the feasibility of requiring these technologies to be used in the offshore environment needs further exploration and may be appropriate on a case-by case basis for full commercial-scale construction projects, where the total duration of pile-driving activities would be greater than that for a single meteorological tower.

Benthic Habitat Effects

Benthic organisms can serve as forage for some sea turtle species, and it is expected that some of these organisms may become unavailable during certain activities associated with Alternative A. However, because impacts on the benthos itself are expected to be minor (*see* Section 4.1.2.2.2 above) impacts on sea turtle habitat are expected to be negligible.

Geotechnical Sampling Effects

As noted in Section 4.1.2.2, "Coastal and Benthic Habitats," geotechnical sampling would result in a negligible temporary loss of some benthic organisms (i.e., an area less than 1 foot [0.3 meter] in diameter would be disturbed in core sampling locations) and a localized increase in disturbance due to vessel activity, including noise and anchor cable placement and retrieval. The activity could impact sea turtles by removing a small amount of forage items for these species. However, due to the small footprint, the temporary nature of the action, and availability of similar benthic habitat regionally, it is expected that this activity would have a negligible impact on sea turtles in the WEA.

Meteorological Tower/Buoy Installation Effects

Construction/installation of a meteorological tower would result in direct effects on benthic invertebrates by burying or crushing them. Also, it is anticipated that sediment would become suspended around deployed anchoring systems for buoys and around tower monopoles during installation. However, this sediment would quickly disperse and settle onto the surrounding seafloor. Depending on the local currents, this sedimentation could smother some benthic organisms, but the Southern New England-New York Bight is considered a high-energy environment where sediment transport occurs regularly. Therefore, it is expected that this activity would have only a minor impact on sea turtle food availability and foraging success.

Meteorological Tower/Buoy Operation Effects

A meteorological tower and/or anchor system for a buoy could create new "hard bottom" substrate in an otherwise soft sediment system. However, the operation of a single meteorological tower or buoy within a lease area is not expected to result in significant changes to the local community assemblage or in the availability of habitat and forage items for sea turtles in the WEA.

Collision Effects

Collisions with vessels and/or structures associated with Alternative A could result in injury to the animal and/or damage to the vessel or structure. BOEM anticipates that sea turtles would avoid fixed structures, such as meteorological towers, reducing the risk of collisions with these structures.

Vessels associated with site characterization and assessment activities could collide with sea turtles that are in the area during transit. Two main driving factors in sea turtle and vessel collisions are the abundance of the species and the speed of the vessel (Merrick and Cole 2007). The amount of vessel traffic and navigational visibility are also factors.

Sea turtles have been killed or injured in collisions with vessels. Hatchlings and juveniles are more susceptible to collisions than adults because their swimming ability is limited. The small size and darker coloration of hatchlings also makes them difficult to spot from vessels. However, hatchlings are not likely to be present in the WEA and surrounding waters because the WEA does not provide nesting habitat, precluding any impacts on that life stage.

While adults and juveniles are larger and may be easier to spot when at the surface than hatchlings, they often spend time below the surface of the water, which makes them difficult to spot from a moving vessel. Adults and juveniles are more likely to be present within the WEA; however, if HRG surveys occur between June and October, the slow speed of the survey vessels (typically about 4.5 knots) would reduce the potential for interaction with vessels and the associated towed survey gear. At these speeds, sea turtles are expected to be able to avoid the vessels and gear if they come in contact. Hazel *et al.* (2007) reported that the ability of green sea turtles to avoid an approaching vessel decreases significantly as the vessel speed increases. The small numbers of vessels used during the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys are expected to travel at slow speeds for only a short time. Therefore, while potential impacts on individual adult or juvenile sea turtles could occur, population-level impacts on sea turtle species from vessel collisions are not expected. In addition, BOEM's SOCs (*see* Appendix B) require a 50-meter separation distance between the vessel and observed sea turtles. BOEM will require as a stipulation of its lease that the lessee abide by the following vessel strike avoidance measures which are based on the Joint BOEM-BSEE Notice to Lessees and Operators (NTL) of Federal Oil, Gas, and Sulphur Leases in the OCS, Gulf of Mexico of Mexico OCS Region on "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting" (NTL 2012-JOINT-G01) (see http://www.bsee.gov/Regulations-and-Guidance/Notices-to-lessees-and-Operators.aspx), which in turn is based upon the NMFS's Vessel Strike Avoidance Measures and Reporting for Mariners. These measures have become standard means to protect marine mammals and sea turtles by maintaining a vigilant watch for these species and reducing speed and/or course to reduce or eliminate the potential for injury.

Discharge of Waste Materials and Accidental Fuel Leaks

Although unlikely, pollutants such as diesel fuel could be spilled during a collision between vessels or allisions between vessels and meteorological towers and buoys. If a diesel fuel spill occurred, it would be expected to be small and dissipate quickly, then evaporate and biodegrade within a few days (*see* Section 3.2.3, "Fuel Spills"). Sanitary and domestic wastes would be processed through onboard waste treatment facilities before being discharged overboard. Thus, waste discharges from construction vessels would not be expected to directly affect sea turtles.

Juvenile and adult sea turtles could be adversely impacted by the presence of pollutants or accidentally released solid debris in the water column. Both pollutants and solid debris could be ingested by the animals. The ingestion of marine debris is widely reported among species of sea turtle worldwide (Tourinho, Ivar do Sul, and Fillmann 2010; Lazar and Gračan 2011). Ingestion of marine debris can lead to starvation, malnutrition, and absorption of chemicals (USEPA 2012a; McCauly and Bjorndal 1999). Loggerheads are known to ingest all types of marine debris with little discrimination on the size of the debris (Thomas *et al.* 2002). Leatherbacks, whose primary prey item is jellyfish, commonly ingest floating surface and subsurface translucent plastic material and sheeting, which is believed to be mistaken for these prey items. Also of concern is the risk of entanglement in debris, which can result in reduced mobility, suffocation, starvation, and increased vulnerability to predators (USEPA 2012a). However, the discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by the BSEE (30 CFR 250.300) and the USCG (33 CFR 151), so the risk of ingestion of or entanglement in solid debris during implementation of Alternative A would not be expected under normal circumstances.

Meteorological Tower and Buoy Decommissioning

Upon completion of site assessment activities, the meteorological tower or buoy would be removed and transported by barge to shore (*see* Section 3.1.3.1 for a description of decommissioning). During this activity, sea turtles may be affected by sound and/or operational discharges similar to the sounds and discharges expected during meteorological tower construction/installation. Piles would be removed by cutting them (using mechanical cutting or high-pressure water jets) at a depth of 15 feet (4.6 meters) below the sea bed. Sea turtles could be affected by noise produced during pile-cutting; however, sound levels of these activities have not yet been tested for Atlantic wind energy projects. Despite this lack of information, pile-cutting activities are expected to produce less noise than pile-driving. Additionally, only the sea turtles in the immediate vicinity of pile-cutting (i.e., those that had not left the area upon the arrival of decommissioning vessels) would be expected to be affected during tower removal, transport, and pile-cutting. Disturbance of sea turtles during decommissioning is expected to be lower than during construction/installation, and impacts from vessel disturbance associated with decommissioning are expected to be minor.

4.1.2.5 3 Conclusions

Effects on sea turtles within the WEA and surrounding waters are expected to be short- term and would result in minor to adverse harassment, depending on the specific activity. The NMFS concurred with this determination regarding threatened and endangered sea turtles in their April 10, 2013, Biological Opinion (*see* Section 5.2.1, "Endangered Species Act"). Impacts related to noise, minor loss/displacement from forage areas, and the potential for vessel collisions are all considered minor because the site characterization area, site assessment activities, and individual components of the activities would be limited. Population-level impacts are not expected to occur for these same reasons.

4.1.2.6 Coastal Wetland Habitats and Ecosystems

4.1.2.6.1 Description of the Affected Environment

The coastal wetland ecosystem in the Rhode Island and southern Massachusetts WEA is a hydrodynamically connected area in Rhode Island and southern Massachusetts. This coastal area is located along the Rhode Island Sound and southwestern portion of Buzzards Bay and includes Block Island in Rhode Island and the Elizabeth Islands, Martha's Vineyard, and Nantucket Island in Massachusetts.

The Rhode Island and Massachusetts WEA is located offshore of the Atlantic coastal plain. This plain is a flat stretch of land that borders the Atlantic Ocean for approximately 2,200 miles (about 3,541 kilometers) from Cape Cod to the southeast United States. Many different coastal habitat types are found in and around the shorelines of Rhode Island and southern Massachusetts (*see* Figure 4-4), including open waters forming tidal creeks and numerous coves and natural harbors, subtidal bottom habitats, islands, sand spits, beaches and dunes, a complex intertidal zone of mud and sand flats, emergent wetlands and SAV with macroalgal and eelgrass beds, and shorelines that have been modified by both people and natural processes) (USDOI, MMS 2007).

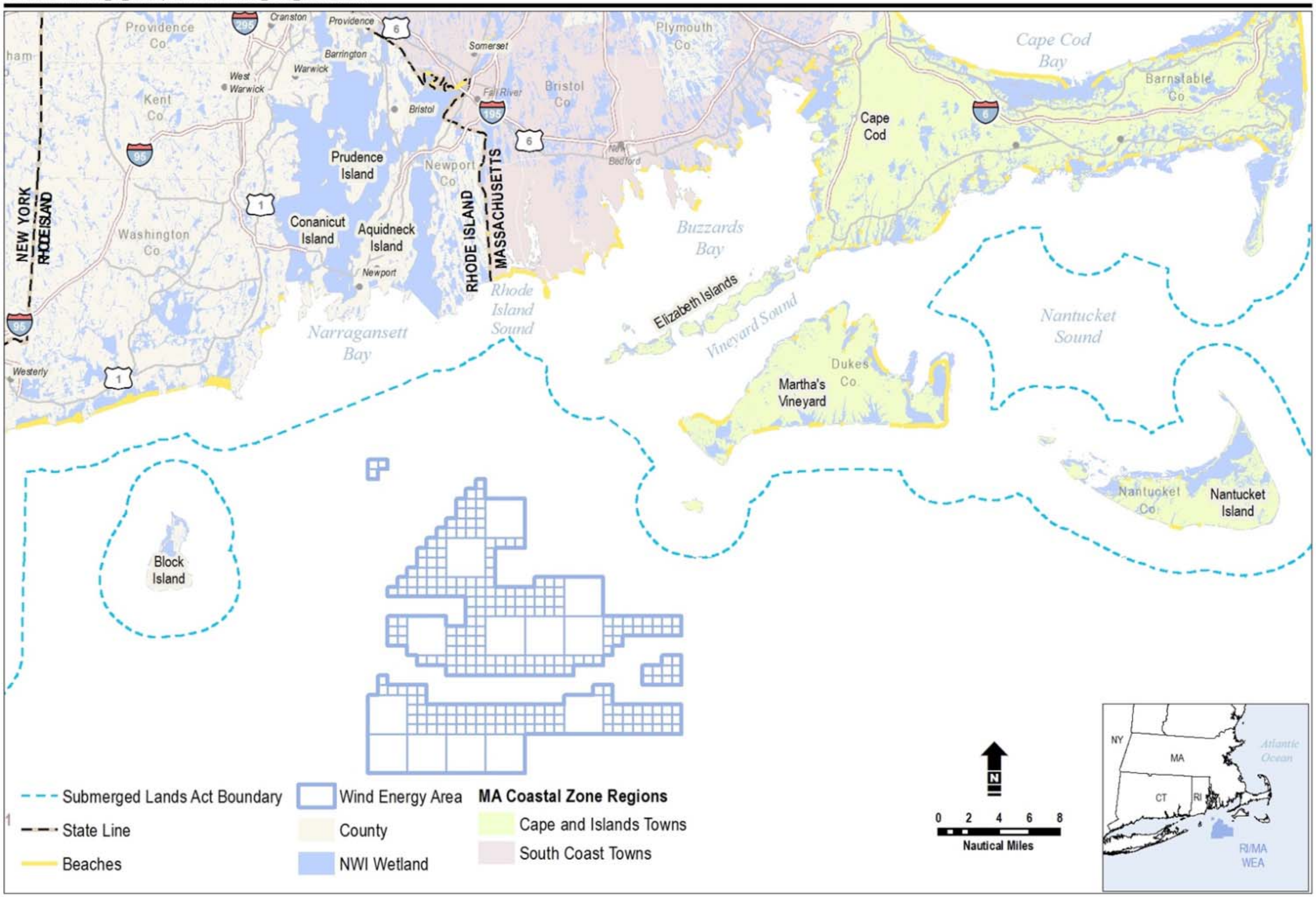
Much of the Atlantic shoreline in these states has been altered and most of the coastal habitats have been impacted by human activities and reduced in area than was historically present. Much of the impact and reduction in extent has been from development, agriculture, vessel and ground traffic, industry, beach replenishment, or shore-protection structures such as jetties (USDOI, MMS 2007). A general description of coastal habitats along the Atlantic Coastal Plain can be found in Chapter 4.2.13 of the Programmatic EIS (USDOI, MMS, 2007a) and is summarized in this section. The following section describes the affected coastal environments in the Rhode Island and southern Massachusetts WEA, including Narragansett Bay and Buzzards Bay, respectively.

The open water, or pelagic, habitat is the most extensive coastal habitat; it is a phytoplankton-based ecosystem with direct physical and hydrologic linkage to the adjacent salt marshes, unvegetated flats, and subtidal aquatic vegetated beds and bottom habitats. The pelagic habitat is a dynamic bi-directional environment with tidally and wind-driven circulation from the Atlantic Ocean and inputs of fresh water from various bays and numerous rivers of this area. The open water habitats and the marine mammals and sea turtles they support are addressed in Sections 4.1.2.4 and 4.1.2.5. The pelagic habitat also supports a number of nekton and commercial and recreational fisheries and shellfisheries, which are addressed in Section 4.1.2.3. A wide variety of plankton and benthic communities are found in and under the open water habitat as described in Section 4.1.2.2.

Within this coastal zone are approximately 160,829 acres (65,085 hectares) of emergent tidal wetlands and approximately 5,671 acres (2,295 hectares) of vegetated subtidal habitats, as classified according to Cowardin *et al.* (1979), the national digital data standard for wetland habitats and ecosystems. The various coastal wetland habitats are shown on Figure 4-4. Coastal vegetated subtidal habitats include continuously submerged marine habitats such as aquatic eelgrass beds (*Zostera marina or Ruppia* sp.), estuarine subtidal algal and aquatic beds (*Ulva lactuca*, *Fucus* spp. *Chondrus crispus*, *Enteromorpha* sp.), and unvegetated estuarine subtidal unconsolidated bottoms. Coastal wetlands are intertidal where the substrate is exposed and flooded by tides and include associated splash zones. Differing tidal regimes result in different coastal wetlands distinguished by frequency and duration of tidal flooding. Exposed flats that concentrate salts either support salt-tolerant *Salicornia* sp. or can be too salty to support vegetation and are called pannes. Mollusk reefs and oyster beds (*Crassostrea virginica*) are also part of these diverse coastal habitats.

The coastal wetlands are characterized by two general types, which are based on differences in tidal flooding: regularly flooded low marsh and irregularly flooded high marsh. The low marsh is flooded daily by the tides and is dominated by a single plant, smooth cordgrass (*Spartina alterniflora*). Irregularly flooded high marsh is characterized by other persistent emergent vegetation that includes *Spartina patens*, *Juncus gerdii*, and *Distchlis spicata* or broad-leaved scrub-shrub-dominated marsh supporting *Iva frutescens* and *Baccharis halmifolia.* Intertidal and irregularly flooded brackish marshes are present where rivers and streams discharge into the natural coves, harbors, and bays. These marshes are characterized by *Typha angustifolia*, *Sartina pectinata*, and *Phragmites australis*.

Path: L:\Buffalo\MA_RI_EA\Maps\MXD\EA\Coastal_Zone_Wetlands.mxd



Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; RI OceanSAMP 2009

Figure 4-4. Coastal Zone Region and NWI Wetlands.

The general coastal habitats, their National Wetlands Inventory (NWI) map code, description, and characteristic vegetation species are listed in Table 4-10.

Table 4-10
National Wetlands Inventory (NWI) Classification Codes

NWI Code	Cowardin *et al.* (1979) Description	Common Description	Vegetative Cover Type
E1UB	Estuarine, marine subtidal, unconsolidated bottom	Estuarine or Marine open water	Open water
E1AB3L; M1AB3L	Estuarine or marine subtidal, rooted vascular aquatic bed	Eel grass beds	*Zostera marina*
E1AB1L	Estuarine, subtidal algal, aquatic bed	Algal beds	*Ulva lactuca, Fucus spp.*
E1AB4L	Estuarine, subtidal unconsolidated bottom, organic	Polls	*Ruppia sp.* Or other algae
E2US4	Estuarine, subtidal unconsolidated bottom, organic	Pannes	*Salicorni sp.*
E2US	Estuarine, intertidal unconsolidated bottom	Tidal flats	Cobble, gravel, sand or mud: patches or algae
E2RS	Estuarine or marine, intertidal rocky shores	Rocky shores	Bedrock or rubble; patches of *Fucus spp.*
E2RFN	Estuarine, intertidal, mollusk reef	Oyster beds	*Crassostrea virginica*
E2SB	Estuarine, intertidal stream bed	Tidal Creek	Sand or mud
E2EM	Estuarine, intertidal, persistent emergent, irregularly flooded	High marsh	*Spartina patens, Juncus gerdii, Distchlis spicata*
E2SS1P	Estuarine, intertidal scrub-shrub, broad-leaved deciduous, irregularly flooded	High marsh	*Iva frutescens, Bacchais halmifolia*
E2EMIN	Estuarine, intertidal, persistent emergent regularly flooded	Low marsh	*Spartina alterniflora*
E2EM	Estuarine, intertidal, persistent emergent irregularly flooded, oligobaline	Brackish marsh	*Typha angustifolia, Sartina pectinata*

Source: USACE 2008.

Rhode Island

The Rhode Island coastal zone is defined as shoreline that fronts onto the Atlantic Ocean and includes Block Island and the shorelines and islands around and within Narragansett Bay. Excluding the Narragansett Bay estuary, approximately 13,052 acres (5,282 hectares) of marine and estuarine wetland and other coastal marine and estuarine habitats were mapped for coastal Rhode Island fronting the Rhode Island Sound/Atlantic Ocean. Estuarine environments account for about 85 percent (11,045 acres or about 4,470 hectares) of the total acreage (USACE 2008). The ocean habitat is not included except for nearshore areas with SAV beds. According to the USACE, irregularly flooded emergent wetlands dominate the tidal marshes of Rhode Island, representing approximately 99 percent (1,325 acres or about 536 hectares) of these vegetated wetlands. *Phragmites australis* (common reed) occurs in 555 acres (almost 225 hectares) and is the dominant species in at least 289 acres (about 117 hectares). Scrub-shrub wetlands account for only approximately 12 percent of the vegetated wetlands (159.3 acres or about 64.5 hectares).

Narragansett Bay

Narragansett Bay is an estuary on the north side of Rhode Island Sound covering 147 square miles (380 square kilometers). The bay forms New England's largest estuary, defined as the limits of brackish tidal water and hydrogeomorphology (Huber 2003). The bay functions as an expansive natural harbor and includes a group of more than 30 islands, which form an archipelago, 6 major rivers, and more than 113 coves, inlets, and natural harbors. The three largest islands are Aquidneck, Conanicut, and Prudence. Bodies of water that are part of Narragansett Bay include the Sakonnet River, Mount Hope Bay, and the southern, tidal part of the Taunton River. Narragansett Bay opens into Rhode Island Sound and the Atlantic Ocean. According to Tiner *et al.* 2004, there are 130,027 acres (almost 53 hectares) of coastal wetlands and shallow vegetated habitats in the Narragansett Bay ecosystem. Additionally, Narragansett Bay has a few natural rocky reefs (e.g., off Hope Island), but the West Passage of Narragansett Bay near Dutch Island has six small artificial rocky reefs (Tiner *et al.* 2004). The diversity of coastal habitats of Narragansett Bay, which includes approximately 290 acres (about 117 hectares) of eelgrass (*Zostera marina)* beds (R. Hudson, personal communication. March 12, 2012), is shown on Figures 4-5 and 4-6. In a 500-foot buffer around Narragansett Bay are an additional 1,669.6 acres (about 676 hectares) of freshwater wetlands that make up approximately 6.3 percent of this buffer area.

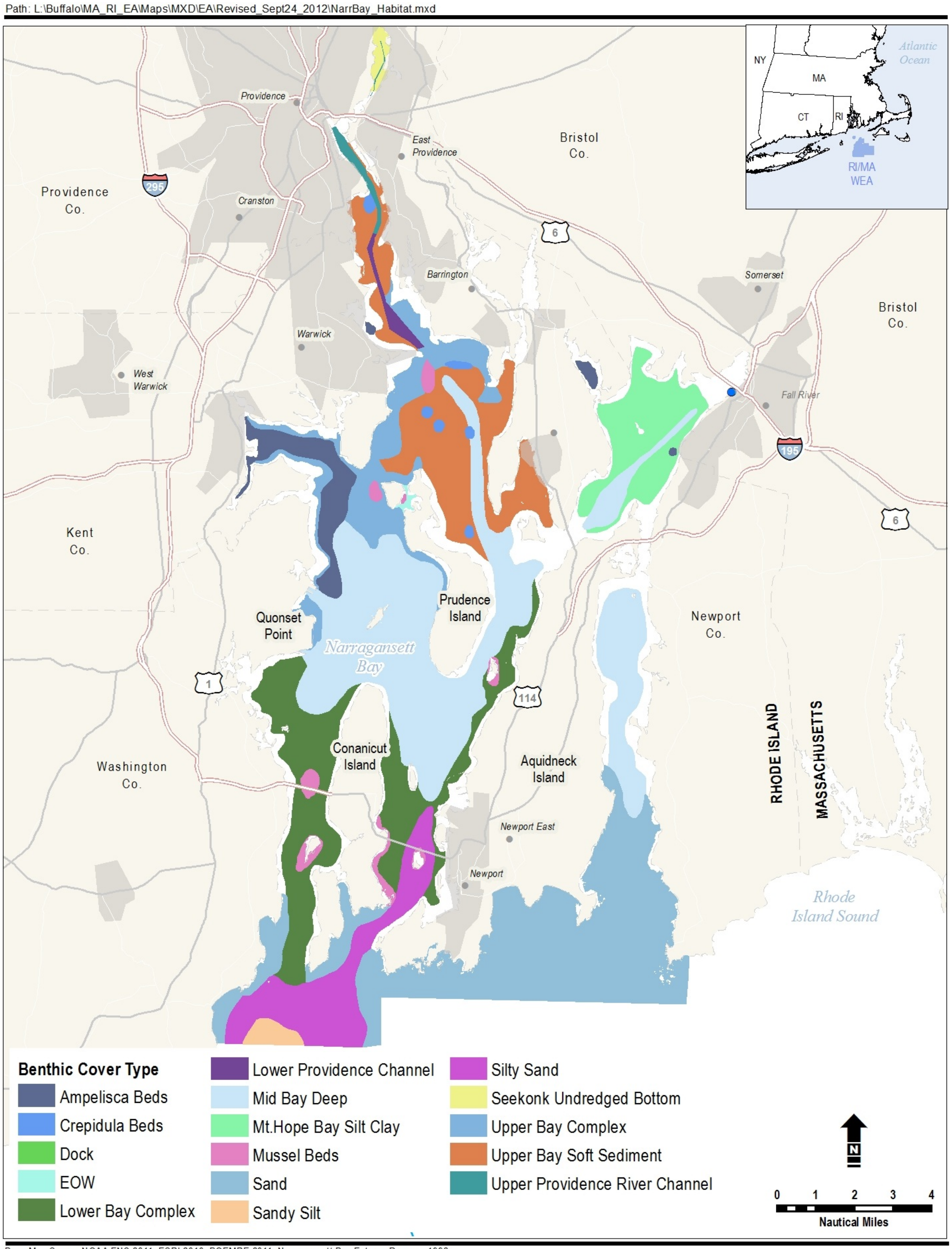


Figure 4-5. Principal Benthic Domains of Narragansett Bay, Habitat Type, and Faunal Assemblages.

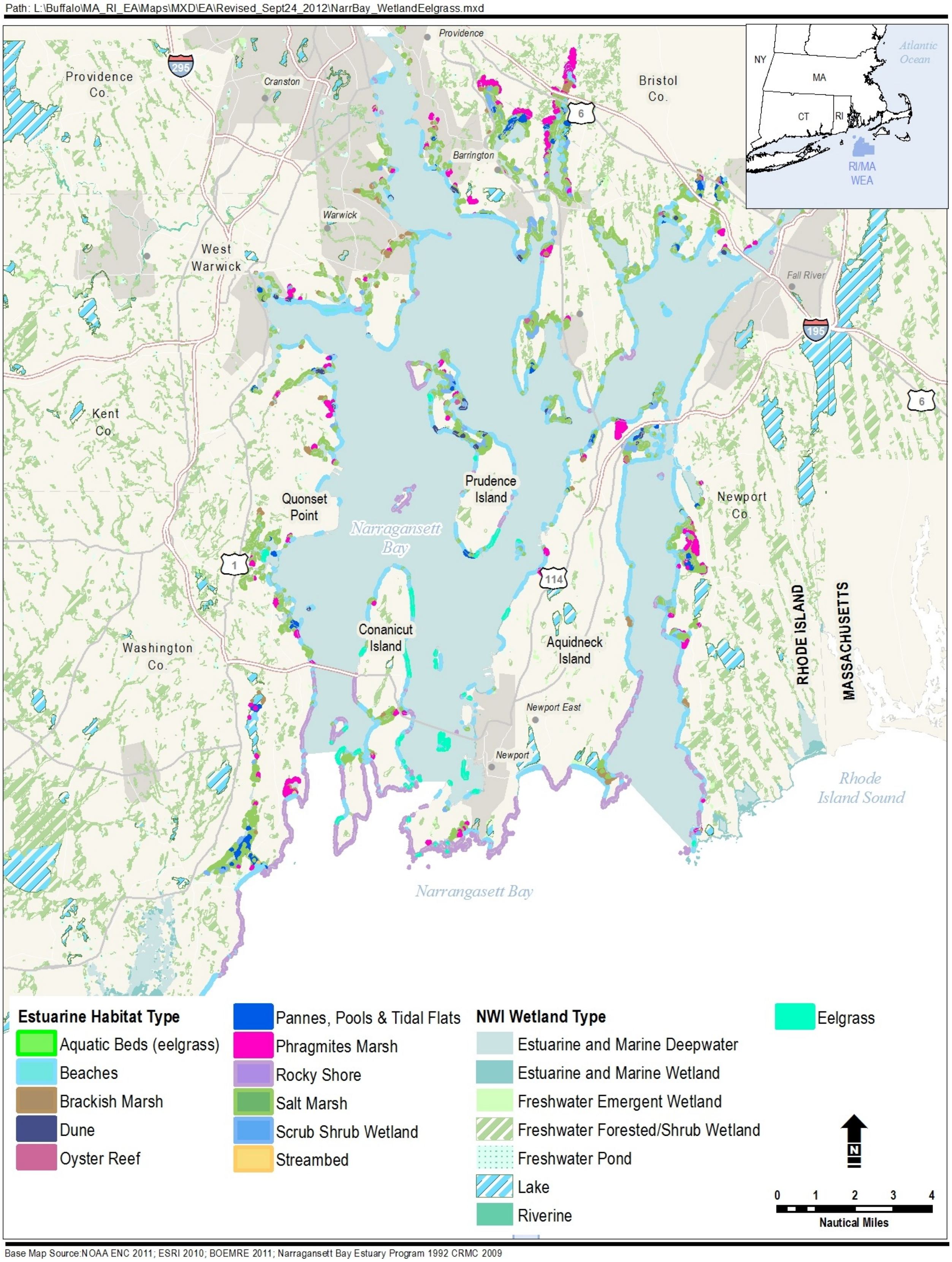


Figure 4-6. Narragansett Bay NWI Wetlands and Eelgrass Areas.

Massachusetts

Massachusetts' coastal zone management (CZM) areas are shown on Figure 4-7. The coastal and vegetated marine environments in Massachusetts are a relatively diverse mosaic of habitats. The types and functions of coastal habitats in Massachusetts are largely influenced by the position of Massachusetts at the intersection of the northern waters of the Gulf of Maine and southern waters of the Mid-Atlantic Bight (Lund and Wilbur 2007). As noted in Section 4.1.2.2, "Coastal and Benthic Habitats," Cape Cod marks the boundary between the Acadian and Virginian provinces. The provinces are distinguished by substantial differences in physical characteristics, weather patterns, and biological communities. This variation exerts a strong influence on habitat type, abundance, and function.

Sandy beaches dominate the coastline in the study area around the southwestern end of coastal Massachusetts, Buzzards Bay, Elizabeth Islands, Martha's Vineyard, and Nantucket, which are located in two of Massachusetts coastal zone regions: the South Coast region and Cape and Islands region.

Buzzards Bay

In 1987, Buzzards Bay was designated an estuary of national significance. Eelgrass beds are a critical coastal habitat within Buzzards Bay. Eelgrass is a subtidal marine angiosperm, or "seagrass," that grows in temperate waters, often forming extensive underwater meadows. In southern New England, eelgrass grows to a depth of 3 feet (1 meter) below the mean low water (MLW) mark or less in bays with poor water quality but may grow as deep as 12 meters below MLW in clear offshore waters (Costa 1988a *as cited in* Costa n.d.). Eelgrass beds are highly productive communities and are ecologically important because they act as a nursery, habitat, and feeding ground for many fish, waterfowl, and invertebrates. Eelgrass and other underwater seagrasses are often referred to as submerged aquatic vegetation (SAV). This distinguishes them from algae, which are not classified as "plants" by biologists (rather, they are often placed in the kingdom Protista), and from the "emergent" saltwater plants found in salt marshes. In Buzzards Bay, eelgrass beds are more extensive than salt marshes. In 1996, the Massachusetts Department of Environmental Protection conducted an eelgrass survey in Buzzards Bay and in 2005 made available its maps from a 2001 survey. The 2001 survey consisted of aerial photography and field verification within Buzzards Bay (Costa n.d.). In 2003, the State of the Bay reported approximately 8,000 acres (3,237.5 hectares) (Haupert and Rasmussen 2003). The 2007 State of the Bay, which contained information from the 2001 survey, reported that 2,000 acres of eelgrass has been lost (The Coalition for Buzzards Bay 2007).

The amount of eelgrass in Buzzards Bay as of 2011 was approximately 5,578 acres (2,257 hectares)[14] and approximately 16,415 acres (6,643 hectares) of emergent salt marsh in the Cape Cod vicinity, which includes the eastern portion of Buzzard's Bay (Tiner 2010).

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[14] *See* http://www.buzzardsbay.org/eelgrass-historical.htm

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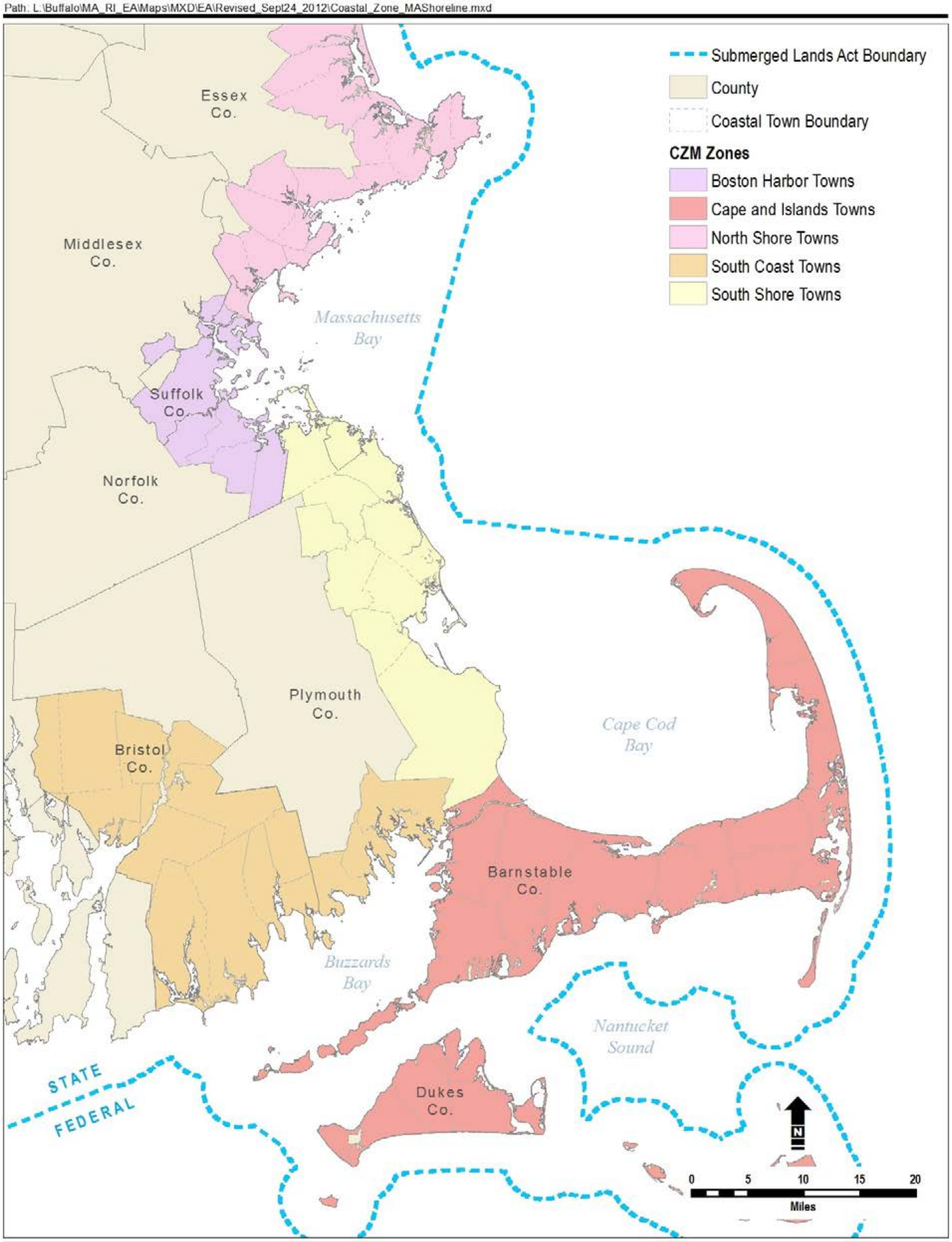

Base Map Source:ESRI 2010; MASSGIS 2012

Figure 4-7. Massachusetts Coastal Zone showing Buzzards Bay and Elizabeth Islands, Martha's Vineyard Island, and Nantucket Island.

Elizabeth Islands

More than 1,300 acres (about 526 hectares) of wetlands were inventoried on these islands in 2010 (Tiner 2010). Wetlands cover up to 15 percent of the Elizabeth Islands. Nearly half of the wetlands were marine wetlands (641.8 acres [260 hectares]), mostly unconsolidated shores (beaches and tidal flats) and rocky shores. Nearly 40 percent of the wetlands (500.8 acres [201 hectares]) were freshwater types, with deciduous scrub-shrub and forested wetlands predominating. Ponds (palustrine unconsolidated bottoms) represented almost 9 percent of the wetlands. Approximately 14 percent (179.6 acres [73 hectares]) of the wetlands was estuarine, with tidal marshes (emergent wetlands) having slightly more than twice the acreage of tidal flats (unconsolidated shores).

Martha's Vineyard

Nearly 4,000 acres (1,619 hectares) of wetlands were mapped on Martha's Vineyard (Tiner 2010). Wetlands occupy up to 7 percent of the Vineyard. Half of the wetlands were estuarine (1,417.5 acres [574 hectares]) with vegetated types representing nearly two-thirds of them. Estuarine emergent wetlands alone accounted for 22 percent of the Vineyard's wetlands. Marine wetlands, mainly unconsolidated shores (beaches and tidal flats), comprised nearly one-quarter of the area's wetlands (903.0 acres [930 hectares]). More than 1,500 acres (607 hectares) of freshwater wetlands (palustrine) were inventoried. Scrub-shrub wetlands were the most common freshwater type (49 percent of the palustrine wetlands). Less than 400 acres (162 hectares) of forested wetlands and 302 acres (122 hectares) (of ponds (unconsolidated bottoms and shores) were detected. These types represented 9 percent and 8 percent of the Vineyard's wetlands, respectively.

Nantucket Island

Nearly 4,450 acres (1,800 hectares) of wetlands were inventoried on Nantucket (Tiner 2010). They comprised up to 15 percent of Nantucket. Freshwater wetlands (palustrine) were most abundant (2,374 acres [961 hectares]) representing slightly more than half of the wetlands (52 percent).

Deciduous scrub-shrub wetlands were the most common freshwater type, accounting for nearly two-thirds (64 percent) of the acreage. Forested wetlands represented only 10 percent of the palustrine wetlands, while ponds (palustrine unconsolidated bottoms and shores) and emergent wetlands each made up 7 percent. Marine wetlands totaled 1,141 acres (462 hectares)—25 percent of the island's wetlands. Unconsolidated shores (beaches and tidal flats) predominated. Estuarine wetlands were nearly as abundant, with 1,031.2 acres (417 hectares) of marine wetlands representing 23 percent of the wetlands. Emergent wetlands (salt and brackish marshes) comprised 70 percent of these tidal wetlands.

4.1.2.6.2 Impact Analysis of Alternative A

Coastal Habitats: Since no expansion of existing onshore facilities is expected to occur as a result of Alternative A, impacts from routine activities are expected to be limited to a negligible increase, if any, to wake-induced erosion around the smaller, non-armored, waterways that may be used by project-related vessels. Impacts on coastal habitats could occur from an accidental diesel fuel spill and if this does occur, it is expected to be localized and temporary, and therefore negligible.

Since existing onshore facilities are expected to be expanded in order to implement Alternative A, impacts of routine activities would be expected to be limited to a negligible increase, if any, to wake-induced erosion around the smaller, non-armored, waterways that might be used by project vessels. Impacts on coastal habitats could occur from an accidental diesel fuel spill and, if this occurs, would likely be localized and temporary and, therefore, negligible.

The proposed lease area(s) within the WEA would be located at least 10.4 NM from the nearest shoreline. Therefore, site characterization surveys and the construction/installation, operation and maintenance, and decommissioning activities of meteorological towers and buoys occurring within the proposed lease area would have no direct impact on nearshore coastal habitats. However, vessel traffic associated with Alternative A and the use of existing coastal infrastructure, (i.e., port facilities) have the potential to contribute to impact coastal habitats, as discussed below.

Impacts of Routine Activities and Events

Several existing fabrication sites, staging areas, and ports in southern Rhode Island and southern Massachusetts would support site characterization surveys, and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys as discussed in Section 4.1.3.7, "Land Use and Coastal Infrastructure." No expansion of these existing fabrication sites, staging areas, and ports is anticipated to support Alternative A. Existing channels could accommodate the vessels anticipated to be used, and no additional dredging would be required to accommodate different vessel size(s) as a result of Alternative A. In addition, no cables would be installed to shore to support the meteorological towers or buoys.

Routine activities, i.e., transport boat/barge and survey crew vessel trips, may create impacts such as wake erosion and associated sedimentation. For up to four leaseholds under Alternative A, between 1,500 and 4,000 vessel round trips are anticipated for site characterization and assessment activities over the five-year lease period. These trips would be divided among major and smaller existing ports in coastal Rhode Island and Massachusetts. The majority of traffic associated with site characterization and site assessment of the WEA (*see* Sections 3.1.2.6 and 3.1.3.4, respectively) most likely would be supported by the major and smaller ports around Narragansett Bay in southeast Rhode Island. If all ports were used equally, this would range from 84 to 222 round trips to each of these Rhode Island ports around the bay over the five-year period.

Wake erosion and suspended sediment effects would be limited to approach channels and the nearshore coastal areas near the ports and bays being used. Given the amount and type of existing vessel traffic (including tanker ships, container ships, and other very large vessels) into and out of these ports (*see* Sections 4.1.3.7, "Land Use and Coastal Infrastructure," and 4.1.3.8, "Navigation and Vessel Traffic"), the relatively small size and number of vessels associated with Alternative A would be expected to cause a negligible increase, if any, to wake-induced erosion of associated channels.

Impacts of Non-Routine Events

A spill could occur within a channel or bay from WEA-related vessels on their way to or from the ports, in the WEA during survey activities, or during construction/installation, operation and maintenance, or / decommissioning of meteorological towers and buoys. If a spill occurred within a channel or bay and contacted the shoreline, the impacts on coastal habitats would depend on the type of material spilled, the size and location of the spill, the meteorological conditions at the time, and the speed with which cleanup plans and equipment could be used. These impacts are anticipated to be minor because the average spill size would likely be small (approximately 88 gallons [333 liters]) (*see* Section 3.2.3, "Fuel Spills," and U.S. Department of Homeland Security, USCG 2011 *as cited in* USDOI, BOEM, OREP 2012b) and vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. The distance from shore of the activities and the rapid evaporation and dissipation of diesel fuel a spill occurring within the WEA would most likely preclude contact with the shore. Collisions between vessels and collisions between vessels and meteorological towers and buoys are also considered unlikely. However, in the unlikely event that a vessel allision or collision occurred, and in the unlikely event that such a collision or allision caused a spill, the most likely pollutant to be discharged would be diesel fuel. If a diesel spill occurred, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days, resulting in negligible impacts in the area of the spill.

4.1.2.6.3 Conclusions

No direct impacts on coastal habitats would occur from routine activities in the WEA due to the distance of the WEA from shore. Existing ports or industrial areas in southern Rhode Island and Massachusetts are expected to be used in implementing Alternative A. In addition, existing facilities are not expected to be expanded in order to implement Alternative A.

Indirect impacts such as wake-induced erosion and associated added sediment may occur from routine activities that increase vessel traffic. However, given the volume and nature of existing vessel traffic in these areas, a negligible increase of wake-induced erosion, if any, may occur around the smaller, non-armored waterways. If an accidental diesel fuel spill occurred, the potential impacts on coastal habitats are expected to be negligible, localized, and temporary.

4.1.3 Socioeconomic Resources

4.1.3.1 Aesthetics and Visual Impacts

4.1.3.1.1 Description of the Affected Environment

The aesthetic and potential visual impacts of the installation of four meteorological towers and eight meteorological buoys within the four leasehold areas on the OCS offshore of Rhode Island and Massachusetts were considered. BOEM is not currently reviewing any COP, nor has any COP been submitted for the agency's consideration in the WEA. Additional analysis under NEPA will be required before any future decisions are made regarding construction or operation of any wind energy facility on leases that may be issued in the WEA. Because project design and the resulting environmental impacts are often geographically and design-specific, it would be premature to analyze environmental impacts related to approval of any future COP at this time (Musial and Ram 2010; Michel *et al.* 2007). Since the specific information contained in such a plan would determine the reasonably foreseeable environmental consequences associated with the development of any lease, BOEM will not speculate in this revised EA as to what the consequences would be of the potential future development of any leasehold within a specific lease area.

Section 3.1.3.1, "Meteorological Towers and Foundations," describes the meteorological towers. The meteorological towers would have lighting and marking for marine navigational and aircraft avoidance purposes, in accordance with USCG and FAA requirements (*see* Section 3.1.3.1), with a visual range that is in compliance with 33 CFR 66.01-11. Final design of these markings will be determined in consultation with and approval by the USCG and FAA. The visual simulations developed for this analysis assumed red flashing lighting would be implemented at the base and top of the towers.

Simulation Methodology

Daytime and nighttime simulations of the project were developed from two locations (Aquinnah, [also known as Gay Head], Massachusetts, and Point Judith, Rhode Island) demonstrating sensitive and representative viewpoints of the project. Photographs of the two vantage points were collected from March 26 through March 30, 2012, at various times throughout the day in order to characterize existing views in the morning, midday, afternoon, and nighttime. Photographs were taken on clear days, with more than 20 NM of visibility. Trimble global positioning system (GPS) technology was used to accurately determine the photographs' directions and locations and to record GPS locations of reference points (i.e., safety cones) within the photographs. To provide a visual representation of the proposed project, "wireframe" reference points created with digital mapping software (WindPro 2.7) were superimposed on the photographs. Site-specific locations and viewing (geometric) data collected from existing maps and the field study were used, including elevation and reference points to provide the baseline view for the simulated photographs (*see* Appendix D).

Visual reference points (e.g., safety cones) were placed to indicate compass points, and GPS coordinates of existing visible reference points were recorded. These references were used to locate the towers, which are depicted as rectangles representative of the height of the towers and the width of the base platforms, providing a conservative reference figure to evaluate the potential visibility of the towers. Once reference coordinates were determined within each photograph, the photomontages were assembled to create a panoramic view. Each simulation is accompanied by the original panoramic photomontage to demonstrate the existing conditions. A magnified view of the wireframe reference points is provided to demonstrate what potentially would be visible at a closer distance. The views and additional data collection details for the simulated photographs are provided in Appendix D.

An animation was created using existing nighttime photographs to approximate the effect of a red strobe light on each of the four towers. The final color, intensity, and timing of these lights will be determined in consultation with and final approval by the USCG and the FAA.

4.1.3.1.2 Impact Analysis of Alternative A

As discussed in Section 5.2.21.2 of the Programmatic EIS (USDOI, MMS 2007), a meteorological tower in a typical seascape could introduce a vertical line that would contrast with the horizon line and would introduce a geometrical man-made element into a natural landscape. Visual impacts would be contingent upon the distance from shore, earth curvature, wave height, and atmospheric conditions, which could screen some or all of the deck from view. As discussed in Section 3.1.3.1, "Meteorological Towers and Foundations," and analyzed in the simulations (Appendix D), the geometry of the views from shore would prevent the potential visibility of the tower base and deck or any of the meteorological buoys.

4.1.3.1.3 Conclusions

For the Rhode Island and Massachusetts WEA, the widest portion of meteorological towers (the decks) would be located below the visual horizon and would not be visible from shore. In addition, due to the width of the towers and the distance from the viewpoints, the masts of the towers would not be discernible by the naked eye.

As observed in the simulations, the visibility of the meteorological towers would be significantly limited by distance and curvature of the earth. Even from the elevated shoreline position of Gay Head, the bases or decks of the towers would be blocked by the curvature of the earth, and the towers would be too narrow to see using the naked eye. Lighting markers at the top of the tower could be visible on clear nights. From Point Judith, the distance and curvature would prevent the potential visibility of all but the very top of the tower, where lighting could be visible under very clear nighttime conditions. If meteorological buoys were used instead of towers, they would not be visible from shore due to the curvature of the earth.

The lighting on meteorological towers may be visible from several miles away at night, but tower lighting would be faint and difficult to distinguish from other lighting present (e.g., vessel traffic). Weather conditions would also significantly limit the visibility, and fog, haze, clouds, or rough seas would likely prevent any potential visibility of the towers and lighting.

4.1.3.2 Military Areas and Aviation

4.1.3.2.1 Description of the Affected Environment

Chapter 4.2.16 of the Programmatic EIS (USDOI, MMS 2007) discusses the numerous military-use areas off the Atlantic Coast where the U.S. Navy, Marine Corps, Air Force, and Special Operations Forces conduct various testing, training, and operational missions. The U.S. Navy, USCG, Air Force, and Air National Guard are responsible for search and rescue missions on the Atlantic coast, including the areas in and near the Rhode Island and Massachusetts WEA. Navy fleet and Marine Corps amphibious warfare training occurs nearly every day all along the East Coast and in open ocean areas (USDOI, BOEM, OREP 2012b). The level of activity varies from unit-level training to full-scale Carrier/Expeditionary Strike Group pre-deployment certification exercises. Military aircraft testing and training in special use airspace overlying the coast and in offshore warning areas includes using low-flying aircraft and helicopters offshore (USDOI, BOEM, OREP 2012b). Additionally, there are military training routes, military operating areas, restricted airspace, and warning areas designated by the FAA (USDOI, MMS 2007). The warning areas are located predominantly offshore and would start 3 NM from the coast and extend outward into international waters and in international airspace.

Military Activities

In June 1998, under the provisions of the land transfer component of the Base Realignment and Closure Act (BRAC), the Nomans Land Island was transferred from the DOD to the USDOI. The USDOI transferred to the USFWS the management responsibility for the island's use as a wildlife refuge, primarily for migratory birds. The area is designated as a danger zone for naval operations (33 CFR 334.70) because unexploded ordnance (UXO) is suspected to be present (NOAA, Office of Coast Survey 2009); access is not permitted, and the island is closed to the public.[15] In addition to Nomans Land Island, there are seven other identified locations of UXOs and one active spoil ground (or designated dredged material disposal site) which is located 4.91 NM from the WEA. The spoil ground where dredged material is deposited is named the Rhode Island Sound Disposal Site and has a circumference of about 24,050.83 feet (about 7,331 meters). No UXO sites are located within the proposed action area (Alternative A) WEA; however, the closest UXO site to the WEA is 0.14 NM away and has a circumference of about 47,690.21 feet (about 14,536 meters) (*see* Table 4-11).

Table 4-11
Unexploded Ordnance, Circumference, and Distance to Wind Energy Area

Type	Information	Circumference (feet)	Distance to WEA (NM)	Last Active
Rhode Island Sound Disposal Site	Spoil ground	24,050.83	4.91	Current [(a)]
Explosives Dumping Ground	Unexploded Ordnance	47,690.21	0.14	1995
Explosives Dumping Ground	Unexploded Ordnance; Reported	2,808.92	0.31	1952
Explosives Dumping Ground	Unexploded Depth Charge	1,709.08	1.08	1947
Explosives Dumping Ground	Unexploded Depth Charge	2,437.90	1.39	1971
Explosives Dumping Ground	Unexploded Bombs	1,712.27	1.82	1958
Explosives Dumping Ground	Unexploded Depth Charges Position Approximate	18,802.41	2.56	1957
Explosives Dumping Ground	Unexploded Depth Charge	38,979.11	5.14	1992

Note:
(a) The Rhode Island Sound Disposal Site was formerly designated on December 16, 2004 by the USEPA as a long-term disposal of dredged sediment (USEPA 2004).

All seven UXO sites, including unexploded depth charges, unexploded bombs, and unexploded general ordnance, are east of Block Island (*see* Figure 4-8). These sites are no longer active, and there is no evidence that these will be removed because some date back to the 1940s and 1950s (Battelle 2003 *as cited in* Rhode Island CRMC 2010). Disposal types and dates, moving from east to west (*see* Figure 4-8), include a depth charge (1995); depth charges

[15] Navigation regulations are published in Chapter 2, U.S. Coast Guard Pilot 2. Additions or revisions to Chapter 2 are published in the Notice to Mariners. Information concerning the regulations may be obtained at the Office of the Commander, 1st Coast Guard District in Boston, Massachusetts, or at the Office of the District Engineer, Corps of Engineers in Concord, Massachusetts. *See* http://www.charts.noaa.gov/OnLineViewer/13218.shtml.

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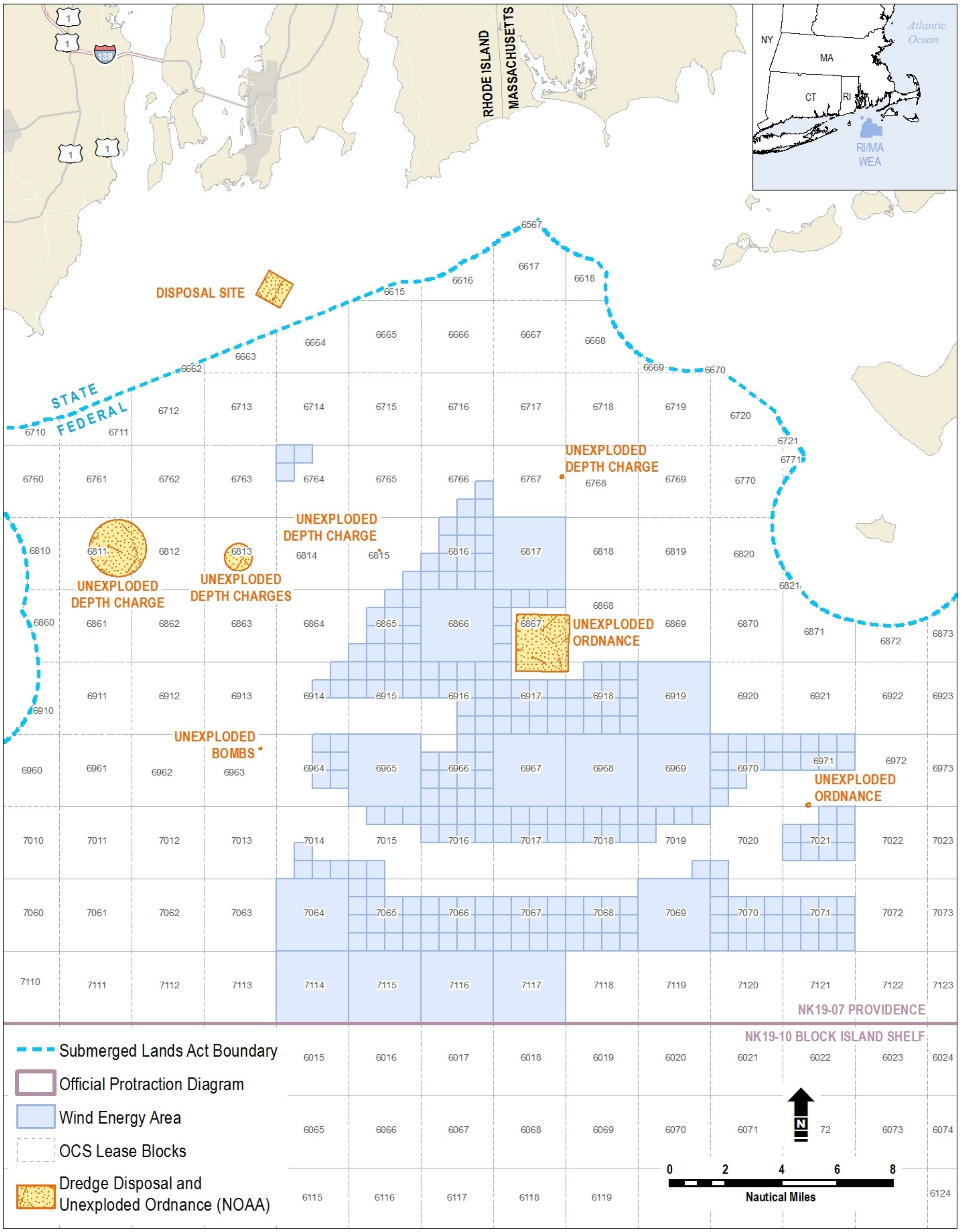

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011;

Figure 4-8. Unexploded Ordnance and Dredge Disposal Sites, Rhode Island and Massachusetts Wind Energy Area.

(1952); bombs (1958); depth charge (1947); general ordnance (1971); depth charge (1957); and general ordnance (1992) (Battelle 2003 *as cited in* Rhode Island CRMC 2010).

Whereas there is little naval fleet training activity within the Ocean SAMP area and the overlapping areas of the WEA, the Naval Undersea Warfare Center (NUWC), Division Newport, routinely performs testing in this area. Six different test operation types currently occur in the area designated as the Ocean SAMP boundary, a portion of which includes areas that overlap or are adjacent to the WEA: launcher testing, torpedo testing, semi-stationary equipment testing, towed equipment testing, unmanned surface vehicle (USV) testing; and unmanned undersea vehicle (UUV) testing. High speed launcher and torpedo testing are confined to the designated Navy restricted areas, while all other activities are allowed to be conducted in waters both inside and outside the restricted areas. Future test activities will include unmanned aerial vehicle (UAV) testing.

In Rhode Island and its adjacent waters, naval activity has decreased since the active fleet left in early 1973 (a result of a Shore Establishment Realignment study that directed the closing of the Quonset Point Naval Air Station [Rhode Island CRMC 2010]). Although a series of BRAC commissions affected the level of naval operations in Newport, Rhode Island, the Navy retains several facilities of strategic importance, which together comprise Naval Station Newport (Global Security 2012). The WEA is located in a Navy operating area (OPAREA), the Narragansett Bay Operations Area, an offshore area where the Navy conducts training exercises that includes military warning areas and a restricted area (USDOI, BOEM, OREP 2012b). The restricted area designated by the Navy and indicated in the *U.S. Coast Pilot Volume 2* (USDOC, NOAA, NOS 2012) is used for military testing (torpedo range training area) (Rhode Island CRMC 2010). The Navy's restricted torpedo testing area (*see* Figure 4-9), located 3.2 NM northeast of the WEA, is a 2-NM-wide strip that begins within the northern precautionary area of the approach to Narragansett Bay and extends south for more than 11.5 NM, coinciding with the traffic separation zone (Rhode Island CRMC 2010). The NUWC uses this area during appropriate weather conditions as a torpedo range and, when the torpedo range is in use, navigation in this area is prohibited. In addition, the Navy has designated submarine transit lanes for submerged submarine transit. One of these lanes, "Alpha," is located 2.4 NM from the WEA.

Although the WEA is near the Navy fleet training exercises locations, those exercises are generally carried out in deeper waters, outside of the Ocean SAMP boundary, beyond 30 NM (Rhode Island CRMC 2010); therefore, activities conducted within the locations would have minor impact on the proposed action. Within the Narragansett Bay OPAREA, surface vessels may take part, upon request, in submarine training exercises (Rhode Island CRMC 2010). Although detailed information on submarine transit is classified, submarines travel primarily from New London, Connecticut, through an area adjacent to the WEA to reach the deepwater Naval Fleet Operations Submarine Lanes. Submarines travel on the surface of the water and generally wait until they reach the 100-fathom depth far offshore before submerging (Rhode Island CRMC 2010).

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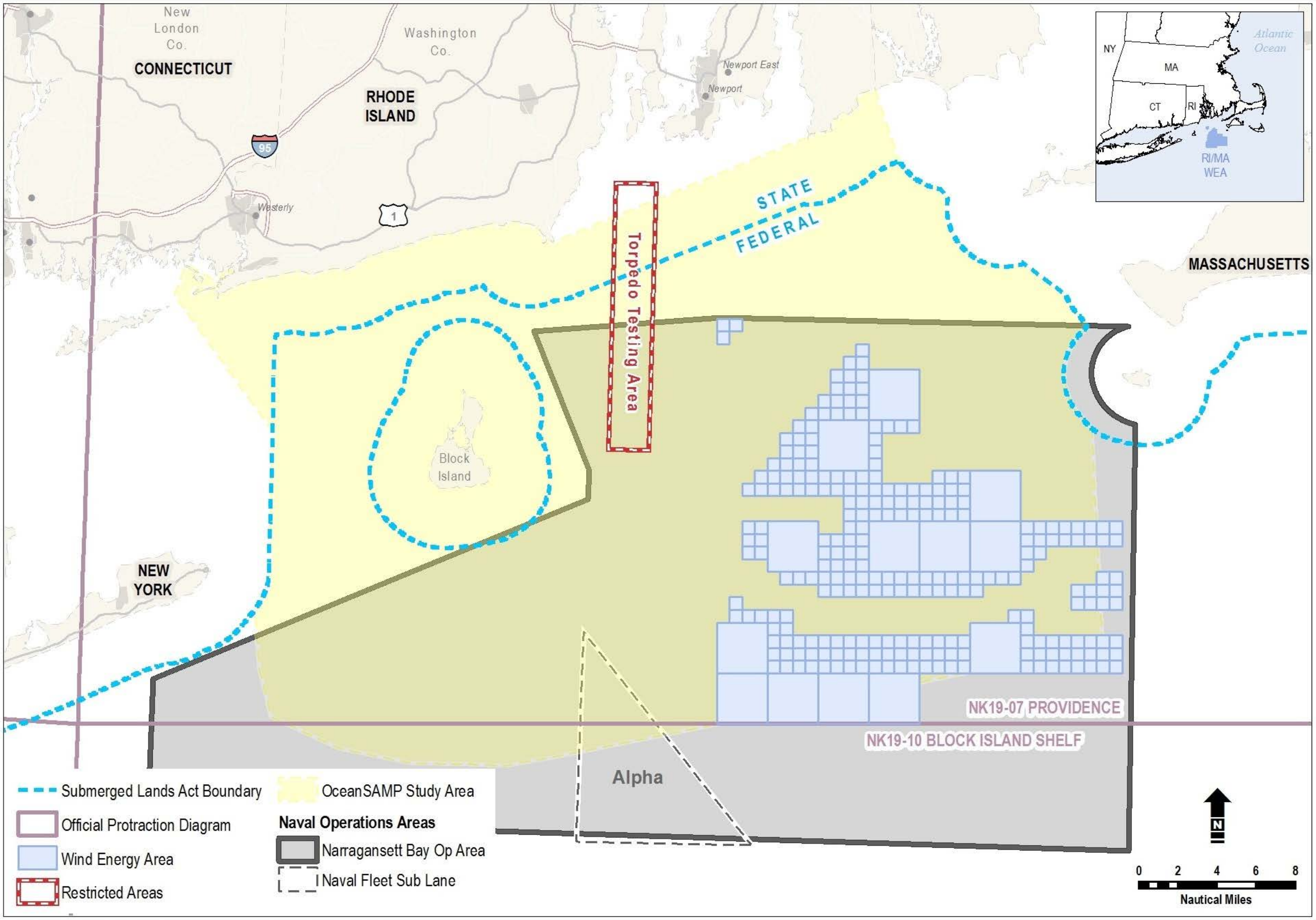

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; RI OceanSAMP 2009

Figure 4-9. Naval Operations Areas, Rhode Island and Massachusetts Wind Energy Area.

Aviation

As described in Section 3, "Scenario of Reasonably Foreseeable Activity and Impact-Producing Factors," site characterization and assessment activities including aerial surveys would be conducted as part of the proposed action in order to detect potential impacts to birds. Airports within both Rhode Island and Massachusetts are an important infrastructure for the proposed action because they could support aircraft-based survey activities. Characteristics of the airports located within the vicinity of the Alternative A WEA are described below.

Rhode Island Airport Corporation (RIAC) is a quasi-public corporation of the State of Rhode Island established specifically to assume management and operating responsibilities for all six state airports. Of the six Rhode Island airports, the three closest airports to the WEA are the Theodore Francis Green (T. F. Green) Airport, the Block Island State Airport, and the Westerly State Airport. In Massachusetts, Martha's Vineyard Airport is the closest one to the WEA. The Nantucket Memorial Airport is the second closest airport to the WEA in Massachusetts. The distances from these airports to the WEA are noted in Table 4-12.

Table 4-12
Distance of Area Airports to the Wind Energy Area

LOCID	Name	State	Distance of Airport to WEA (miles)
PVD	Theodore Francis Green State	Rhode Island	30.16
BID	Block Island State	Rhode Island	16.60
WST	Westerly State	Rhode Island	26.78
MVY	Martha's Vineyard	Massachusetts	21.13
ACK	Nantucket Memorial	Massachusetts	40.96

Marked flight paths V 46 and V 34-58 on the FAA sectional chart include air space above the WEA that will most likely be used by pilots flying to and from the abovementioned airports (Figure 4-10).

T. F. Green Airport was the first state-owned airport in the U.S. and is owned by the Rhode Island Department of Transportation (Landrum & Brown 2002). As the state's largest airport, it is situated on approximately 1,200 acres (over 485 hectares) in the City of Warwick, Rhode Island, at an average elevation of 50 feet (15.2 meters) above mean sea level (Landrum & Brown 2002). The airport is located approximately 6 miles (almost 10 kilometers) south of the state's capital, Providence (41-43-26.3970N/071-25-41.5960W, 41-43.439950N/071-25.693267W, 41.7239992/-71.4282211 [estimated]) (AirNav, LLC n.d.). T. F. Green airport is located 30.16 miles (48.5 kilometers) from the WEA. Major regional and national ground access is available from the airport area via Interstate Highways I-95 and I-295, Route 6, and Route 146. I-95 is the primary north-south ground transportation route accessing the entire East Coast of the U.S. Route 6 is one of the most widely used routes connecting Rhode Island with Connecticut and other points west. Route 146, beginning in Providence, provides access to northern Rhode Island and Massachusetts.

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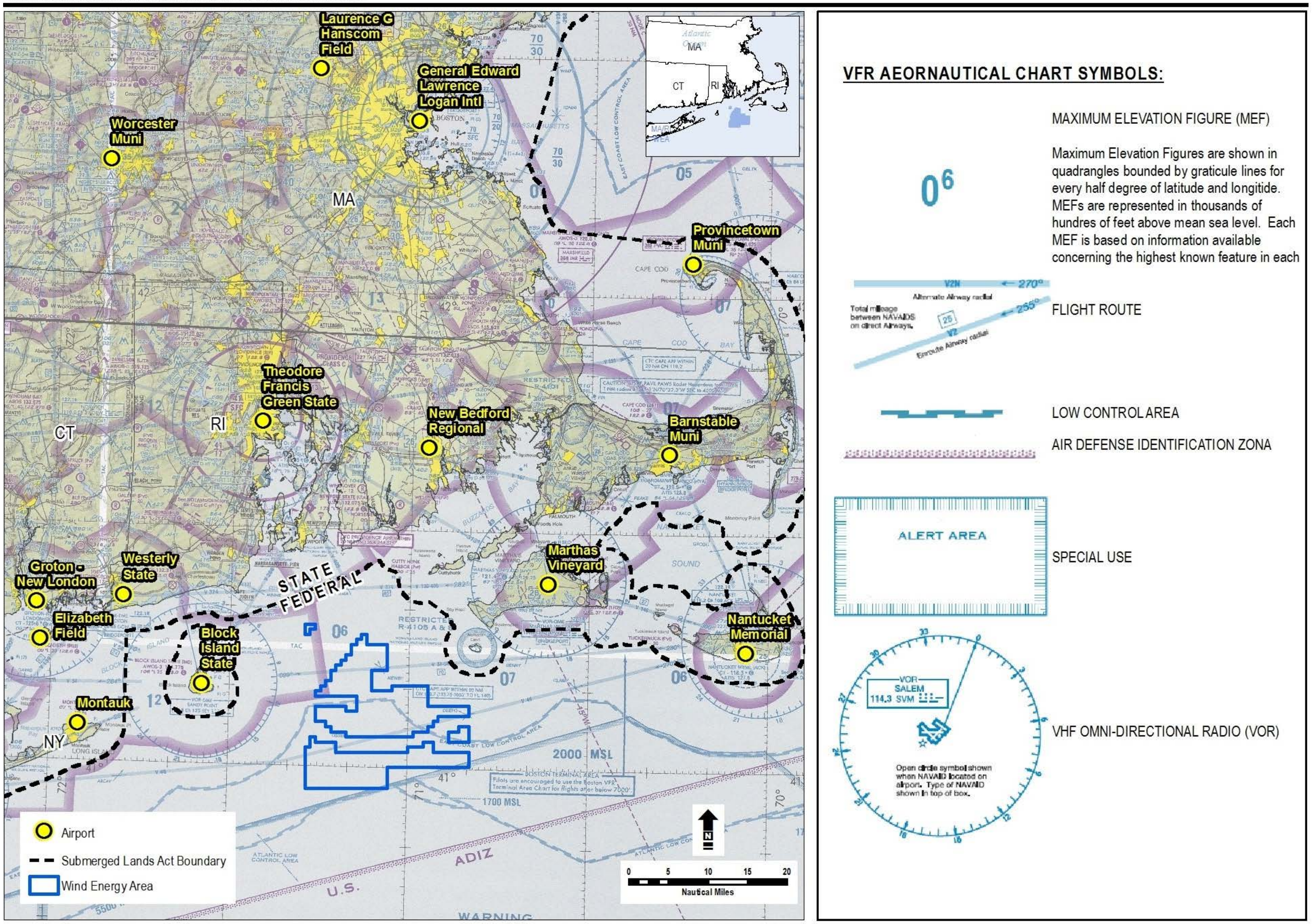

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; FAA Sectional Chart 2011

Figure 4-10. Federal Aviation Administration Section Chart.

T. F. Green Airport is classified in the National Plan of Integrated Airport Systems, which provides a general overview of the airport's role in the national airport system, as a medium-haul commercial service airport (Landrum & Brown 2002). Non-stop commercial airline service at medium-haul commercial airports primarily serves destinations between 500 and 1,500 miles (about 805 and 2,414 kilometers); however, this designation does not restrict or prevent its use by general aviation or military aircraft, nor does it preclude either "short haul" or "long-haul" flights. In 2010, T. F. Green Airport served approximately 3.9 million passengers with more than 220 daily aircraft operations (i.e., aircraft landing or departing) (T. F. Green Airport – Monthly Airport Passenger Activity Summary, RIAC December 2010 *as cited in* United States Department of Transportation [USDOT], FAA 2011).

T. F. Green Airport plays a critical role in New England's regional airport system and particularly in the eastern New England region. Due to the overall aviation (aircraft operations and passenger) demand, the T. F. Green Airport Improvement Program was implemented to enhance the efficiency of the airport. The FAA issued its Record of Decision, which set forth the FAA's determinations and environmental approvals for the federal actions necessary to implement the project, including the determination of effects upon safe and efficient use of air space (USDOT, FAA 2011). The FAA approved the $165 million plan for T. F. Green Airport, which includes terminal, roadway, and parking expansion as well as the extension of runways. The estimated date of completion for the project is by the end of 2020 (USDOT, FAA 2011). The project moved one step closer to completion when the RIAC Board unanimously approved an agreement with the City of Warwick that addressed local concerns regarding runway expansion and removed a lawsuit that was stalling planning and construction (Polichetti 2012).

Block Island Airport is 16.60 miles (26.7 kilometers) from the WEA. The airport is on New Shoreham, Rhode Island (41-10-05.2000N/071-34-40.2000W, 41-10.086667N/071-34.670000W, 41.1681111/-71.5778333 [estimated]). Aircraft operations averaged 45 per day for a 12-month period ending August 30, 2010 (AirNav, LLC n.d.). Because the island is a tourist destination in the summer and fall months, aviation traffic is much greater during those times.

Westerly State Airport is approximately 26.78 miles (43.1 kilometers) from the WEA. The airport is 2 miles (3.2 kilometers0 southeast of Westerly, Rhode Island (41-20-58.6787N/071-48-12.3006W; 41-20.977978N/071-48.205010W; 41.3496330/-71.8034168 [estimated]) and fulfills several roles for the South County area, including corporate aviation service, extensive aircraft maintenance and repair, and regularly scheduled air passenger service to Block Island, Rhode Island. It has been operational since December 1939 and aircraft operations averaged 53 per day for the 12-month period ending June 30, 2011 (AirNav, LLC n.d.).

Martha's Vineyard Airport is located 21.13 miles (34 kilometers) from the WEA. The airport is 3 miles (almost 5 miles) south of Vineyard Haven, Massachusetts (41-23-36.3194N / 070-36-49.9829W, 41-23.605323N / 070-36.833048W, 41.3934221 / -70.6138841 [estimated]) (AirNav, LLC n.d.). Daily aircraft operations average 121 flights per day for the 12-month period ending January 1, 2010 (AirNav, LLC n.d.).

At Nantucket Memorial Airport (41-15-11.2000N/070-03-37.1000W, 41-15.186667N/ 070-03.618333W, 41.2531111/-70.0603056 [estimated]) daily aircraft operations averaged 326 per day for a 12-month period ending April 30, 2011 (AirNav, LLC n.d.). The airport is 40.96 miles (65.92 kilometers) from the WEA.

Radar

Numerous military and civilian radar systems provide radar coverage along the U.S. coastline. Tower-like structures can interfere with radar signals and radar accuracy can be degraded by this interference. Evaluation of impacts from the installation of meteorological towers on military and civilian radar systems will be included in any Determination of Hazard/No Hazard by the FAA (if within 12 NM of shore). BOEM will consult with the DOD on any meteorological towers outside of FAA jurisdictional authority to determine potential impacts of meteorological towers farther than 12 NM from shore on military and civilian radar systems. Any meteorological tower more than 199 feet (about 61 meters) tall and within 12 NM of shore would require an Obstruction Evaluation and a Determination of Hazard/No Hazard by the FAA and each lessee would be required to file a "Notice of Proposed Construction or Alteration" with the FAA in accordance with federal aviation regulations (14 CFR 77.13). According to the FAA, specific lighting requirements or recommendations, radar impact analysis (including any existing windshear detection radar(s)), and recommendations for potential mitigation measures would be applied on a case-by-case basis (Page, personal communication, 2012).

4.1.3.2.2 Impact Analysis of Alternative A

Section 5.2.17 of the Programmatic EIS (USDOI, MMS 2007) discusses the impacts that site characterization and assessment could have on military use areas. The WEA for Alternative A would be located 1.3 NM from the nearest restricted area, the torpedo testing area. Increased vessel traffic from survey activities and construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys would increase vessel traffic in the WEA and between the WEA and shore-based staging areas. This increase in traffic could conflict with military uses of the OCS. In addition to the increase in traffic, site characterization surveys, and the construction/installation, operation and maintenance, and decommissioning activities of meteorological towers and buoys in the proposed lease area have the potential to directly impact military uses of the OCS (*see* below). Non-routine events could include collision between vessels, an allision between a vessel and a meteorological tower/buoy, and/or accidental spills of diesel or oil.

BOEM consulted with the DOD on Alternative A of this EA. On April 25, 2012, the DOD responded that the impact on the Navy's training areas and other DOD activities from site characterization surveys and installation, operation and maintenance, and decommissioning of meteorological towers and buoys offshore of Rhode Island and Massachusetts could be mitigated, given site-specific stipulations in consultation with the DOD.

Impacts of Routine Activities and Events

Military Testing

Direct impacts on military activities in the designated OPAREA and aviation from routine activities may occur as a result of increased vessel traffic. BOEM will consult with DOD on any activities that may affect military activities to determine the extent of potential impacts. Specific

DOD requirements or recommendations for potential SOCs or further mitigation measures may be necessary to eliminate or reduce potential impacts on military activities and would also be applied on a case-by-case basis.

Aviation Traffic

Given that the air space above the WEA will continue to be used for the duration of the proposed action and alternatives, it is important to consider the height of the proposed meteorological towers to be installed in the WEA. As discussed in detail in Section 3.1.3, "Site Assessment Activities and Data Collection Structures," all meteorological towers and buoys, regardless of height, would have lighting and marking for navigational purposes. Meteorological towers and buoys would be considered private aids to navigation, which are regulated by the USCG under 33 CFR 66.

Radar

Numerous military and civilian radar systems provide radar coverage along the U.S. coastline. Meteorological towers could affect nearby radar use and accuracy because they are a useful platform for avian detection and tracking radar, shipping vessel traffic-monitoring radar, and lightning detection sensors. Radar interference effects depend on the type of radar, specific characteristics of meteorological towers, and the distribution of the meteorological towers.

Evaluation of impacts from the installation of meteorological towers on military and civilian radar systems will be included in any Determination of Hazard/No Hazard by the FAA (if within 12 NM of shore). BOEM will consult with DOD on any meteorological towers outside of FAA jurisdictional authority to determine potential impacts of meteorological towers greater than 12 NM from shore on military and civilian radar systems. Any meteorological tower more than 199 feet (just over 60 meters) tall and within 12 NM of shore would require an Obstruction Evaluation and a Determination of Hazard/No Hazard by the FAA and each lessee would be required to file a "Notice of Proposed Construction or Alteration" with the FAA in accordance with federal aviation regulations (14 CFR 77.13). According to the FAA, specific lighting requirements or recommendations, radar impact analysis (including any existing windshear detection radar(s)), and recommendations for potential mitigation measures would be applied on a case-by-case basis (Page, personal communication, 2012).

BOEM consulted with the FAA on Alternative A. On April 25, 2012 the FAA responded that interference from meteorological towers to radar systems, including windshear detection radars, would be determined on a case-by-case basis.

Impacts of Non-Routine Events

An aircraft (commercial or otherwise) colliding with the meteorological structures could result in the spillage of diesel fuel, oil-based lubricants, or hydraulic oil.

4.1.3.2.3 Conclusions

The increase in activities associated with the installation/operation of the meteorological towers and buoys would not measurably impact current or projected future military or aviation activities for several reasons: It is unlikely that vessels would collide with meteorological towers or buoys because there are USCG requirements relating to marking and lighting meteorological towers or buoys; the WEA avoids the highest traffic areas; and the few structures in the Rhode Island and Massachusetts WEA would have a small footprint and would be dispersed over a wide area of ocean.

4.1.3.3 Commercial and Recreational Fishing Activities

4.1.3.3.1 Description of the Affected Environment

The area encompassed by the Rhode Island and Massachusetts WEA is used actively for both commercial and recreational fishing. Fishing in the State of Rhode Island ("Ocean State") and the Commonwealth of Massachusetts ("Bay State") has a long and rich maritime history. For both states, commercial and recreational fishing are significant drivers of the marine economies and are also important for their contributions to shore-side business. This section discusses these activities in the context of the proposed action in the WEA. An overview of commercial and recreational fishing for the entire Atlantic region is discussed in Sections 4.2.23.1 and 4.2.23.2 of the Programmatic EIS (USDOI, MMS 2007), respectively. Section 4.1.2.3 above discusses fish and fish habitat in the Rhode Island and Massachusetts WEA.

More information regarding fish habitat can be found on the NMFS website (http://www.nero.noaa.gov/hcd/), and information on New England FMPs and Mid-Atlantic FMPs can be found on the NEFMC website (http://www.nefmc.org/) and the MAFMC website (website (http://www.mafmc.org/), respectively. The inter-council boundaries for the New England and the Mid-Atlantic Councils begin at the intersection point of Connecticut, Rhode Island, and New York at 41°18'16.249" N. lat. and 71°54'28.477" W. long. and proceeds south at 37°22'32.75" and east to the point of intersection with the outward boundary of the EEZ as specified in the Magnuson-Stevens Act (50 CFR 600.105). The ASMFC) http://www.asmfc.org/) works cooperatively with the relevant FMCs to develop FMPs for species that have significant fisheries in both state and federal waters (i.e., Atlantic herring and summer flounder).

The entire WEA supports varying levels of commercial and recreational fishing. Figure 4-11 represents high value commercial and recreational fishing activities in the WEA. The figure illustrates data compiled by the Rhode Island Fisheries Advisory Board and submitted in public comments on the NOI for this EA and values fishing areas by the number of fishing sectors that use a particular area.

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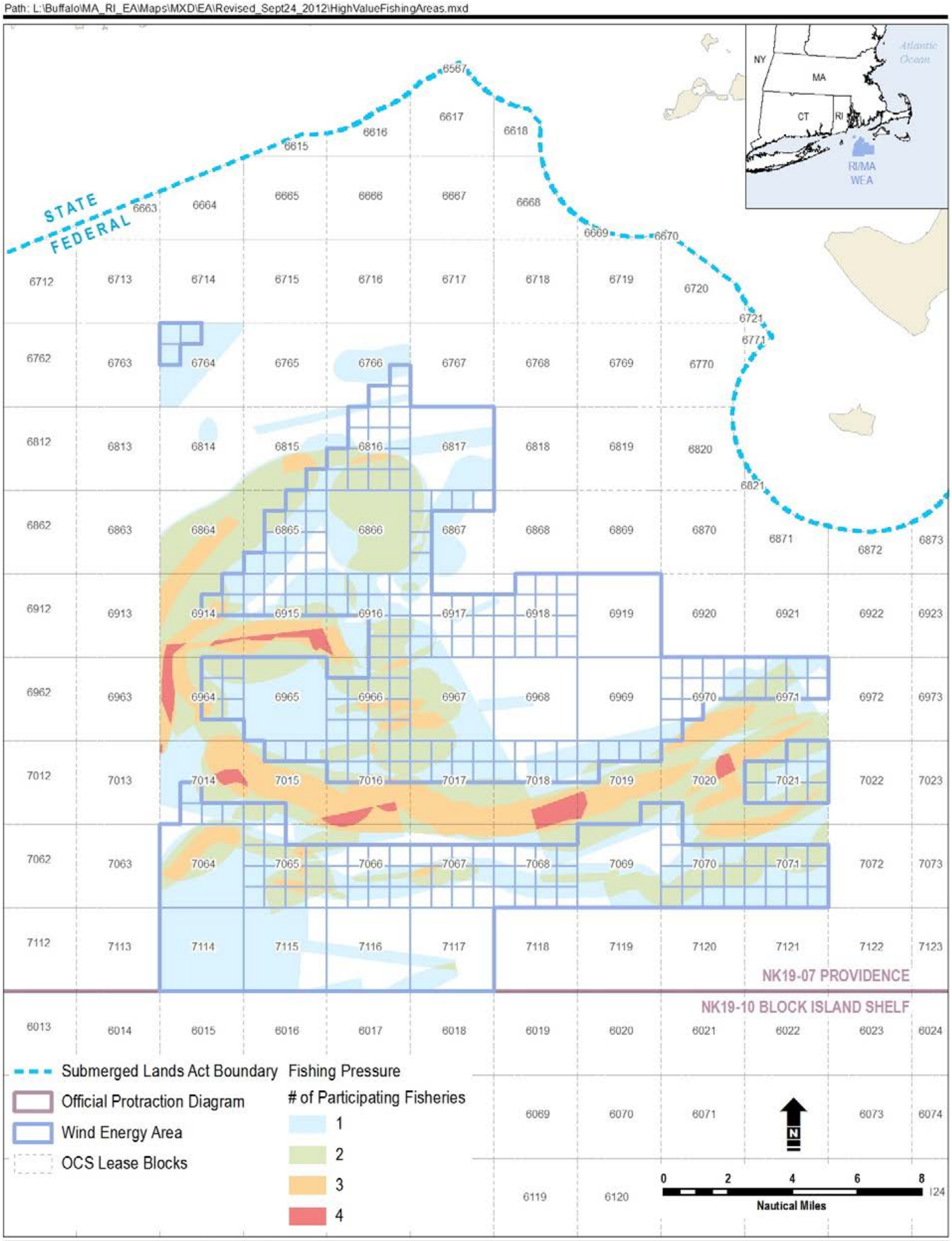

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; RI OceanSAMP 2009

Figure 4-11. High Value Fishing Areas, Rhode Island and Massachusetts Wind Energy Area.

Commercial Fishing

Commercial fishing is an important contributor to Rhode Island's and Massachusetts' economies. The economic contribution of commercial fishing is determined by the value of the fish landed within the state; the export of fisheries products; the impact of processing, distribution, and volume of sales; the resulting employment; and other factors. Commercial fishers use mobile and fixed gear (trawls, dredges, longlines, pots and traps, weirs, purse seines, and gill nets). Table 4-13 lists the fishing gears and techniques used in the northeast region, categorized by the waters in which they are used, by whether or not they contact the bottom, and by whether or not their use is regulated by federal FMPs. Table 4-13 is based on 2004 landings data and an ASMFC report on gear impacts on SAV; it reflects all gears that accounted for 1 percent or more of any state's total landings and all gears that harvested any amount of any federally managed species (Stevenson *et al.* 2004).

Table 4-13
Fishing Gear and Techniques Used in the Northeast Region

Gear	Water Type: Estuary or Bay	Water Type: Coastal (0 to3 NM)	Water Type: Offshore (3 to 200 NM)	Contacts Bottom	Federally Regulated
By hand	X	X			X
Diving	X	X	X		
Dredge, clam	X	X	X	X	X
Dredge, crab	X	X		X	
Dredge, mussel	X	X		X	
Dredge, oyster	X			X	
Dredge, bay scallop	X			X	
Dredge, sea scallop		X	X	X	X
Dredge, sea urchin		X	X	X	
Dredge, whelk	X			X	X
Floating trap	X	X		X	X
Fyke and hoop net, fish	X	X		X	
Gill Net, drift			X		X
Gill Net, run-around	X			X	X
Gill Net, sink/anchor	X	X	X	X	X
Gill Net, stake	X	X	X	X	X
Handline	X	X	X		X
Haul seine, beach	X	X		X	
Haul seine, long	X	X		X	
Haul seine, long (Danish)		X	X	X	X
Hoe	X			X	
Longline, bottom		X	X	X	X
Longline, pelagic		X	X		X
Otter trawl, bottom, crab	X	X	X	X	
Otter trawl, bottom, fish	X	X	X	X	X
Otter trawl, bottom, scallop		X	X	X	X
Otter trawl, bottom, shrimp	X	X	X	X	X
Otter trawl, midwater		X	X		X
Pots and traps, crab, blue	X	X		X	
Pots and traps, crab, other	X	X	X	X	X

(continued on next page)

Table 4-13. Fishing Gear and Techniques Used in the Northeast Region (continued)

Gear	Water Type			Contacts Bottom	Federally Regulated
	Estuary or Bay	Coastal (0 to3 NM)	Offshore (3 to 200 NM)		
Pots and traps, eel	X	X		X	X
Pots and traps, fish	X	X	X	X	X
Pots and traps, lobster, inshore	X	X		X	
Pots and traps, lobster, offshore			X	X	X
Pots and traps, whelk	X	X		X	
Pound nets, crab	X	X		X	
Pound nets, fish	X				
Purse seines, herring		X	X		X
Purse seines, menhaden		X	X		
Purse seines, tuna		X	X		X
Rakes	X			X	
Reel, electric or hydraulic		X	X		X
Rod and reel	X	X	X		X
Scottish seine		X	X	X	X
Scrapes	X			X	
Spears	X	X	X		
Stop seines	X			X	
Tongs and grabs, oyster	X			X	
Tongs, patent, clam, other	X			X	
Tongs, patent, oyster	X			X	
Trawl, mid-water, paired		X	X		X
Troll line, other		X	X		X
Trot lines, with bait		X	X		X
Weirs	X			X	

Key: NM = nautical mile(s).
Source: Stevenson *et al.* 2004.

To assess the economic impacts of commercial and recreational fishing, the NMFS publishes an economics and sociocultural status and trends series, most recently, the *2009 Fisheries Economics of the United States* (NMFS 2011). The 2009 study (published in May 2011) covers the 2000 to 2009 time period and provides descriptive statistics for the following categories: economic impacts of the commercial seafood industry, commercial fisheries landings, revenue, and price trends; 2008 angler expenditures and economic impacts of recreational fishing, recreational fishing catch, effort, and participation rates; and employer and non-employer establishment, payroll, and annual receipt information for fishing-related industries (NMFS 2011).

Of the five New England states, Massachusetts contributed the most to landings revenue and pounds landed in 2009, with over $400 million and 356 million pounds landed, while Rhode Island's total landings revenue was $62 million and 85 million pounds (NMFS 2011). Table 4-14 lists landings revenue and pounds landed in 2009 for New England, Massachusetts, and Rhode Island. In 2009, Massachusetts again had the highest landings revenue in the region while Rhode Island ranked third for landings (NMFS 2011).

Table 4-14
Total Commercial Fishery Landings by Region and State in 2009

Total Landings	New England	Massachusetts	Rhode Island
Weight (thousands of pounds)	646,876	355,965	84,495
Revenue (thousands of dollars)	782,170	400,248	61,663

Source: NMFS 2011.

Commercial catch and effort data by the three major commercial fishing ports located closest to the WEA are presented in Table 4-15. Catch and effort data are reported based upon the port of landing, not the port from which the vessel hails.

Table 4-15
Commercial Catch and Effort Data from 1997-2010

	New Bedford (Massachusetts)		Point Judith (Rhode Island)		Newport (Rhode Island)	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
1997	83,144,217	10,1473,323	74,502,350	47,529,746	8,066,589	7,598,103
1998	91,223,154	91,902,686	75,391,684	42,614,448	8,006,670	8,196,648
1999	85,331,521	125,653,816	70,413,133	51,144,479	7,280,853	8,740,339
2000	88,672,468	142,593,638	59,284,369	41,703,396	7,263,915	8,307,686
2001	106,161,135	146,776,674	48,484,450	33,712,326	8,663,607	7,491,269
2002	107,190,990	162,239,706	42,793,511	31,379,955	8,237,983	7,570,597
2003	154,310,710	171,292,417	54,396,469	31,579,838	10,370,108	6,123,798
2004	174,252,905	203,099,920	51,612,441	31,095,367	7,572,356	6,389,354
2005	152,280,733	278,918,511	41,164,423	31,623,215	6,857,289	12,697,755
2006	168,658,925	276,368,348	44,931,917	38,294,538	9,701,987	17,867,306
2007	149,863,584	268,844,671	37,604,270	36,732,971	8,739,032	12,364,989
2008	145,979,145	240,789,737	37,673,668	37,047,458	6,786,231	6,765,087
2009	169,389,782	249,239,273	39,876,323	32,434,359	7,845,991	7,161,886
2010	133,417,714	306,089,817	35,641,557	32,190,868	7,451,310	6,854,663

Source: Lewis 2012a.

Rhode Island

Commercial and recreational fishing is among the oldest and most widespread use of the areas next to and including the Rhode Island and Massachusetts WEA. Both commercial and recreational fisheries contribute significantly to the economic, historic, and cultural value of the State of Rhode Island. Commercial fisheries sustain Rhode Island coastal communities by providing jobs to fishermen and supporting businesses and industries as well as food for local consumption or export throughout the United States and overseas. In 2010, the total number of species landed in Rhode Island weighed 77,476,775 pounds (35,143.2 metric tons), contributing revenue of $62,676,833 (NOAA Fisheries Office of Science & Technology 2010).The most valuable species per pound, on average, were longfin squid and scup (Table 4-16). These figures include all ports in Rhode Island and include species targeted both inside and outside of the WEA, including Narragansett Bay. However, it should be noted that landings may not reflect the area where the fish are processed.

Table 4-16
Top Landed Species in Rhode Island by Value (1999-2010 Averages)

Species	Average Pounds Landed	Average Dollar Value	Average Dollars per Pound
Herring, Atlantic	16924331	1326407	0.078373
Squid, Longfin	16312055	12324840	0.755566
Herring, Sea	16082078	1642752	0.102148
Squid, Northern Shortfin	13166345	4836856	0.367365
Mackerel, Atlantic	8204166	2123004	0.258771
Skates	8074067	812073	0.100578
Squids	7745551	3359664	0.433754
Skate, Little	7098201	670357	0.09444
Scup	3500320	2659948	0.759916
Hake, Silver	3352783	1374772	0.410039

Source: Lewis 2012b.

In 2006, Rhode Island’s two top fishery ports—Point Judith and Newport—reported 168 and 48 vessels with federal permits listing one of these ports as their home port, respectively (Rhode Island CRMC 2010). The total federal landings value in Point Judith was $46,947,791; the total value of landings in Newport was $20,837,561. The most valuable federally managed group of species in Point Judith was squid, mackerel, and butterfish (combined into one group for management purposes), with a 2006 landings value of $13,188,211, followed by lobster, with landings of more than $8.6 million (Clay *et al.* 2008 *as cited in* Rhode Island CRMC 2010). The most valuable species landed in Newport in 2006 was scallops, with a landed value of $13,267,494, followed by lobster, worth just under $3 million (Clay *et al.* 2008 *as cited in* Rhode Island CRMC 2010).

In 2008, Point Judith ranked 18th in value of landings and 21st in pounds among all major U.S. fishing ports. Newport, however, did not appear in the rankings for 1999 to 2003. Newport climbed significantly in the rankings for both pounds landed and landings value in 2006 but declined again in 2007. Data for Newport for 2008 were not available (NMFS 2009a *as cited in* Rhode Island CRMC 2010).

Figure 4-12 shows trends in landings and landings value in Rhode Island from 1999 to 2008. The landings estimates include fish caught both within and outside of the Ocean SAMP area.

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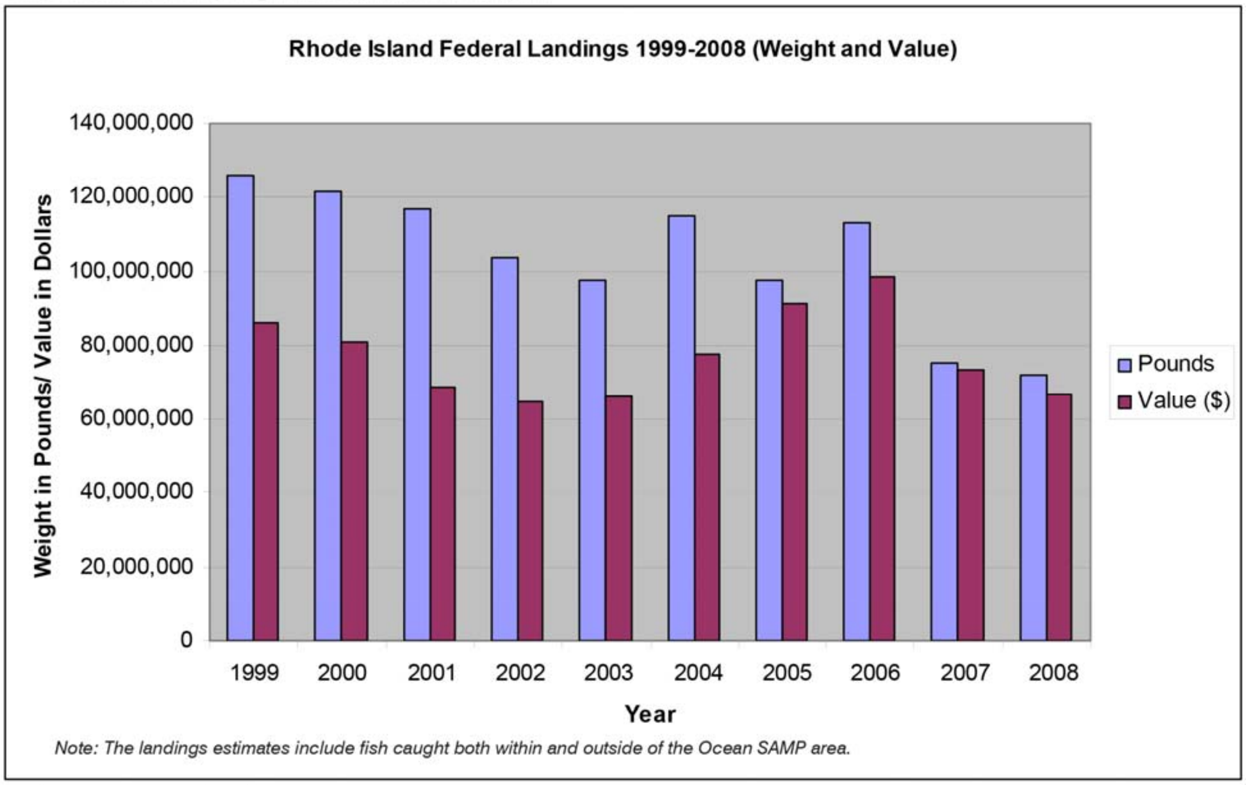


SOURCE: Rhode Island CRMC 2010

Figure 4-12. Trends in Landings and Landings Value in Rhode Island for the Years 1999-2008.

Massachusetts

The Massachusetts Division of Marine Fisheries (MA DMF) is the state agency responsible for managing commercial fishing activities. MA DMF works closely with the NEFMC and the ASMFC to manage species across the region. Major fisheries in Massachusetts comprise shellfish (including lobster, crabs, scallops, conch, quahogs, and surf clams), finfish, and urchins. In 2004, commercial seafood, including the combined inshore/offshore landings, was a $1.6 billion industry in Massachusetts (University of Massachusetts 2006). Individual species with more than $5 million in annual landed value in 2007 included sea scallop, lobster, monkfish, cod, haddock, winter flounder, Atlantic sea herring, yellowtail flounder, skates, and witch flounder (MA DMF 2009 *as cited in* Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). Two species—scallop and lobster—combined to approach 50 percent of the total landed value of all species (MA DMF 2009 *as cited in* Commonwealth of

Massachusetts Executive Office of Energy and Environmental Affairs 2009). Table 4-17 provides an average for 1999 through 2010 of the top-landed species in Massachusetts.

Table 4-17
Most-Often Landed Species in Massachusetts by Value (1999-2010 Averages)

Species	Average Pounds Landed	Average Dollar Value	Average Dollars per Pound
Herring, Sea	84,599,825	6,983,468	0.082547
Herring, Atlantic	48,033,875	4,802,446	0.09998
Lobster (1)	3,225,342	$14,281,814	4.63
Mackerel, Atlantic	28,856,636	3,184,537	0.110357
Scallop, Sea	24,253,972	147,271,644	6.072,063
Skates	18,193,081	3,511,617	0.193019
Clam, Ocean Quahog	16,066,439	8,058,855	0.501596
Monkfish	13,072,185	11,674,930	0.893112
Pollock	7,442,784	4,345,386	0.583839
Menhaden	5,772,070	620,755	0.107545
Cod, Atlantic	4,594,753	5,748,299	1.251057

Sources: Lewis 2012b, except (1) Defilippi 2012.

Adding to the industry's revenue in Massachusetts is the Port of New Bedford, which has held the designation of the most valuable (by value of landings) port in the United States for the past eight years (NOAA 2010). Currently, approximately 500 fishing vessels, rigged for catching groundfish and scallops, operate out of the Port of New Bedford (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). In recent years, the port's seafood processing industry has grown to become a nationally and internationally recognized industry center, with deliveries from international sources arriving at New Bedford's Maritime International Terminal every two weeks to satisfy the needs of Massachusetts fish processors and distributors.

Although not as proximate to the action area as New Bedford, Gloucester, Provincetown, and Boston also harbor major commercial fleets, and virtually all harbors and inlets in Massachusetts support some type of commercial fishing activity (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). On a regional basis, Massachusetts had the highest finfish and shellfish landings revenue in 2009 (NMFS 2011). In 2007, the commercial fishery brought in 94.4 million pounds (42.8 kilograms) of fish valued at $46.8 million (NOAA NMFS 2008b *as cited in* Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009) to Gloucester. Gloucester is Massachusetts' second largest fishing port and is now the state's leading port for lobster landings (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). This is due, in part, to Gloucester harbor being named as a "Designated Port Area" since 1978 in order to protect the viability of the harbor for marine industrial use (Buck, Ketchen, and Urban Harbors Institute 2009).

The dominant level of fishing effort and value of catch are found around Cape Ann, between Boston and Plymouth, Wellfleet Harbor, the western side of Monomoy Island, Vineyard Sound, and New Bedford Harbor, as recorded by vessel trip reports and landings data (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). These significant fishing grounds, including north of Cape Cod are several miles from the proposed action area. Massachusetts' historical landing of quota-managed species for 2011 landings is presented in Table 4-18. As in most fisheries, effort and landings are not distributed evenly within a particular reporting area, as can be seen in Table 4-18, which shows the coast-wide quota is shared between Massachusetts and other Atlantic states. Therefore, it is possible for distinct portions of a "low" activity area to support fishing effort and landings on a par with "high" activity areas and vice versa. Also, since the majority of landed shellfish including sea scallops are caught outside of state waters (both landward and seaward), further analysis of the assessment of fishing activity described in the Massachusetts Ocean Management Plan is needed to remove the effect of shellfish landings from catches outside of state waters (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009).

Table 4-18
Historical Landings of Quota-Managed Species,
2011 Landings, and Quota Information [(a)]

Species	2011 MA Landings[1]	2011 Quota	Quota Type	Percent Landed
Black Sea Bass	264,165	222,440	MA	118.8%
Bluefish	579,504	629,704	MA	92.0%
Spiny Dogfish	9,048,607	11,145,452	CW	to NMFS
Fluke	1,134,080	1,156,952	MA	98.0%
Illex Squid	3,619	51,429,436	CW	to NMFS
Loligo Squid	1,404,688	TBA	CW	to NMFS
Scup (Summer)	1,044,854	1,285,325	MA	81.3%
Striped Bass	1,163,865	1,061,898	MA	109.6%
Tautog	57,762	54,189	MA	106.6%

Note:
(a) As of January 20, 2012, at 5:00 a.m.

Key:
CW = Coast-wide quota shared between MA and other Atlantic states.
MA = Massachusetts-specific quota.

Source: MA DMF 2012b.

Recreational Fishing

Rhode Island and Massachusetts boast an active recreational fishing sector in coastal waters and in waters throughout the WEA. Information on recreational fishing such as catch (numbers of finfish caught, harvested, and released), fishing effort (number of angler trips), participation (number of people who fished for recreational purposes at least once within the calendar year), economic impact, and activity areas (seasonal and geographical distribution of the catch and effort) is difficult to quantify because less information is collected and published by federal and state regulatory agencies than information on commercial fishing, in part because no federal recreational fishing licensing program is currently in place in the northeastern U.S. (However, it should be noted that the National Saltwater Angler Registry and the Rhode Island Recreational Saltwater Fishing License Program, both of which took effect in 2010, are designed to improve recreational fishing data collection [Rhode Island CRMC 2010]).

A major focus of the Magnuson-Stevens Reauthorization Act, passed by Congress and signed by the President in 2007, was improving catch estimates. In response, the NMFS announced on January 25, 2012, that it has begun to use an improved method to estimate the amount of fish caught by saltwater anglers that will allow rules that fishermen follow to be based on more accurate information (NOAA 2012b). The angler-driven initiative is a new method of counting and reporting marine recreational catch and effort and is part of an overall effort to improve the accuracy of recreational catch data collected by the Marine Recreational Information Program (MRIP). MRIP replaced the Marine Recreational Fisheries Statistics Survey (MRFSS), a nationwide program that provides a database of marine recreational fishing activity, which has been in place since 1979 (USDOC, NOAA, NMFS 2010). The NMFS will use the new method to calculate estimates for the Atlantic coast and Gulf of Mexico regional FMCs and states to use in fishery management and stock assessment.

Before the transition from the MRFSS to the MRIP, the MRFSS consisted of two independent, yet complementary surveys—a Coastal Household Telephone Survey to assess fishing effort of random households within coastal communities from each state and an Access-Point Angler Intercept Survey to assess catch per unit effort. Data from the two surveys are combined to estimate total fishing effort, participation, and catch by species across the nation (USDOC, NOAA, NMFS 2010). Because of the random samples collected via survey methods and the associated margin of error with the MRFSS, one of the goals of the MRIP is to address stakeholder concerns about the reliability and credibility of data. For example, the MRIP has made recreational fisheries statistics for 2010-2011 available. The statistics are more accurate, peer-reviewed data (*see* Table 4-19).

Table 4-19
Recreational Fisheries Statistics for 2010-2011:
Number of Participants of Anglers by Resident Type

Estimate Status	Year	Coastal	PSE	Non-Coastal	PSE	Out-of-State	PSE	Total	PSE
RI FINAL	2010	161,277	11.3	.	.	225,284	14.9	386,560	9.8
MA FINAL	2010	585,553	7.7	152,219	11.3	433,348	9.1	1,171,120	5.3

Note: PSE (proportional standards error) is automatically included in all outputs. It expresses the standard error of an estimate as a percentage of the estimate and is a measure of precision.

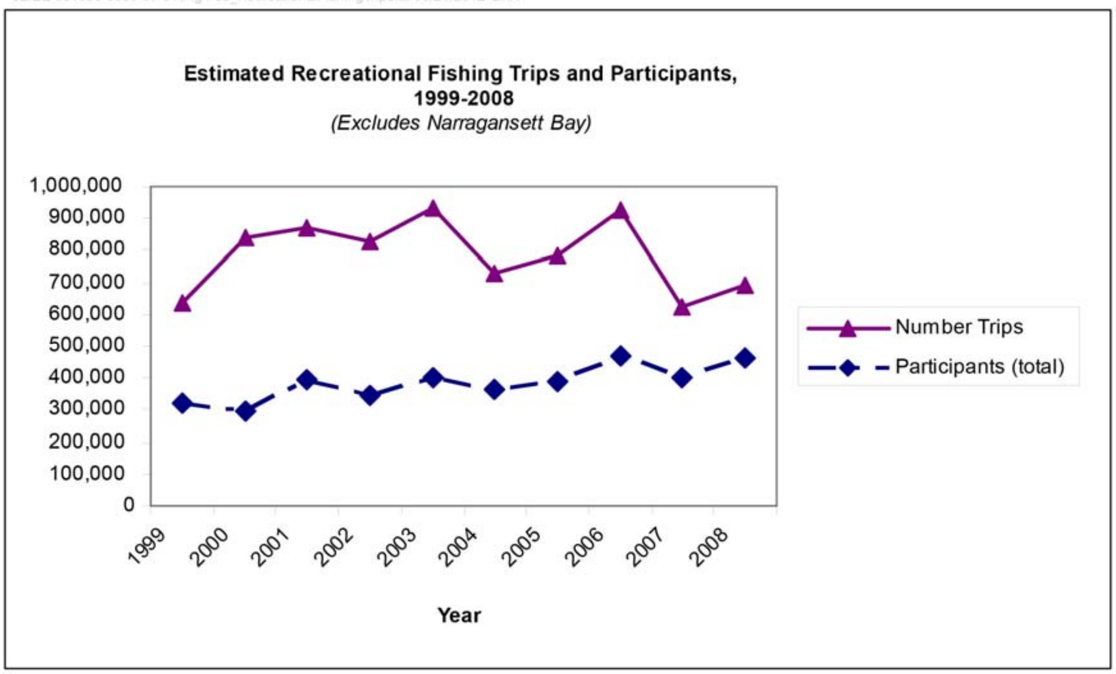
Source: NMFS, Fisheries Statistics Division 2012.

Rhode Island

Recreational fisheries, including for-hire party and charter boats, as well as recreational anglers fishing from private boats, are a major contributor to Rhode Island's economy. Recreational fishing activity occurs both within and outside the WEA (*see* Figure 4-11 above). For example, the Rhode Island Saltwater Anglers Association, the largest recreational fishing organization in the state with 1,800 members, estimates that approximately 30 percent of its members fish roughly once a week outside of Narragansett Bay or the areas covered as part of the Ocean SAMP, while 70 percent of its members fish in the area designated by the Ocean SAMP at least once a year (Rhode Island CRMC 2010). Recreational fishing vessels from every Rhode Island coastal city/town use the Ocean SAMP area. In addition to economic revenue, Rhode Island fisheries have significant non-market value because the industry provides Rhode Islanders with a connection to the sea and to New England's rich maritime history (Rhode Island CRMC 2010).

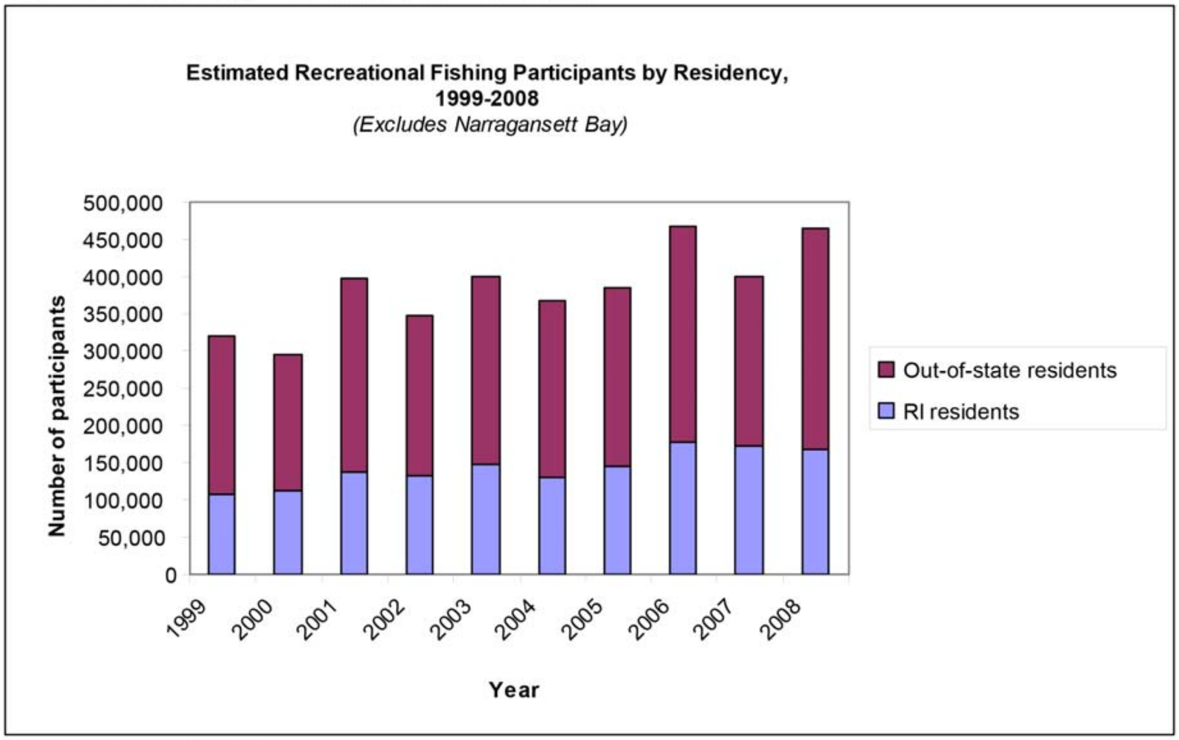
The most common recreationally targeted species in marine waters in Rhode Island include Atlantic bonito, Atlantic cod, black sea bass, bluefish, scup, striped bass, summer flounder, tautog, winter flounder, and yellowfin tuna (NMFS 2008b *as cited in* Rhode Island CRMC 2010). Striped bass and summer flounder (fluke) are the two most commonly caught species in both state and federal waters, followed by bluefish and scup. From 1999 to 2008, an average of approximately 385,000 people participated in recreational fishing in the federal and state waters of Rhode Island annually, making more than 785,000 fishing trips per year (Rhode Island CRMC 2010). These figures include both Rhode Island residents and out-of-state fishermen; an average of approximately 143,000 (37 percent) Rhode Islanders and 242,000 out-of-state residents (63 percent) fished in Rhode Island ocean waters (Rhode Island CRMC 2010). Recreational fishing in Narragansett Bay was not recorded**.** The number of trips and participants from 1999 to 2008 (*see* Figure 4-13), as well as the annual number of participants by residency *(see* Figure 4-14) illustrate that even while the number of trips varies from year to year, participation in recreational fishing has generally grown over the past decade. Figure 4-14 also illustrates how out-of-state fishermen consistently comprise the majority of recreational anglers fishing in Rhode Island ocean waters.

02:EE-001096-0089-07-01\Fig4-38_RecreationalFishingTrips.ai-06/21/2012-GRA



SOURCE: Rhode Island CRMC 2010

Figure 4-13. Estimated Recreational Fishing Trips and Participants, 1999-2008.

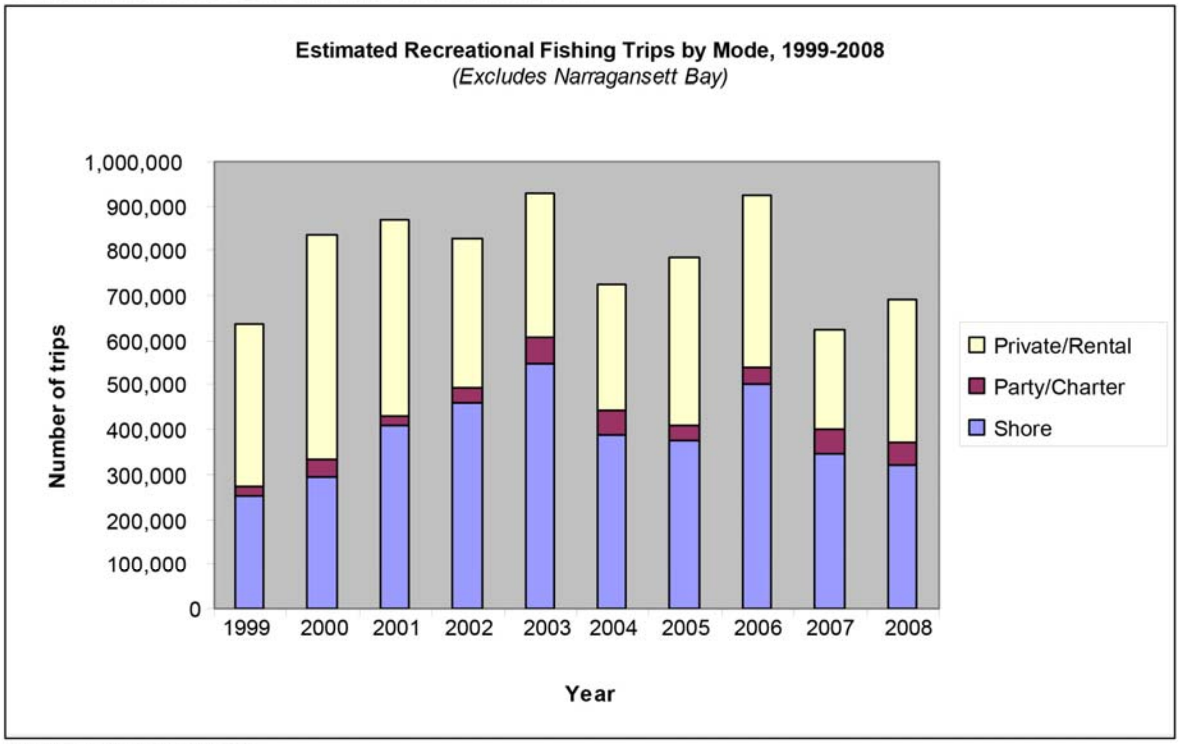


SOURCE: Rhode Island CRMC 2010

Figure 4-14. Estimated Recreational Fishing Participants by Residency, 1999-2008.

Figure 4-15 shows the estimated recreational fishing trips by mode. These data include only recreational fishing in ocean waters, including both federal and state waters, not fishing in Narragansett Bay. Shore-based fishing makes up nearly 50 percent of recreational ocean fishing trips in Rhode Island. Fishing by private boat, whether owned or rented, makes up more than 45 percent of saltwater fishing trips within the state, and many of these trips will take place in the areas in and adjacent to the WEA. Party and charter boat fishing (for-hire fishing), while having the smallest number of trips of the three fishing modes surveyed, occurs almost entirely within the area designated as the Ocean SAMP boundary area.

02:EE-001096-0089-07-01\Fig4-40_RecreationalFishingTripsMode.ai-06/21/2012-GRA



SOURCE: Rhode Island CRMC 2010

Figure 4-15. Estimated Recreational Fishing Trips by Mode, 1999-2008.

Massachusetts

Recreational fishing occurs in both state and federal waters offshore of Massachusetts. Historically, recreational fishing was an important cultural tradition in coastal Massachusetts and has evolved from its early days of subsistence fishing (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). Today, sport fishery includes a component of subsistence fishing, although in a reduced role that is not well-documented. A survey of guides and other expert recreational fishermen indicates that more than 1 million recreational anglers alone regularly use state waters for fishing, primarily hook and line fishing (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). Recreational fishing for lobsters, crab, and shellfish (mostly in the Wellfleet harbor area and some areas where bay scallop is targeted, such as off of Falmouth and upper Buzzards Bay) occurs in the nearshore areas. Recreational shellfishing, however, occurs almost entirely in federal waters, with the exception of the abovementioned areas. Recreational fishing is conducted primarily from the shore and from individually owned vessels or for-hire vessels (charter and party boats). Anglers target a variety of species, including striped bass, black sea bass, bonito, bluefish, cod, cusk, false albacore, haddock, halibut, mackerel, pollock, scup, sharks, smelt, fluke, tautog, bluefin tuna, weakfish, winter flounder, and wolffish (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009).

All of Massachusetts' ports have access to excellent recreational fishing and contribute to the state's economy. For example, the groundfisheries off of Cape Ann, the flounder fishery off of Boston Harbor, and the striped bass fisheries off of Cape Cod and Elizabeth Islands are well-known attractions that bring in visitors and support local business (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009).

Data on recreational lobster fishing and spatial distribution, collected for the first time in 2009, can be further analyzed in tandem with commercial lobster fishing using the statistical reporting areas for the lobster fishery.

Aquaculture

To date, all commercial aquaculture facilities in the United States are located in nearshore waters under state or territorial jurisdiction (Upton and Buck 2010). Aquaculture is a thriving business in Rhode Island, with 33 farms generating a farm gate value of aquaculture products for consumption (Rhode Island-grown shellfish) of $1,785,135 in 2009 (Beutel 2009). Although aquaculture is currently permitted only in Rhode Island state waters[16], open ocean aquaculture or offshore aquaculture may be a potential future use in areas in and around the WEA once national aquaculture standards are established.

The Massachusetts marine aquaculture industry, administered by the Aquaculture Program in the Division of Agricultural Conservation and Technical Assistance[17], is also a very important and growing trade. The Massachusetts shellfish aquaculture industry generated more than $6.2 million in 2006 (Commonwealth of Massachusetts 2012b). At that time, more than 350 individuals and companies were involved in aquaculture in Massachusetts, with nearly 300 of these marine shellfish culture enterprises growing mostly quahogs and American oyster. Although currently focused on shellfish within state waters, with technological advances and improved understanding of oceanographic conditions, offshore aquaculture has considerable promise for the future. Offshore aquaculture has been proposed for Massachusetts, but due to market pressures, use conflicts, and the possibility of environmental impacts, there are currently no offshore commercial aquaculture activities. However, because of technological advances and improved understanding of oceanographic conditions, offshore aquaculture has considerable promise for the future (NH Sea Grant 2006 *as cited in* Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009).

The future of aquaculture beyond state waters in the EEZ (generally 3 to 200 NM from shore) is still unknown because of regulatory uncertainty; furthermore, it is a complex and unpredictable mix of technological, biological, and economic elements that will likely determine the profitability of open ocean aquaculture (Upton and Buck 2010).

4.1.3.3.2 Impact Analysis of Alternative A

Potential effects on commercial and recreational fishing activities can be grouped into two broad categories: (1) displacement of fishing activities and (2) target species availability/species disturbance. Chapter 5.2.23.2 of the Programmatic EIS [USDOI, MMS 2007] discusses impacts

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[16] *See* State of Rhode Island and Providence Plantations Guide to Aquaculture Lease Application (Rhode Island CRMC n.d.; http://www.crmc.ri.gov/applicationforms/AquaApp.pdf).
[17] *See* Massachusetts Aquaculture Permits Guidance Document (Massachusetts Aquaculture Advisory Group 1998; http://www.mass.gov/agr/aquaculture/docs/Aquaculture%20Permit%20Guidance%20Document.pdf).

of typical site characterization and assessment activities on commercial and recreational species. Section 4.1.2.3.2 of this revised EA discusses impacts on fish species and their habitat specific to Alternative A.

Impacts of Routine Activities and Events

Fishing Displacement

During site characterization and construction/installation of meteorological towers and buoys, fishing vessels (primarily recreational party and charter vessels) could be excluded from fishing grounds for short periods in order to avoid conflicts with survey vessels and/or construction vessels. It is anticipated that during installation and decommissioning of a meteorological tower or buoy, a radius of about 1,500 feet (about 457 meters) around the site would be needed for moving and anchoring support vessels. It is estimated that installing a meteorological buoy would take one to three days and installing a meteorological tower would take one to ten weeks (*see* Section 3.1.3, "Site Assessment Activities and Data Collection Structures"). Displacement during site characterization surveys is estimated to be on the order of hours rather than days. Site characterization surveys and construction/installation and decommissioning activities could occur during spring and summer months, which overlap with both recreational and commercial fishing seasons (*see* Section 3.1.2 regarding site characterization scenario). The 2007 Record of Decision (USDOI, MMS 2007) for the renewable energy program adopted the best management practices (BMPs) that must be demonstrated in a lessee's SAP (*see* 30 CFR 585.606(a)(5)). BOEM will not approve a SAP unless it has demonstrated compliance with the BMPs. The Record of Decision states that lessees and grantees shall review planned activities with potentially affected fishing organizations and port authorities to prevent unreasonable fishing gear conflicts. Lessees and grantees shall minimize conflict with commercial fishing activity and gear by notifying state and federal regional fishery management organizations and local fishing groups of the location and timeframe of the project construction/installation activities well in advance of mobilization with updates throughout the construction/installation period. In addition, lessees and grantees shall place proper lighting and signage on applicable alternative energy structures to aid navigation per USCG Navigation and Vessel Inspection Circular (NVIC) 02-07 (USCG 2007) and comply with any other applicable USCG requirements.

Sections 3.1.3.1, "Meteorological Towers and Foundations," and 3.1.3.2, "Meteorological Buoy and Anchor System," describe Alternative A, as well as the estimated footprint of a meteorological tower and buoy. The area of ocean bottom affected by a meteorological tower would range from about 200 square feet (approximately 18.6 square meters), if supported by a monopile, to 2,000 square feet (184.1 square meters) if supported by a jacket foundation. However, with the exception of the project footprint, it is not anticipated that recreational and commercial fishing activities would be excluded from the immediate area. No cables would be installed for site assessment and site characterization activities; however, surveys for cable installation would most likely be conducted. Since no electricity is transmitted from meteorological observation platforms, no electrical cables would connect the meteorological towers and/or buoy structures to shore or to any other structures. As part of the data site characterization study contemplated in this revised EA, ACDPs or fixed Passive Acoustic Monitoring Systems (PAMS) could be deployed on the seafloor near foundations or moorings;

however, these subsurface devices used to collect predevelopment baseline studies are not anticipated to cause problems/entanglement with fishing gear.

It is likely that tying up a vessel to the structure would be prohibited by the project developer because it is private property. If a vessel were to tie up to a meteorological buoy, it could cause the buoy to move away from its mooring location, resulting in further benthic impacts and/or loss of some of the data if measuring or transmitting devices are damaged. Additionally, unauthorized tie-ups to buoys or towers could damage the vessel and harm its occupants. Temporary displacement of recreational fishing to avoid project vessels and construction/installation activities is not anticipated to result in any measurable economic loss from decreased fish catches or from reduced access to fishery resources.

Activities associated with the proposed action (Alternative A) are not anticipated to interfere more than temporarily with commercial fishing efforts in the action area. Furthermore, the majority of commercial fishing is located outside the WEA (s*ee* Figure 4-11 above). Although commercial fishing vessels could travel through the WEA, it is unlikely that survey activities or construction/installation activities would unreasonably interfere with access to the active fisheries beyond the WEA.

Once site assessment activities are completed, any of the installed meteorological towers would be removed to at least 15 feet (5 meters) below the mudline to avoid interfering with future activities in the area (30 CFR 585.910). Once the meteorological towers are removed, the proposed sites would pose no obstacle to commercial or recreational fishing. Meteorological buoys anchors would likewise be removed following the completion of site assessment activities to avoid interfering with future commercial and recreational fishing activities.

Numerous port and marina locations shoreward of the WEA can be used by commercial fishing vessels, recreational vessels, and project vessels. New Bedford Harbor, for example, is used for marine shipping, commercial and recreational fishing, boating tourism, and a mix of other commercial, industrial, and recreational uses. In Rhode Island, the two major commercial fishing ports are Point Judith/Galilee and Newport, along with several smaller fishing ports used by both commercial and recreational fishermen, e.g., Sakonnet Point and Block Island. These commercial fishing ports serve commercial fishermen and fishing vessels from Rhode Island and from other states along the East Coast.

Disturbance of Fish Resources

Fish resources could be temporarily affected by acoustic surveys associated with site characterization activities and by pile-driving activities associated with the installation of the meteorological towers. The most substantial potential effects would be the acoustic effects associated with pile-driving. It is anticipated that fish in the immediate area would leave the area when pile-driving begins, but it is recognized that some fish, depending on development stage, are not mobile or have limited mobility including fish eggs, larvae, and shellfish. Moreover, soft start pile-driving is industry practice and would be required by BOEM (*see* Appendix B) as a condition of any lease or SAP approval to ensure that marine mammals are not affected by the activity. However, if fish do not leave the area during the soft start pile-driving procedure there could be limited mortality. There is also the potential for sub-lethal effects, including damage less than mortality, such as temporary loss of hearing, energetic loss due to displacement, interruption of feeding, generalized stress and masking of sounds important to fish and shellfish (Normandeau Associates, Inc. 2012).

In addition, turbidity would increase during platform installation, resulting in temporary habitat loss. Both positive and negative effects on fish habitat after construction/installation are expected, but these would be negated in any case after decommissioning (*see* Sections 4.1.2.2 and 4.1.2.4 for a full discussion of benthic habitat and fish impacts). Impacts related to construction/installation, operation and maintenance, and decommissioning of the meteorological towers and buoys are expected to be minor and are not expected to result in changes in local community assemblage and diversity. These effects are not expected to have population-level impacts that would affect fisheries and the availability of fish to catch during or between fishing seasons.

Impacts of Non-Routine Events

The potential impacts of non-routine events on water quality are discussed in Section 4.1.1.4.2. During the various phases of Alternative A, vessels, generators, and pile-driving hammers would be the source of diesel fuel, lubricating oil, and hydraulic oil. Spills could occur during refueling or as the result of a collision From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88.6 gallons (U.S. Department of Homeland Security, USCG 2011 *as cited in* USDOI, BOEM, OREP 2012b), and if Alternative A results in a spill in any given area, BOEM anticipates that the average volume would be about the same. If such a diesel or lubricating oil spill occurred, it would be expected to dissipate very rapidly and would evaporate and biodegrade within a few days, resulting in a negligible impact (*see* Section 3.2.3, "Fuel Spills").

4.1.3.3.3 Conclusions

The increase in vessel traffic and activities related to the installation/operation of the meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, the total catch of fish and shellfish, or navigation over any substantial period of time. Any impacts on localized fishing displacement and/or target species availability within the immediate area of activities associated with Alternative A would cover a limited area and are expected to be temporary and to result in negligible impacts on fishing.

4.1.3.4 Cultural Resources

Both site characterization (i.e., surveys and geotechnical sampling) and site assessment activities (i.e., installation of meteorological towers and/or buoys) have the potential to affect historic and pre-contact cultural resources. Construction/installation activities associated with the placement of site assessment structures that disturb the ocean bottom have the potential to affect archaeological sites and traditional cultural properties on or under the seabed. Vessel traffic associated with surveys and structure construction/installation, although indistinguishable from existing ocean vessel traffic could, at times, be visible from coastal areas of both Rhode Island and Massachusetts, potentially impacting historic sites, structures, districts and traditional cultural properties onshore (historic properties). Similarly, although indistinguishable from other lighted structures on the OCS, some meteorological towers and/or buoys might be visible from historic properties onshore. The information presented in this section is based on existing and available information (*see* Section 4.1.3.4.1 below), and it is not intended to be a complete inventory of historic properties within the WEA. BOEM requires that lessees submit results of HRG surveys in SAPs and COPs in order to consider the effects of those undertakings on historic properties (*see* Section 3.1.2, “Site Characterization Surveys”).

4.1.3.4.1 Description of the Affected Environment

An overview of the cultural resources that might be expected on the Atlantic OCS is presented in Chapter 4.2.19 of the Programmatic EIS (USDOI, MMS 2007). Shipwrecks from the 17th to 20th Centuries—particularly ocean-going and coastal sailing vessels and steamers, fishing vessels, and small vernacular craft—could be located in the WEA (Albion *et al.* 1972; Bauer 1988; Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009; Mather and Jensen 2010; McLoughlin 1978; Massachusetts Ocean Resource Information System; MA CZM n.d.(b); Rhode Island CRMC 2010; Automated Wreck and Obstruction Information System [AWOIS] NOAA Office of Coast Survey n.d.; Robinson *et al.* 2003; Rhode Island Shipwreck Database; and TRC Environmental Corporation 2011). The potential for finding shipwrecks increases in areas of historic shipping routes, harbor approaches, fishing grounds, and narrow straits, reefs, and shoals. Positioned between larger ports in Boston and New York, the WEA is situated just offshore of ports in Narragansett Bay and Rhode Island Sound. Additionally, the WEA is located in an area that would have been traversed regularly by vessels travelling through Long Island and Nantucket shoals. This extensive maritime history increases the potential for the presence of shipwrecks within the WEA (Mather and Jensen 2010; Bauer 1988). Accordingly, BOEM’s Atlantic OCS Shipwreck Database identifies the WEA as located in a region of high probability for shipwreck presence (TRC Environmental Corporation 2011).

BOEM’s Atlantic OCS Shipwreck Database lists 140 known or reported wrecks for the state of Rhode Island and 762 for the state of Massachusetts. In the WEA, based on the review of existing and available information, there are at least seven known probable wreck sites and, according to NOAA’s Automated AWOIS (NOAA Office of Coast Survey n.d.), nine obstructions or objects of unknown character. The AWOIS system lists more contacts because, according to BOEM (TRC Environmental Corporation 2011), it includes some features from survey data that may not be shipwrecks.

Submerged pre-contact cultural resources also could be present in the WEA. BOEM noted the area as having a high probability for such sites (TRC Environmental Corporation 2011), although the potential for site preservation is complex and localized (Merwin and Bernstein 2003; Merwin, Lynch, and Robinson 2003; Stanford and Bradley 2012). The WEA was fully covered by glaciers and unavailable for habitation at the late glacial maximum, around 21,500 calendar years before present (BP) (calibrated years before the present). Isostatic uplift and most sea level rise occurred from 16,500 BP to 5,000 BP, or later (Boothroyd and August 2008; Coleman and McBride 2008; Peck and McMaster 1991; Rhode Island CRMC 2010). When it was exposed, the inner continental shelf would have had aspects like modern coastal zones of southern New England and Long Island, comprised of estuaries, lagoons, and protected embayment environments all creating the potential for human settlement and exploitation (Robinson *et al.* 2004). The Rhode Island Shelf Valley, whose margins have potential for archeological sites, is a submerged paleochannel feature within the WEA that contained and then drained the Buzzards Bay lobe of glacial ice (Coleman and McBride 2008; Rhode Island CRMC 2010).

Submerged prehistoric sites can be expected on the inner continental shelf ranging from the pre-Clovis times (earlier than 13,000 BP) and Clovis Paleo-Indian times (between 13,000 and 11,500 BP), and up to Early Archaic times (between 11,500 BP to 9,000 BP) (Rhode Island CRMC 2010, Robinson *et al.* 2004; TRC Environmental Corporation 2011). Oldale and O'Hara (1980) estimate submergence of the inner continental shelf (and the WEA) began 11,000 BP, during the Early Archaic and younger sites would not be expected in the WEA (*see also* Boothroyd and August 2008; Blanchon 2011).

4.1.3.4.2 Impact Analysis of Alternative A

Chapter 5.2.19 of the Programmatic EIS discusses possible impacts to potential cultural resources, both direct and indirect, that could occur as a result of site characterization and assessment activities (USDOI, MMS 2007). Potential cultural resources offshore of Rhode Island and Massachusetts that could be impacted by leasing, site characterization, and site assessment associated with Alternative A are discussed below.

Impacts of Routine Activities and Events

Site Characterization Activities

As detailed in Chapter 3.5.2 of the Programmatic EIS (USDOI, MMS 2007), site characterization activities entail "integrated marine geophysical/hydrographic surveys and geotechnical/sediment sampling programs." Geophysical surveys do not impact the bottom and therefore have no ability to impact cultural resources. Geotechnical/sediment sampling does impact the bottom and therefore does have the ability to impact cultural resources. However, if the lessee conducts HRG surveys prior to conducting geotechnical/sediment sampling, the lessee will be able to avoid impacts to historic properties. Therefore, BOEM will require the lessee to conduct HRG surveys prior to conducting geotechnical/sediment sampling and when a potential historic property is identified, the lessee will be required to avoid it. Inclusion of the following elements in the lease(s) will ensure avoidance of historic properties. The following language will be included in leases issued within the WEA under the Smart from the Start Initiative:

The lessee may only conduct geotechnical (sub-bottom) sampling activities in areas of the leasehold in which an analysis of the results of geophysical surveys has been completed for that area. The geophysical surveys must meet BOEM's minimum standards (*see* "Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585"), and the analysis must be completed by a qualified marine archaeologist who both meets the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44738-44739) and has experience analyzing marine geophysical data. This analysis must include a determination of whether any potential archaeological resources are present in the area and the geotechnical (sub-bottom) sampling activities must avoid potential archaeological resources by a minimum of 164 feet (50 meters). The avoidance distance must be calculated from the maximum discernible extent of the archaeological resource. In no case may the lessee's actions impact a potential archaeological resource without BOEM's prior approval.

Additionally, during all ground-disturbing activities, including geotechnical sampling, BOEM requires that the lessee observe the unanticipated finds requirements stipulated in 30 CFR 585.802. If the lessee, while conducting activities, discovers a potential cultural resource such as the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock), pre-contact artifacts, and/or relict landforms within the project area, then the SOCs would be followed (*see* Appendix B, Section B.1).

Finally, vessel traffic associated with surveys activities, although indistinguishable from existing ocean vessel traffic, could at times be within the viewshed of onshore cultural resources sites and properties. These effects would be limited and temporary (*see* Section 4.1.3.1, "Aesthetics and Visual Impacts").

Site Assessment Activities

For site assessment activities, this revised EA considers the impacts of construction/ installation and operation of up to four meteorological towers and up to eight meteorological buoys. Although the construction/installation of meteorological towers and buoys would impact the bottom, the lessee's SAP must be submitted to and approved by BOEM prior to construction. The SAP must contain information that would assist BOEM in complying with the National Historic Preservation Act (NHPA) of 1969 (*see* Section 5.2.4) and other relevant laws (30 CFR 585.611(a),(b)(6)), which include a description of the archaeological resources that could be affected by the activities proposed in the plan. Under its Programmatic Agreement (*see* Appendix E), BOEM will then consult to ensure potential effects to historic properties are avoided, minimized, or mitigated under Section 106 of the NHPA.

It is anticipated that bottom disturbance associated with the installation of meteorological towers and buoys would disturb the seafloor in a maximum radius of 1,500 feet (approximately 450 meters) or 162 acres (65.6 hectares) around each bottom-founded structure. This includes all anchorages and appurtenances of the support vessels. Direct impacts to archaeological resources within 1,500 feet of each meteorological tower and buoy would be the result of direct destruction or removal of archaeological resources from their primary context. Although this would be extremely unlikely given that site characterization surveys described above would be conducted prior to the installation of any structure (*see* e.g., 30 CFR 585.610 and 585.611), should contact between the activities associated with Alternative A and an historic or pre-contact site occur, there may be damage or loss to archaeological resources.

Should the surveys reveal the possible presence of an archaeological resource in an area that may be affected by the planned activities, the applicant would have the option to demonstrate through additional investigations that an archaeological resource either does not exist or would not be adversely affected by the seafloor/bottom-disturbing activities (*see* 30 CFR 585.802(b) and the Programmatic Agreement presented in Appendix E of this revised EA). Although site assessment activities have the potential to affect cultural resources either on or below the seabed or on land, existing regulatory measures, coupled with the information generated for a lessee's initial site characterization activities and presented in the lessee's SAP, make the potential for bottom-disturbing activities (e.g., anchoring, installation of meteorological buoys and/or towers) to damage to cultural resources very low.

Meteorological towers installed under Alternative A would likely not be visible from shore based on the narrow profile of the structure, distance from shore; earth curvature, waves, and atmosphere (*see* Section 4.1.3.4, "Visual Aesthetics", of this revised EA). Existing ports and other onshore infrastructure are capable of supporting site assessment activities with no expansion (*see* Section 4.1.3.7). Visual impacts to onshore cultural resources would be limited and temporary in nature and would consist predominately of vessel traffic, which most likely also would not be distinguishable from existing vessel traffic. Therefore, the likelihood of impacts on onshore cultural resources from meteorological structures and from construction vessel traffic also would be very low.

Impacts of Non-Routine Events

Of the identified non-routine events of allision and collision, storms, and fuel spills, only storms could impact cultural resources, if anchors are dragged. Depending on the anchoring systems of the towers and buoys, this revised EA assumes the use of data collection devices mounted on a fixed or pile-supported platform (i.e., monopile, jackets, or gravity bases). It is anticipated that fixed or pile-supported platforms (compared with semi-submersible or tension-leg floating platforms) would result in fewer impacts from bottom disturbance and noise, due to a smaller footprint. Project vessels are unlikely to be present or engaged in anchoring offshore during storms. In the event of a storm of magnitude, a post-storm survey would be conducted to ascertain anchor/structure location. The cultural resource site information obtained from the site characterization HRG studies would be used to assess any likely damage to a resource from unanticipated drag events. In the event that BOEM determines that a historic property has been or may have been impacted, the lessee would be required to conduct additional investigations, protect and/or mitigate adverse effects, and, if applicable, pay reasonable costs for BOEM carrying out its preservation responsibilities under the OCS Lands Act and section 110(g) of the NHPA (*see* 30 CFR 585.802(b))

4.1.3.4.3 Conclusions

Bottom-disturbing activities have the potential to affect historic and pre-contact cultural resources. However, existing regulatory measures, information generated for a lessee's initial site characterization activities, and the unanticipated discoveries requirement make the potential for bottom-disturbing activities (e.g., coring, anchoring, and installation of meteorological towers and buoys) to have an adverse effect (i.e., cause significant impact or damage) on cultural resources very low. Impacts on onshore cultural resources from meteorological structures and vessel traffic associated with surveys and structure construction/installation are expected to be negligible.

4.1.3.5 Demographics and Employment

4.1.3.5.1 Description of the Affected Environment

The proposed action that is the subject of this revised EA is the issuance of wind energy leases within all or some of the Rhode Island and Massachusetts WEA, and the approval of site assessment activities within those lease blocks. It is important to note that the proposed action (Alternative A) does not include the consideration or approval of any commercial operation of any wind energy facilities. Additional analysis under NEPA will be required before any future decisions are made regarding construction/installation, operation and maintenance, or decommissioning of any future wind energy facility to be sited in the WEA. The U.S. Atlantic region's coastal communities are characterized in the Programmatic EIS as being socioeconomically similar (USDOI, MMS 2007), particularly in the large metropolitan areas of the northeast region, including Boston, and in the large number of smaller urban and suburban areas located in Rhode Island and Massachusetts. These areas tend to comprise complex economic structures with a variety of industries, labor markets, and occupations. In addition, a large number of local and regional market areas serve specific industries (such as fishing and agriculture) that comprise simpler economic structures and smaller, less-diversified labor markets. The coastline of much of New England is characterized by these small communities, which primarily rely on the economic sectors of agriculture, fishing, recreation, and tourism. These communities are usually less economically and culturally diverse than their urban counterparts (USDOI, MMS 2007). The population, establishments, employment, and wages of the ocean economy in the coastal counties of Rhode Island and Massachusetts are listed in Table 4-20. Massachusetts has a smaller percentage of their population below the poverty line when compared to the U.S. average of 10.8 % and Rhode Island has a number slightly above the U.S. average. Median household income in Rhode Island and Massachusetts as listed in Table 4-20 is also above the U.S. average of $51,918.

Coastal counties are those defined by the coastal states in accordance with the federal Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. 1450 *et seq.*). Because the WEA would be 10.4 NM or more from the nearest coastal point, any data-gathering activities for the proposed action would not have adverse environmental or health effects on minority or low-income populations since no coastal facilities would be added or expanded during site assessment or site characterization activities proposed.

Table 4-20
Population and Economic Data for Adjacent Coastal Counties in Rhode Island and Massachusetts

State	Population (1)	Establishments	Employment	Persons Below Poverty Line	Median Household Income
Rhode Island	1,052,567	1,915	30,069	12.2%	$54,902
Massachusetts	6,547,629	5,193	80,073	10.5%	$64,509

Source: (1) National Ocean Economics Program 2010. NOEP data are from state labor agencies, the Bureau of Labor Statistics, and the Bureau of Economic Analysis. Values include 2006-2010 average data for Rhode Island, Massachusetts, and the U.S.

4.1.3.5.2 Impact Analysis of Alternative A

Various support services located in the coastal counties of Rhode Island and Massachusetts would be needed to implement Alternative A. However, the duration of activities is anticipated to be relatively short-term with a minor increase in temporary employment. It likely would not lead to long-term employment of local workers or have a noticeable long-term effect on the local economy. Operation and maintenance of the meteorological towers and buoys would be limited and intermittent and are not expected to affect local employment numbers. Spending by workers on goods and services offered and supplied by the host communities in Rhode Island and Massachusetts would temporarily stimulate the local economies.

4.1.3.5.3 Conclusions

Alternative A is anticipated to have negligible but positive impacts on the coastal communities in Rhode Island and Massachusetts, with a minor increase in temporary employment and population and subsequent spending on support services for the duration of activities associated with Alternative A.

4.1.3.6 Environmental Justice

4.1.3.6.1 Description of the Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," (59 FR 7629, February 11, 1994) directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, or actions on minority and low-income populations. If such an impact is identified, appropriate mitigation measures must be implemented. The Programmatic EIS contains the complete description of the method of analysis (USDOI, MMS 2007). This analysis follows guidelines described in the CEQ"s Environmental Justice Guidance under NEPA (CEQ 1997) and any recommended actions if impacts are identified.

4.1.3.6.2 Impact Analysis of Alternative A

The WEA is 10.4 NM or more from the nearest coastline and any data-gathering activities or construction/installation occurring in the WEA would not have disproportionally high or adverse environmental or health effects on minority or low-income populations. Only onshore activities would have the potential to impact minority or low-income populations in the coastal communities. Onshore activities associated with surveys or construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys would be limited to work at existing fabrication sites, staging areas, and ports. However, as expansion of these onshore facilities as a result of Alternative A activities is not anticipated, minority or low-income populations are not expected to be affected.

4.1.3.6.3 Conclusions

Alternative A is not anticipated to incur disproportionally high or adverse environmental or health effects for minority or low-income populations due to the distance of the WEA from shore, the short duration of onshore and nearshore activities, and the use of existing fabrication sites, staging areas, and ports.

4.1.3.7 Land Use and Coastal Infrastructure

4.1.3.7.1 Description of the Affected Environment

Existing large to small commercial ports and harbors or industrial areas comprising the coastal infrastructure in Rhode Island and/or Massachusetts are expected to be used when implementing the proposed action. Existing sites would be used for fabrication, as staging areas, and crew/cargo launch sites for the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys and to depart and return from conducting surveys. Expansion of existing port or industrial areas is not expected to be necessary for the proposed action, i.e., site surveys, construction/installation, operation and maintenance, or decommissioning activities related to meteorological towers and buoys.

Proximity to the offshore lease blocks, the capacity of coastal infrastructure to handle the proposed activities associated with the proposed action, and/or established business relationships between port facilities and potential lessees are key determinants of where a lessee would choose to stage operations. Of the 149 largest ports (measured by annual cargo tonnage) in the United States, 35 are located along the East Coast (ERG 2010 *as cited in* USDOI, BOEM, OREP 2012b). Numerous smaller ports in Long Island Sound, Buzzards Bay, and Vineyard Sound are closer to the WEA. Because anticipated offshore site characterization work would generally be smaller in scale than other activities within existing ports, port infrastructure requirements also would likely be smaller. Because of their proximity to the WEA, the majority of onshore activities would be divided among existing commercial ports in Narragansett Bay, Rhode Island, and/or Buzzards Bay, Massachusetts, and/or smaller ports in Rhode Island and Massachusetts.

Land Use

Rhode Island

USGS land use and land cover maps show that development along the Rhode Island coastline is heaviest around Narragansett Bay, particularly around the cities of Providence and Newport, where the coastline is developed primarily with medium- to high-density residential areas and commercial and industrial development (*see* Figure 4-16). Outside the Narragansett Bay area, land use along the remaining Rhode Island coastline is predominantly agricultural and residential. Land use along the Block Island shoreline is primarily scattered, low- to medium-density residential and agricultural land (United States Geological Survey Gap Analysis Program [USGS GAP] 2011, RIDEM 2009). State- and municipally managed lands, such as Scarborough State Beach and Misquamicut State Beach, are also located intermittently along the Rhode Island coastline (RIDEM 2009).

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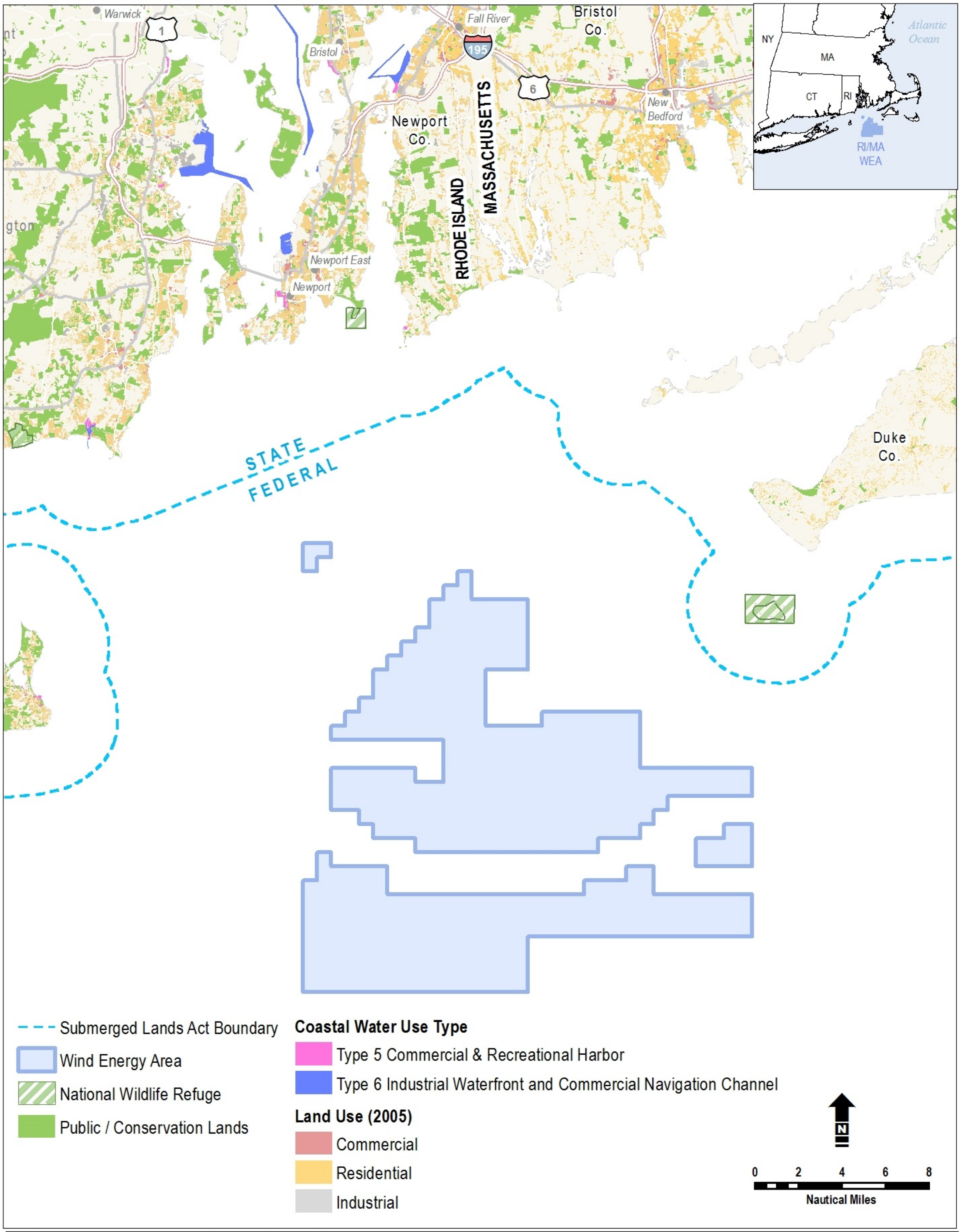


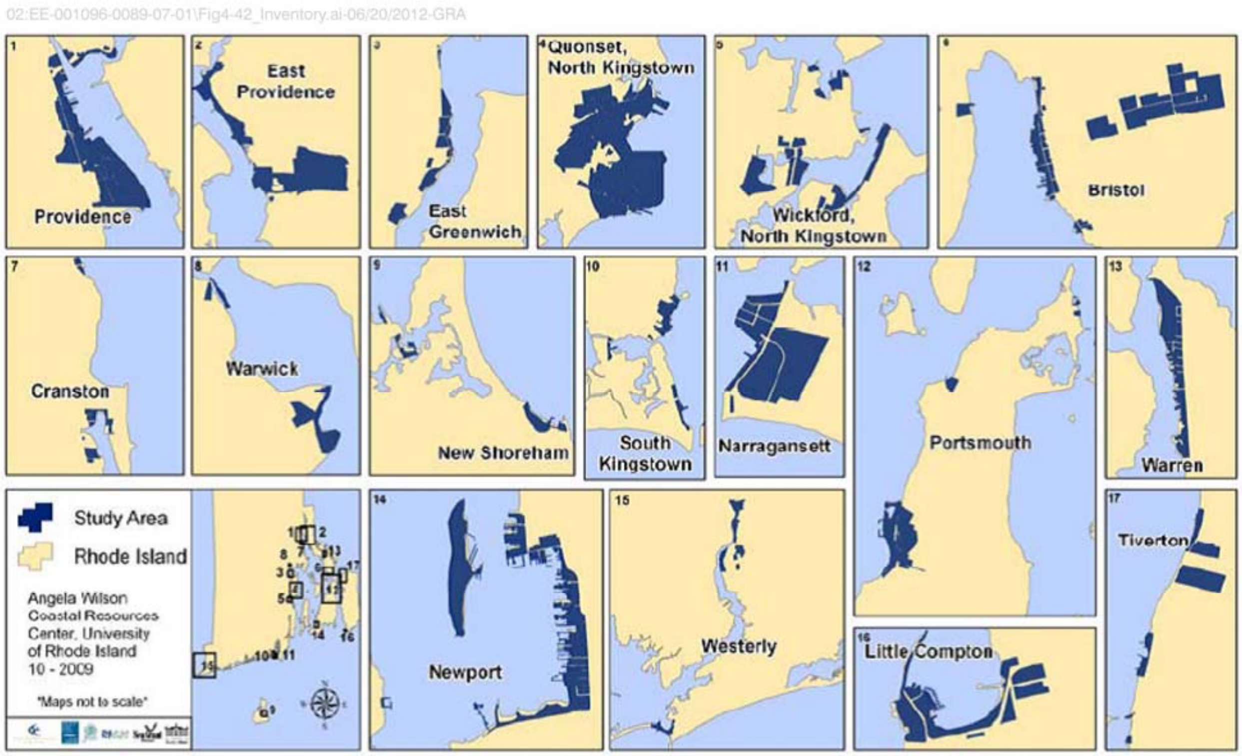
Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; RI OceanSAMP 2009

Figure 4-16. Land Use, Coast Water Use Types, and Public Lands, Rhode Island and Massachusetts Wind Energy Area.

The waters within a 0.5-mile (0.8-kilometer) area around the Rhode Island coast have been classified by the Rhode Island CRMC as Type 5 and Type 6 Waters. Type 5 Waters are commercial and recreational harbors**,** such as Newport Harbor, that support a mix of commercial and recreational waterfront activities. These activities (i.e., commercial fishing, recreational boating, ferry service) are traditional for Rhode Island and constitute important components of the state's tourism industry. Type 6 Waters are industrial waterfronts and commercial navigation channels**,** such as the Port of Providence, that have made extensive physical alterations to accommodate the commercial and industrial water-dependent and water-enhanced activities they support. In these waters, water-dependent industrial and commercial activities take precedence over all other activities. For both Type 5 and Type 6 Water classifications, maintenance of adequate water depths is essential, high water quality is seldom achievable, and some filling is permitted following appropriate permit processes. Seven percent of Rhode Island's coastline is zoned Type 5 (3 percent) and Type 6 (4 percent) Waters (McCann *et al.* 2010).

According to *Rhode Island Ports & Commercial Harbors: A GIS-based Inventory of Current Uses and Infrastructure* completed in August 2010 (Becker *et al.* 2010), statewide there are 1,946 berthing spots that vary in length (10 to 2,600 feet [about 3 to 792 meters] long) and depth (3 to 40 feet [less than 1 to about 12 meters] deep). There are 431 acres (about 174 hectares) of lay-down space and 58 parcels with active rail. Of the 1,028 parcels (3,009 acres [about 1,218 hectares]) that are zoned for commercial or industrial uses in coastal Rhode Island, 176 parcels (879 acres [about 356 hectares]) are being used for marine commercial or industrial purposes. Within the 176 marine commercial or industrial parcels, 30 parcels are utilized by Type 5 Waters and 79 parcels are utilized by Type 6 Waters. There are 384 parcels (1,204 acres [about 487 hectares]) being used for water-dependent, water-related, or water-enhanced uses. Four parcels (64 acres [about 26 hectares]) are vacant, zoned commercial or industrial, are within 200 feet (about 61 meters) of Type 6 Waters, and are 200 feet (about 61 meters) from water with a depth of 25 feet (almost 8 meters) or more.

There are 17 major waterfronts from 16 Rhode Island municipalities: Providence; East Providence; East Greenwich; Quonsett/Davisville, North Kingstown; Wickford, North Kingstown; Bristol; Cranston; Warwick; New Shoreham; South Kingstown; Narragansett; Portsmouth; Warren; Newport; Westerly; Little Compton; and Tiverton (*see* Figure 4-17) Marine/commercial utilization is highest (77 percent) in Providence, followed by 20 percent in Newport, and 10 percent at Warwick (Becker *et al.* 2010). The largest recreational marine use is Newport (32 percent) compared to 10 percent in Warwick and 8 percent in Providence (Becker *et al.* 2010).



SOURCE: Becker et al 2010

Figure 4-17. Rhode Island's Ports and Commercial Harbors Inventory Study Area.

Massachusetts

The majority of the Massachusetts coast, including the coasts of Buzzards Bay and Vineyard Sound, is zoned primarily for single-family residence and single-family residence/agricultural use, with lesser amounts of the coast zoned for multi-family residences. Industrial, commercial, and mixed-use zoning on the Massachusetts coast is most common in and surrounding the cities of New Bedford, Boston, and Gloucester (MassGIS 2007). USGS land use and land cover maps show that development is heaviest in and around the cities of Boston and New Bedford (USGS GAP 2011). Coastal conservation land in Massachusetts is most prominent on outer Cape Cod, where the Cape Cod National Seashore encompasses 44,600 acres (about 18,049 hectares) of land, although smaller state and municipally managed lands are present along the coastline as well (NPS 2010) (*see* Public Lands below).

MA CZM has classified portions of the waterfront in New Bedford and Fairhaven as Designated Port Areas under a program to preserve and promote the maritime industry. The port is developing the New Bedford Marine Commerce Terminal to serve as a hub to support offshore energy developments and import/export trade (New Bedford Harbor Development Commission 2011a).

Coastal Infrastructure

Coastal infrastructure of southern Rhode Island and southwest Massachusetts includes the commercial port facilities of Quonset/Davisville, Providence, Rhode Island, and Fall River, Massachusetts, and passenger ferry, cruise ship, and Navy port facilities in Newport and Quonset/Davisville. There are three entrances to Narragansett Bay: the West Passage (between Point Judith and Beavertail Point), the East Passage (between Beavertail Point and Brenton Point), and the mouth of the Sakonnet River (between Sachuest Point and Sakonnet Point), which allow offshore vessels access to the coastal port facilities (*see* Figure 4-18).

The East Passage provides access to a channel with a depth of about 60 feet (about 18 meters) (NOAA, NOS 2009) and is used by all deep-draft vessels and most tug-and-barge traffic entering and leaving Narragansett Bay. The West Passage is used by some tug-and-barge traffic along with some large commercial fishing vessels (McCann *et al.* 2010). The West Passage also serves as a back-up channel for commercial traffic if the East Passage is not navigable (e.g., coastal hazard or other event). Traffic into the Sakonnet River consists largely of recreational vessel traffic and some cruise ship traffic (Weavers Cove Energy LLC 2009). It is also used as a shortcut by tugs berthed in Fall River and transiting to and from Buzzards Bay to tow or escort barge traffic through the bay and the Cape Cod Canal. (For more information, see the Rhode Island Ports and Commercial Harbors Inventory [Becker *et al.* 2010], which provides more detail and description of the purpose of each port and an inventory of numerous attributes.)

Ferries connect Rhode Island mainland destinations such as Fort Adams, Newport, and Point Judith to Martha's Vineyard and Block Island; other ferries link Connecticut and New York ports with Rhode Island and Massachusetts destinations (Becker *et al.* 2010; McCann *et al.* 2010). Significant ferry ports are Montauk Harbor, New York; New London, Connecticut; Point Judith, Rhode Island; Newport, Rhode Island; Quonset, Rhode Island; New Harbor and Old Harbor, Block Island; and Oak Bluffs, Martha's Vineyard.

Cruise ships use the ports of Bristol, Newport, Block Island, and Providence in Rhode Island. The U.S. Navy maintains a variety of strategic facilities at Naval Station Newport, and submarine traffic originates primarily from New London, Connecticut. Other commercial and recreational fishing vessels use the navigational channels and coastal infrastructure within the area when fishing or traveling to fishing grounds. Fishing vessels use the same navigational infrastructure and some of the same port facilities as the commercial and naval vessels. However, fishing vessels rely on fishing-related infrastructure in Point Judith, Newport, Block Island, and other Rhode Island ports.

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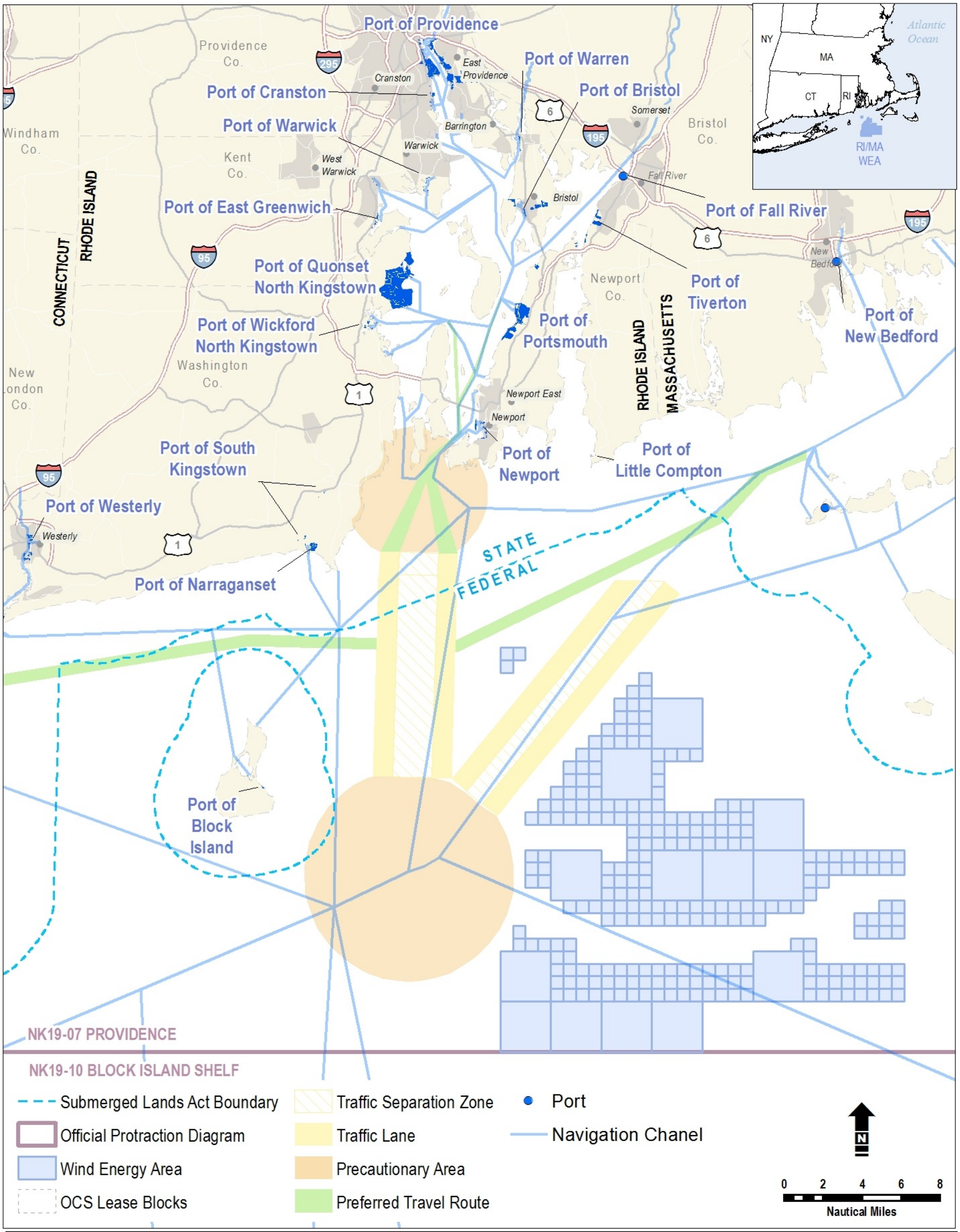

Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; RI OceanSAMP 2009

Figure 4-18. Selected Ports and Navigation Features.

Industrial Waterfronts

The Port of Providence and the Quonset Business Park are Rhode Island's two existing inter-modal ports. Both locations have the infrastructure and geographic requirements to successfully promote freight and/or passenger transportation, including a fully intact marine component, deep-water access, proximity to open ocean, and connections to land transportation infrastructure (Becker *et al.* 2010). Four waterfronts (Providence, Quonset Business Park, East Providence, and Tiverton) are capable of handling industrial-scale cargo such as dry bulk and/or liquids (Table 4-21). Seven waterfronts have at least one commercial or industrial facility currently being used to transport smaller scale commercial/retail cargo such as store goods and equipment and/or passengers.

Table 4-21
Commercial or Industrial Facilities per Municipality

Municipality	Commercial or Industrial Facilities
Bristol	Prudence Island Ferry (commercial ferry)
East Providence	Exxon Mobil and Capital Terminals (liquid cargo)
Narragansett	Block Island Ferry (commercial ferry)
New Shoreham	Block Island Ferry, High Speed Ferry (commercial ferry)
Newport	Block Island Ferry, Jamestown-Newport Ferry, Providence-Newport Ferry (commercial ferry service)
North Kingstown	Martha's Vineyard Ferry (commercial ferry), Port of Davisville Piers 1 and 2, Norad, Inc. (roll-on/roll-out facility), SeaFreeze (dry bulk cargo)
Portsmouth	Prudence Island Ferry (commercial ferry)
Providence	Sprague Energy Corp., Hudson Terminal Corp., Motiva Enterprises, New England Petroleum, Lehigh Terminal, TEPPCO Terminal (liquid cargo), Univar Terminal, North Pacific Plywood, Abhu Merhi Lines, St. Lawrence Cement Co., Schnitzer Northeast (dry bulk cargo), Providence Piers (commercial ferry)
Tiverton	Inland Fuel Terminals (liquid cargo)

Source: Becker *et al.* 2010.

Vacant Land

Becker *et al.* (2010) provides an inventory of vacant land around Narragansett Bay. A total of 1,493 acres (about 604 hectares) in 128 parcels scattered around the bay are vacant (Table 4-22). A vacant parcel by definition has no current use or activity, and there are no developments under way or permits pending. Of these 1,493 vacant acres, 1,014 acres (about 410 hectares; 75 parcels) are zoned for commercial and industrial use.

Table 4-22
Vacant Parcels by Municipality

Municipality	Parcels	Acres
Bristol	10	2
Cranston	2	1
E. Providence	32	644
Narragansett	1	1
Newport	1	1
N. Kingstown (Quonset and Wickford)	49	302
Portsmouth	9	367
Providence	13	63
Tiverton	6	109
Warren	4	2
Westerly	1	1
TOTAL	**128**	**1,493**

Source: Becker *et al.* 2010.

Public Land

Land use along the coasts of Rhode Island and southern Massachusetts includes open public land managed by the federal government, the states, or not-for-profit organizations. Public land in Massachusetts on the west side of Buzzards Bay includes a few scattered holdings: West Port Harbor Entrance Lighthouse (federal), Horseneck Beach State Reservation (state), Gooseberry Island (state), Demarest Lloyd State Park, Stetson-Piney Island Reserve (state), and Allens Pond Wildlife Sanctuary (non-governmental organization [NGO]). Two public land holdings are on the east side of Buzzards Bay: Great Sippewissett Marsh (NGO) and Little Sippewissett Marsh (municipal). Public lands on Martha's Vineyard Island include six NGO properties, Joseph Sylvia State Beach, and Menemsha Beach, a municipal beach along the West Basin of the island. Nantucket Island's five public lands are Eel Point and Madaket on the west end, Coskata-Coatue Wildlife Refuge on the northern spit, Sandfort Farm-Ram Pasture-Cisco Ranch complex on the southwest portion, and South Pasture on the southeast portion of this island, all owned by NGOs. The locations of public lands and more information can be obtained at (http://www.mass.gov/mgis/mapping.htm) and (http://www.dem.ri.gov/maps/index.htm).

4.1.3.7.2 Impact Analysis of Alternative A

Impacts of Routine Activities

Offshore Site Characterization Surveys

Offshore site characterization surveys of all the potential lease blocks in the WEA would involve multiple vessels and would likely take place over a five-year period. These vessels would need to accommodate all of the necessary survey equipment and conduct many surveys simultaneously to be the most efficient; thus, BOEM anticipates that vessels 65- to 100-feet (about 20 to 30 meters) long would be used because this size of vessel would be able to accommodate a crew for several days and be large enough to carry all the necessary equipment and instruments.

Survey vessels would use existing ports and harbors (Type 5 and 6 Waters) for trip departures and returns and require a diesel refueling station. Construction vessels may require facilities with large cranes to load and unload large pieces of equipment, which would require a commercial port and Type 6 Waters (USDOI, BOEM, OREP 2012b).

Vessels conducting HRG surveys and geotechnical sampling work can either depart from one of the 18 large commercial ports or numerous smaller commercial ports (if those ports meet the requirements of the project) along the Eastern Seaboard, but primarily from Narragansett Bay because it is closer. The proximity to the lease blocks from a port would likely be the key determinant of where survey work would originate. Because the survey vessels expected to be used for HRG surveys and geotechnical sampling are smaller than most commercial vessels and require a smaller navigation channel depth, survey crews could depart from most existing commercial ports in Type 5 and 6 Waters.

The total vessel traffic estimated as a result of the HRG surveys and geotechnical sampling work could be reasonably anticipated in connection with the proposed action would range from about 930 to 1,970 round trips over five years and spread over existing and available port facilities in Rhode Island and Massachusetts (*see* “Operation and Maintenance of Towers” in Section 3.1.3.1, “Meteorological Towers and Foundations”). Current port infrastructure can support this vessel traffic.

Site Assessment: Onshore Activities

A meteorological tower platform would be constructed or fabricated onshore at a platform fabrication yard. BOEM assumes one meteorological tower per leasehold for a total of up to four meteorological towers. Tower construction operations at a fabrication yard would include delivery of materials, cutting, welding, and assembling of steel components. The yard would occupy large areas with equipment such as lifts and cranes, welding equipment, rolling mills, and sandblasting machinery. The location of a suitable fabrication yard is directly tied to the availability of a shipping channel that is large enough to allow towing these bulky and long structures out to the offshore lease block.

A suitable fabrication yard would have water access with an average bulkhead depth of 15 to 20 feet (about 5 to 6 meters). A suitable fabricator must also consider other physical limitations, such as the ability to clear bridges and navigate tight corners within channels. Thus, suitable platform fabrication yards must be located at deep-draft seaports or along wider and deeper inland channels. The meteorological tower would likely be manufactured at an existing commercial facility in sections and then shipped by truck, rail, or sea to the onshore staging area. The meteorological tower would be partially assembled and loaded onto a barge for transport/towing to the installation site offshore. Final assembly of the tower would be completed offshore.

BOEM assumes that the staging areas for meteorological towers would be any of the existing ports in Rhode Island and Massachusetts (*see* Section 3.1.3.1, "Meteorological Towers and Foundations"). BOEM assumes zero to one meteorological buoy per leasehold may be used instead of a meteorological tower; thus a maximum of eight buoys may be anticipated for the up to four leases. A meteorological buoy can vary in height, breadth, hull type, and anchoring method. Several meteorological buoy manufacturers are located domestically with headquarters in Colorado, California, and Florida (Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology 2011). International meteorological buoy manufacturers and designers are also likely competitors with domestic firms. For example, Deepwater Wind, LLC has deployed a buoy that was manufactured in the United Kingdom (USDOI, BOEM, OREP 2012b).

Once constructed, an approximately 15-ton buoy would be barged to a testing location (Kuffner 2010 *as cited in* USDOI, BOEM, OREP 2012b). Whether the meteorological buoys originate domestically or internationally, it is likely that for future offshore site assessment work, meteorological buoys would arrive from manufacturers to the lessee's staging areas by truck, rail, or sea, then be assembled and fitted with instrumentation and tested before deployment via a vessel with enough deck space to accommodate a structure potentially up to 40 feet (about 12 meters) in width as well as a crane to lower the buoy into the sea (USDOC, NOAA, NOS 2007). BOEM assumes that the staging areas for meteorological buoys would be any of the exiting ports in Rhode Island and Massachusetts.

Currently, four proposed OCS wind energy-related projects are in various states of planning for the installation of meteorological towers and/or buoys off the coasts of New Jersey and Delaware, including Bluewater Wind New Jersey, LLC (now NRG Bluewater Wind); Fishermen's Energy of New Jersey, LLC; and Deepwater Wind, LLC (USDOI, BOEM, OREP 2012b). Fishermen's Energy has proposed using Barney's Dock in the smaller Atlantic City Port. NRG Bluewater Wind has proposed using the Port of Wilmington, Delaware, as the fabrication site and staging area for construction and installation for its proposals off of Delaware and New Jersey. NRG Bluewater Wind would also use the Delaware Bay Launch located in the Town of Milford, Delaware, and the Indian River Marina located in the Town of Rehoboth Beach, Delaware, as crew boat and/or small cargo barge launch sites to support construction and operation activities. The Deepwater Wind project, on the other hand, demonstrates that an established relationship with a particular port or area may be a stronger determinant of where companies would centralize their operations. Deepwater Wind, LLC, has proposed using a site in Rhode Island to manufacture its 105-foot-tall floating "spar buoy" and plans to deploy the buoy by barge to Block Island, Rhode Island, for testing purposes and then to finally ship it to its New Jersey lease area (Kuffner 2010 *as cited in* USDOI, BOEM, OREP 2012b). The onshore activities associated with one of these previous OCS wind-energy projects may be the same as anticipated for the project that is the subject of this revised EA.

4.1.3.7.3 Conclusions

The increase in activities associated with site characterization and the installation/operation of the meteorological towers and buoys would not measurably impact current or projected land use or coastal infrastructure for several reasons: existing large to small commercial ports and harbors or industrial areas comprising the coastal infrastructure in Rhode Island and/or Massachusetts are expected to be used when implementing the proposed action, and the few structures in the WEA would have a small footprint and would be dispersed over a wide area of ocean. Impacts on land use and coastal infrastructure for site characterization and assessment activities are expected to be negligible.

4.1.3.8 Navigation and Vessel Traffic

4.1.3.8.1 Description of the Affected Environment

The vessel traffic and structures associated with Alternative A could conflict with navigation and other vessel traffic in the WEA and surrounding waters. The WEA is considered an important and highly valuable marine transportation corridor that includes transit to and from Narragansett Bay, Buzzards Bay, Long Island Sound, and Vineyard Sound. Vessels using this corridor are en route to commercial ports, harbors, and other facilities. The following section discusses these activities in the context of the proposed action in the WEA.

Navigation

To facilitate organized, safe access to major ports, a non-mandatory traffic separation scheme (TSS) for Narragansett Bay has been defined by the USCG near the mouths of Narragansett Bay and Buzzards Bay for ship traffic passing through the approaches.[18] The TSS comprises inbound and outbound traffic lanes that are divided by a traffic separation zone and are marked by a precautionary area (one at the southern end and the other at the northern end of the directed traffic lanes and separation zones) to aid commercial ships entering and exiting the estuaries. The separation zone is 2 miles (over 3 kilometers) wide centered on 41°22'42"N, 71°23'18"W, and 41°11'06"N, 71°23'18"W (NOAA, NOS 2010)[19]. The approach to Narragansett Bay runs north/south: the inbound traffic lane is a 1-mile (almost 2-kilometer)-wide lane about 11.5 miles (18.5 kilometers) long entering the traffic lane at approximately 41°11'06"N, 71°21'24"W. The outbound traffic lane is a 1-mile (almost 2 kilometer)-wide lane about 11.5 (18.5 kilometers)

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[18] See NOAA nautical charts 13223, 13221, 13218, and 12300.

[19] The bearings recorded for the TSS are true and expressed in degrees from 000° (north) to 359°, measured clockwise. General bearings are expressed by initial letters of the points of the compass (e.g., N, NNE, NE, etc.). Whenever precise bearings are intended, degrees are used. The geographic coordinates are defined using North American Datum 1983 (NAD 83), which is equivalent to WGS 1984 datum. This information was obtained from The Coast Pilot, a supplement to the navigational information shown on NOAA nautical charts. The publication is continually updated and maintained from inspections conducted by NOAA survey vessels and field parties, corrections published in Notices to Mariners, information from other federal agencies, state and local governments, maritime and pilots' associations, port authorities, and concerned mariners (NOAA, NOS 2010).

miles long entering the traffic lane at approximately 41°22'39"N, 71°25'24"W (NOAA, NOS 2010). The northern precautionary area has a 3.55-mile (5.71-kilometer) radius centered on a point at approximately 41°25'36"N., 71°23'18"W (NOAA, NOS 2010).

Buzzards Bay is the approach to New Bedford, many small towns and villages, and the entrance to the Cape Cod Canal. The bay indents the south shore of Massachusetts, extending in a northeasterly direction from Rhode Island Sound. The bay is enclosed on the south side, and separated from Vineyard Sound by the Elizabeth Islands. Like the approach to Narragansett Bay, the approach to Buzzards Bay is also characterized by inbound and outbound traffic lanes that are divided by a TSS and the offshore limit of this approach is marked by the same precautionary area.[20] The separation zone is a 1-mile (almost 2-kilometer)-wide zone centered on (i) 41°10'12"N, 71°19'06"W, (ii) 41°21'48"N, 71°07'06"W (NOAA, NOS 2010). The inbound traffic lane is a 1-mile (almost 2-kilometer)-wide lane about 14.8 miles (23.8 kilometers) long that enters the traffic lane at approximately 41°09'36"N, 71°18'00"W. (NOAA, NOS 2011). The outbound traffic lane is a 1-mile (almost 2-kilometer)-wide lane about 14.8 (23.8 kilometers) miles long that enters the traffic lane at approximately 41°22'25"N, 71°08'06"W. (NOAA, NOS 2010). There is no inshore precautionary area; for vessels approaching from the south, the inshore navigational aids are the Buzzards Bay entrance light (41°23'49"N, 71°02'05"W) and the Gay Head Light (NOAA, NOS 2010). These shipping lanes and the precautionary area were designated in accordance with standards adopted under the auspices of the International Maritime Organization (NOAA, NOS 2009). The TSS is 0.84 NM from the WEA at its nearest point. Figure 4-18 illustrates the navigation features adjacent to the WEA. Although these features are not in the WEA, it is important to recognize the restricted areas.

These vessel routes are established in order to increase the safety of navigation, particularly in converging areas of high-density marine traffic; furthermore, the routes incorporating traffic separation have been adopted by the International Maritime Organization for commercial deep-draft traffic transiting inshore waters such as Rhode Island Sound. However, it is recommended, not required, that through-traffic use these schemes (NOAA, NOS 2010). Recommended vessel routes for deep-draft vessels and tugs/barges transiting Rhode Island Sound, Narragansett Bay, and Buzzards Bay are established by the USCG Captain of the Port, Providence, in cooperation with the Southeastern Massachusetts and Rhode Island Port Safety and Security Committees (NOAA, NOS 2010).

The USCG anticipates providing BOEM with additional navigational safety recommendations when the Atlantic Coast Port Access Route Study (ACPARS) is complete, which is expected to be during the spring or summer of 2014[21]. The goal of the ACPARS is to enhance navigational safety by examining existing shipping routes and waterway uses and, to the extent practicable, reconcile the paramount right of navigation within designated port access routes with other reasonable waterway uses, e.g., leasing OCS blocks for construction and operation of offshore renewable energy facilities within the WEA[22]. The ACPARS will focus on

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[20] See NOAA nautical charts 13218 and 12300.

[21] *see* USCG Docket #USCG-2011-0351.

[22] *see* http://www.uscg.mil/lantarea/ACPARS/default.asp.

the coastwise shipping routes and near-coast users between Western Atlantic coastal ports including waters of the WEA, approaches to coastal ports, and future uses of those ports (including impacts of the widening of the Panama Canal in 2012). The ACPARS will include analysis of current vessel traffic density, fishing vessel information, and agency and stakeholder experience in vessel traffic management, navigation, ship handling, and effects of weather. The data gathered during the ACPARS may result in the establishment of new vessel routing measures, modification of existing routing measures, or disestablishment of some existing routing measures of the Atlantic coast from Maine to Florida. More specifically, the ACPARS study results may recommend that the USCG modify the existing TSSs, create one or more precautionary areas, and/or identify area(s) to be avoided. None of these existing TSSs will be encumbered by the WEA, therefore impacts are not anticipated. BOEM will continue to coordinate with the USCG about the possible establishment of new vessel routing measures or modification of existing ones.

Vessel Traffic

A general description of vessel traffic along the North Atlantic coast can be found in Chapter 4.2.17 of the Programmatic EIS (USDOI, MMS, 2007). Shipping densities and vessel types vary along the Atlantic seaboard, with the highest vessel density levels associated with access routes to the major Atlantic ports. The WEA, located 5.279 NM from the end of the TSS leading into Narragansett Bay, is an area that is part of the nation's Marine Transportation System—the network of all navigable waterways, vessels, operators, ports, and intermodal landside connections facilitating the marine transport of people and goods in the United States (Marine Transportation System National Advisory Council 2009 *as cited in* Rhode Island CRMC 2010). Military, commercial, recreational, and research vessels traverse the WEA en route to the Rhode Island ports of Providence, Quonset/Davisville, and Newport in Narragansett Bay and the Massachusetts port of Fall River in Mount Hope Bay.

Naval ships with a destination of Naval Station Newport enter Narragansett Bay via the Recommended Vessel Route or Narragansett Bay TSS. For example, the Northeast Marine Pilots provided pilots for Navy vessels seven times in 2006, six times in 2007, ten times in 2008, and five times in 2009, resulting in an annual average of approximately seven port visits or fourteen total transits (Rhode Island CRMC 2010).

Commercial vessel traffic typically concentrates at the entrances of large bays such as Narragansett and Buzzards Bays. The three entrances to Narragansett Bay are the West Passage (between Point Judith and Beavertail Point), the East Passage (between Beavertail Point and Brenton Point), and the mouth of the Sakonnet River (between Sachuest Point and Sakonnet Point). Additionally, ships transit the waters in and adjacent to the WEA between a variety of other ports, including the Port of New York and New Jersey, the Port of Boston, and other ports located on the East Coast or abroad in foreign waters. Offshore waterways or shipping lanes are often not designated on navigational charts, so vessels follow routes determined by their destination, depth requirements, and weather conditions (USDOI, BOEM, OREP 2012b) (*see* Section 4.1.3.3 for more information on recreational and commercial fishing vessel activity).

Recreational vessels, including power boats, sailboats, and cruise ships also transit through the WEA. Data on recreational vessel use from 2000 through 2009 within the WEA were obtained from the Northeast Ocean Data Portal, a decision support and information system for managers, planners, scientists and project proponents involved in ocean planning in the region from the Gulf of Maine to Long Island Sound. The portal is maintained by a Working Group composed of SeaPlan, the Northeast Regional Ocean Council, TNC, the Northeastern Regional Association of Coastal Ocean Observing Systems, NOAA Coastal Services Center, and Applied Science Associates. The largest area within the WEA reported the highest vessel traffic—an average of greater than 1,790 trips (TNC and NOAA NMFS 2011). The area with the next highest level of vessel traffic—representing an average of 1,177 trips over 10 years—is included in the WEA (*see* Figure 4-19) (TNC and NOAA NMFS 2011). The total number of recreational vessels transiting the WEA during the 10-year period was approximately 3,759 (TNC and NOAA NMFS 2011).

According to the Newport and Bristol Convention and Visitors Bureau (Hagerstrom 2012), 41 cruise ships with 80,586 passengers visited Newport in 2012. The greatest number of cruise ships to visit Newport in recent times occurred in 2004 with 76 ships. See Table 4-23 for cruise ship data from 1999 through 2012. Most cruise ships transiting into/out of Narragansett Bay use the Narragansett Bay TSS.

Table 4-23
Number of Cruise Ships and Passengers to Visit Newport, Rhode Island, by Year

Year	Number of Cruise Ships	Number of Passengers
1999	33	28,178
2000	39	27,657
2001	72	43,645
2002	38	52,757
2003	59	48,680
2004	76	57,051
2005	63	35,551
2006	31	58,935
2007	36	66,257
2008	33	81,743
2009	57	83,861
2010	67	126,816
2011	46	99,547
2012	41	80,586

Source: Hagerstrom 2012.

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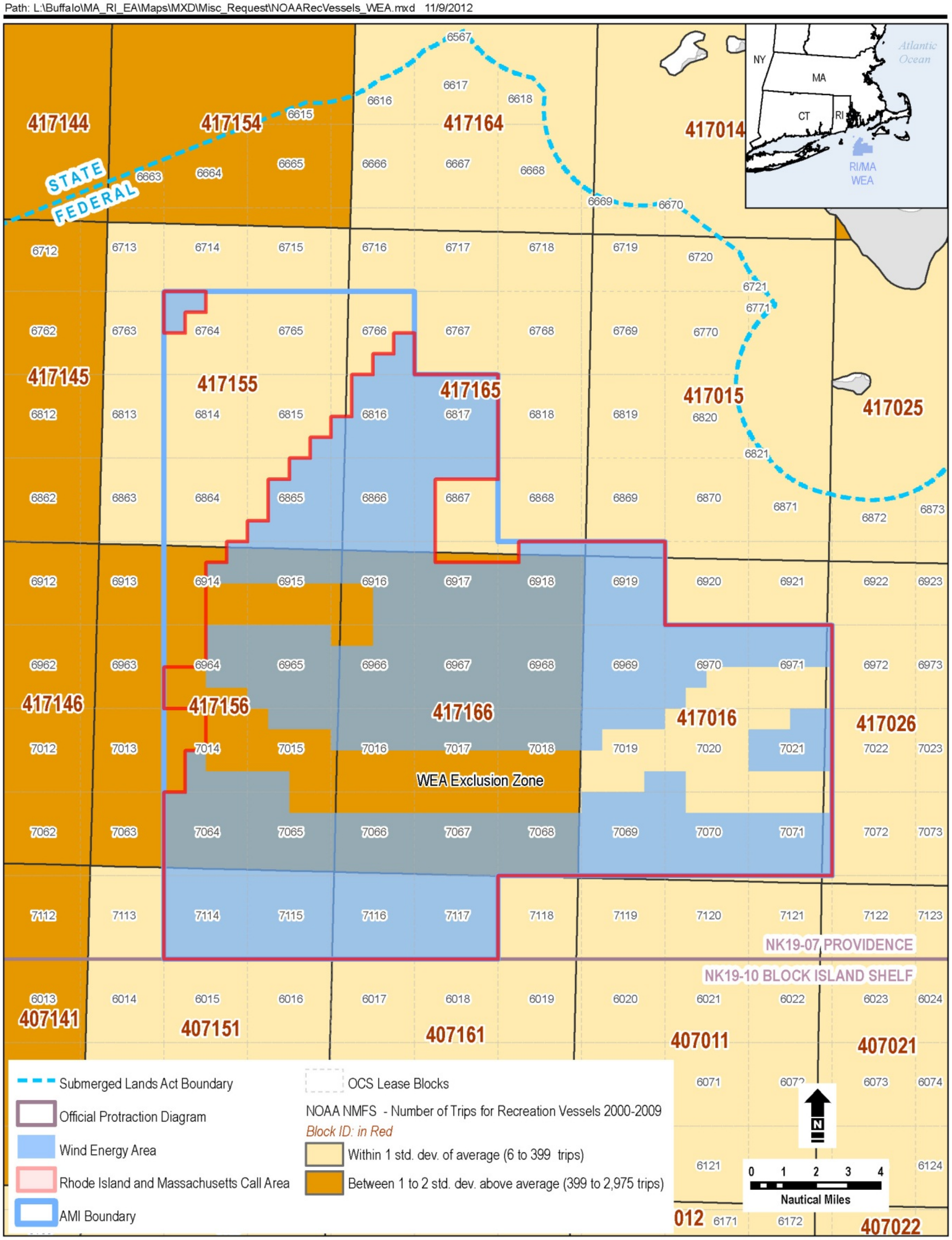


Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; NOAA NMFS 2011

Figure 4-19. Recreational Vessel Effort by Federally Permitted Party and Charter Fishing Vessels Between 2000 and 2009 in the Rhode Island and Massachusetts WEA.

The United States freight tonnage of all types, including exports, imports, and domestic shipments, is expected to grow 73 percent by 2035 from 2008 levels (USDOT, MARAD 2011a). Traffic density and commercial vessel sizes are also expected to increase in the future to reflect this estimated increase in shipments. Completion of the Panama Canal-widening project in 2014 will double the canal's tonnage by 2025 and allow larger vessels access to the East Coast ports of the United States (Panama Canal Authority 2006 *as cited in* USDOI, BOEM, OREP 2012b). Other projects that would increase vessel travel include the 2008 America's Marine Highway program, established by the U.S. Maritime Administration with the goal of transferring commercial transportation from land routes to coastal waterways in order to reduce greenhouse gases (GHGs) and traffic congestion along the East Coast (USDOT, MARAD 2011a) and the designation of a Marine Highway Corridor (in August 2010) by the Secretary of Transportation that extends from Miami, Florida to Portland, Maine (USDOT, MARAD 2011a).

Increased vessel traffic associated with site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys could occur simultaneously, and possibly overlap, with these projected increases in current vessel traffic levels from both the widening of the Panama Canal and the designation of the M-95 Marine Highway Corridor.

Commercial shipping traffic is often located outside USCG-recommended routes and traffic schemes out in the open sea and, as noted above, routes are determined by vessel destination, depth requirements, and weather conditions (Dept. of Navy 2008 *as cited in* USDOI, BOEM, OREP 2012b).

Recent 2011 data for Narragansett Bay indicates that of the 1,462 vessels entering the bay, the majority of vessels are destined for the ports of Providence, Fall River, and Davisville (Narragansett Bay Shipping 2011). The USACE collects annual data on freight traffic (tonnage per year), the number of vessel transits, and drafts of vessels using federally maintained navigation channels. A total of 2,412 vessels were recorded with transits to and from Narragansett Bay in 2007; of that total 1,762 were headed to and from Providence with 23 percent being foreign-flagged vessels (Rhode Island CRMC 2010). An additional 650 transits were to and from Fall River, 16 percent of which were foreign-flagged vessels (Rhode Island CRMC 2010). This vessel transit total is conservative in that it does not include transits by car carriers to and from the Port of Davisville at Quonset/Davisville. Between 80 and 100 ships call at the Port of Davisville each year, resulting in 160 to 200 additional transits in and out of Narragansett Bay (Quonset Development Corporation 2009 *as cited in* Rhode Island CRMC 2010) (*see* Section 4.1.3.7, "Land Use and Coastal Infrastructure").

In Narragansett Bay, the East Passage, which provides access to an approximately 60-foot deep channel (NOAA, NOS 2009), is used by all deep-draft vessels and most tug-and-barge traffic carrying petroleum products from the Port of New York and New Jersey or those en route to points south, including Buzzards Bay and the Cape Cod Canal (Rhode Island CRMC 2010). The West Passage is used by tug-and-barge traffic and large commercial fishing vessels (Scanlon pers. comm. *as cited in* Rhode Island CRMC 2010). Further, in the event that the East Passage is not navigable (e.g., a coastal hazard or other event), the West Passage serves as a back-up channel for commercial traffic (Blount, pers. comm. *as cited in* Rhode Island CRMC 2010).

An increase in commercial vessel traffic in and around the waters adjacent to the WEA may occur if a short sea shipping industry develops in Rhode Island. Short sea shipping is the movement of goods (usually containerized) aboard barges from large ports closer to their destination in order to help reduce truck traffic and road congestion. The corridor between Boston, New York, and Washington, D.C., has been proposed as a region in which to develop short sea shipping routes because of the amount of traffic congestion, the region's population density, and the availability of port facilities (R.I. Economic Monitoring Collaborative 2007 *as cited in* Rhode Island CRMC 2010). Although no short sea shipping routes are currently in use in this corridor, Rhode Island ports, particularly Providence, could serve as a central hub (R.I. Economic Monitoring Collaborative 2007 and National Ports and Waterways Institute, University of New Orleans 2004 *as cited in* Rhode Island CRMC 2010). If short sea shipping were to develop in Rhode Island, it would greatly increase the number of vessels transiting through the Ocean SAMP area and WEA. Based on the information reviewed, it is reasonably foreseeable for Providence to serve as a hub to the sea shipping industry.

Automatic identification system (AIS) data, when aggregated and analyzed using geographic information system (GIS) tools, provide a fairly reliable means of analyzing commercial ship traffic activity and density. AIS is a GPS transponder-based ship identification system that collects position and movement and, using a very high frequency (VHF) transmitter, and broadcasts vessel data among ships and shore-side facilities.

Figure 4-20 uses AIS data to illustrate the heavily trafficked areas adjacent to the WEA including:

- The entrance to Narragansett Bay, which corresponds roughly with the northern precautionary area of the approach to Narragansett Bay;
- The Coastwise Recommended Vessel Route with several aliquots of OCS blocks showing greater than 251 vessels in 2009;
- The north/south route that corresponds to the charted shipping lanes and TSS which report ranges based on AIS data generally from 76 to 750 vessels per aliquot in 2009; and
- The concentration of traffic that represents ships rounding Montauk Point and passing into Long Island Sound.

Relatively little traffic with AIS transponders is shown passing through the charted approach to Buzzards Bay.

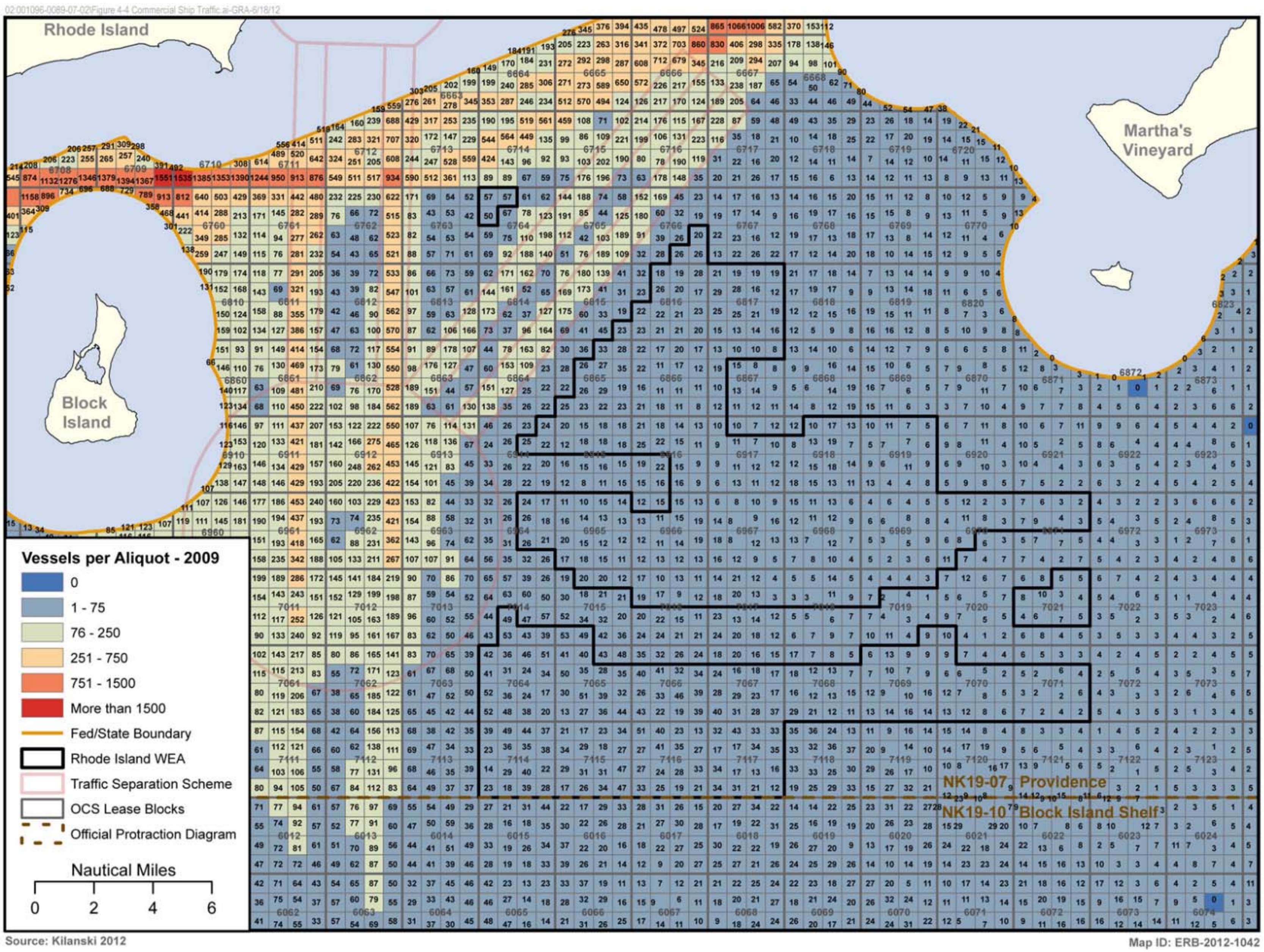


Figure 4-20. Commercial Ship Traffic Based on Automated Information System (AIS) Data, Rhode Island and Massachusetts Wind Energy Area.

4.1.3.8.2 Impact Analysis of Alternative A

Chapter 5.2.17 of the Programmatic EIS (USDOI, MMS 2007) discusses the impacts that site characterization and assessment could have on marine traffic. The proposed leases would be located 10.34 NM from the closest point onshore (Gay Head on Martha's Vineyard, Massachusetts). Increased vessel traffic from survey activities and construction/installation, operation and maintenance, and decommissioning of the meteorological towers and buoys would increase vessel traffic in the WEA and between the WEA and shore. This increase in traffic would be minor compared to the current levels of vessel traffic. Therefore, site characterization surveys and planned activities occurring within the proposed lease areas have the potential to directly impact coastal and offshore vessel traffic. Non-routine activities could include collision between vessels, an allision between a vessel and a meteorological tower/buoy, and/or accidental spills of diesel fuel or other oils.

Impacts of Routine Activities and Events

Vessel Traffic

Direct impacts from routine activities may occur as a result of increased vessel traffic. It is anticipated that additional vessel activity would occur during site characterization surveys (*see* Section 3.1.2, "Site Characterization Surveys") and during the period that construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys takes place (*see* Section 3.1.3.4, "Vessel Traffic Associated with Site Assessment"). This additional vessel activity would likely occur in the WEA, between the WEA and shore, and in harbor and coastal areas. It is reasonably foreseeable that some vessel trips would occur through or near heavily trafficked areas as depicted on Figure 4-120 in the areas north and northwest of the WEA bordering Block Island, such as the entrances to Narragansett Bay and Buzzards Bay. These heavily trafficked areas are already expecting additional increases in traffic density and the addition of larger classes of commercial vessels associated with the completion of the Panama Canal widening in 2014 and identification of a marine highway corridor extending from Miami, Florida, to Portland, Maine.

Tug/towboat traffic associated with the marine highway corridor may occur within the WEA and has the potential to overlap or occur simultaneously with vessel traffic associated with implementing Alternative A. The 2007 Record of Decision (USDOI, MMS 2007) for the renewable energy program adopted the BMPs that must be demonstrated in a lessee's SAP (*see* 30 CFR 585.606(a)(5)). BOEM will not approve a SAP unless it has demonstrated compliance with the BMPs. The Record of Decision states that lessees and grantees shall review planned activities with potentially affected fishing organizations and port authorities to prevent unreasonable fishing gear conflicts. Lessees and grantees shall minimize conflict with commercial fishing activity and gear by notifying state and federal regional fishery management organizations and local fishing groups of the location and timeframe of the project construction/installation activities well in advance of mobilization with updates throughout the construction period. In addition, lessees and grantees shall place proper lighting and signage on applicable alternative energy structures to aid navigation per USCG circular NVIC 02-07 (USCG 2007) and comply with any other applicable USCG requirements.

Because the additional vessel activity associated with Alternative A is anticipated to be relatively small (*see* Section 3.1) compared to existing and projected future vessel traffic in the area, it is not reasonably foreseeable that the number of vessels transiting the WEA for these activities would significantly increase vessel density levels or alter known shipping patterns.

Meteorological Towers and Buoys

The Rhode Island and Massachusetts WEA is located adjacent to an area of high vessel traffic densities, where large commercial shipping vessels often travel (*see* Figure 4-20). Although the WEA is not located within designated TSSs, meteorological towers and buoys may still pose an obstruction to navigation if placed in areas with high vessel traffic. Meteorological tower/buoys placed in an area that previously had no stationary object could pose a hazard to navigation and possibly increase the likelihood of a collision or allision between a vessel and a meteorological tower/buoy or between vessels attempting to avoid a meteorological tower/buoy. The WEA is within roughly 0.84 NM (about 1.55 kilometers) from the heavily trafficked entrance to the Narragansett Bay TSS. Because the placement of any meteorological tower within a TSS is prohibited (*see* 33 U.S.C. Section 1223), any placement of meteorological towers and buoys near a TSS or any of the highly trafficked areas identified in the WEA generally located in the southern and eastern OCS blocks (*see* Figures 4-18 and 4-120) must comply with USCG requirements (33 CFR 66) for marking and lighting to assist mariners with identification and avoidance.

Any meteorological tower or buoy higher than 199 feet (about 60 meters) and within 12 NM of shore would require an Obstruction Evaluation and a Determination of Hazard/No Hazard by the FAA, and each lessee would be required to file a Notice of Proposed Construction or Alteration with the FAA in accordance with federal aviation regulations (14 CFR 77.13). Because safety impacts on low-level flight operations attributable to the construction/installation of meteorological towers in remote and rural areas needed to be addressed, on June 24, 2011, the FAA recommended that landowners and developers use guidance contained in Advisory Circular 70/7460–1, Obstruction Marking and Lighting (USDOT, FAA 2007), for the voluntary marking of meteorological towers less than 200 feet (almost 61 meters) above ground level (76 FR 36983). The guidance document specifies a paint pattern, spherical and/or flag markers, and high visibility sleeves and/or flags on the outer guy wires of these meteorological towers (76 FR 36983). However, specific lighting requirements would be voluntary; furthermore, the stated purpose of the FAA guidance is to *"enhance the conspicuity of the towers for low level agricultural operations in the vicinity of these towers"* with no anticipated guidelines for meteorological towers located in offshore waters (76 FR 36983). Although voluntary, if the FAA issues a Determination of No Hazard to Air Navigation, that determination may be conditional on the meteorological tower(s) being marked and lighted in accordance with the determination.

Most commercial ocean-going vessels and many ocean-going recreational vessels are equipped with onboard radar equipment that would clearly indicate the presence of a meteorological tower or buoy and allow the vessel to change course in time to avoid an allision. The marine navigational rules also require every vessel to maintain an effective lookout while under way to further reduce the likelihood of collisions or allisions. The combination of USCG- and FAA-required lighting/marking and requirements for all vessels to maintain effective lookouts further reduces the chances of collisions or allisions involving any meteorological towers, buoys, and survey vessels associated with implementing Alternative A.

It is reasonably foreseeable that, under routine circumstances, vessels would not strike a meteorological tower or buoy that is marked and lighted as described above in accordance with USCG and FAA recommendations and requirements. As discussed previously, even if a vessel strike occurred, the environmental impacts and impacts on vessel traffic in the area would be minor, if noticeable. No significant impacts on vessel traffic in the WEA would occur from the installation of meteorological towers and buoys.

Impacts of Non-Routine Events

The vessel traffic associated with site characterization surveys (HRG surveys, geotechnical sampling, and biological surveys), and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys close to the major shipping lanes and ports serving Narragansett and Buzzards Bays would not substantially increase the probability of a vessel collision(s) and/or allision(s).

AIS data indicate that the majority of large commercial vessels, which include cargo vessels, container vessels, and oil tankers, operate within and near the TSS lanes and follow distinct patterns in order to approach/depart these lanes, often concentrating in heavily used unofficial approach/departure areas near the entrances and exits of the TSS lanes (*see* Figure 4-20). The WEA was designed to exclude TSS lanes and avoid the heavier trafficked approach/departure areas associated with those TSSs. Lessees are expected to comply with all USCG-required marking and lighting of meteorological towers and buoys and applicable FAA requirements. When BOEM considers any individual SAP, it will further consider local vessel traffic to ensure tower placement would reduce the already small likelihood of commercial or recreational vessel collision or allision with structures associated with implementing Alternative A.

Spills of diesel fuel or other oils could occur as a result of collisions, accidents, or natural events (*see* Section 3.2.3, “Fuel Spills”). Vessels are expected to comply with USCG requirements relating to prevention and control of diesel fuel and oil spills. In 2010, 97 percent of the oil and gas tanker calls in the U.S. were double-hulled vessels, up from 78 percent five years earlier (USDOT, MARAD 2011b). Double-hulled tankers are much less likely to release oil from collision and/or allision than single-hulled tankers. A multitude of government studies and independent reviews recommend double hulls as the single most effective technology to prevent future oil spills from tankers (DF Dickens Associates, Ltd. 1995 *as cited in* USDOI, BOEM, OREP 2012b).

Therefore, it is very unlikely that either a collision or allision or a subsequent oil or diesel spill would occur because vessels can take multiple routes, the proposed WEA lease block avoids the highest traffic areas, USCG-required marking and lighting of meteorological towers and buoys would be used, and the use of double-hulled oil and gas tankers calling at U.S. ports has increased (*see* Section 3.2.2, “Allisions and Collisions”). The impacts on water quality if a spill would occur from these types of collisions are discussed in Section 4.1.1.2.2.

4.1.3.8.3 Conclusions

The increase in vessel traffic and activities associated with the installation/operation of the meteorological towers and buoys would not measurably impact current or projected future shipping or navigation. It is unlikely that vessels would collide with meteorological towers or buoys for several reasons: the USCG requires meteorological towers and buoys be marked and lighted; the WEA does not include the most highly trafficked areas; and the proposed structures would be few in number, small, and would be dispersed over a wide area of ocean, distant from each other and from the shore. For these same reasons, an oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy also is not reasonably foreseeable. The unlikely collapse of a meteorological tower also is not expected to result in serious damage to an oil tanker or large ship.

4.1.3.9 Recreational Resources and Tourism

4.1.3.9.1 Description of the Affected Environment

Recreational activities are ubiquitous throughout the coastal and ocean regions of Rhode Island and Massachusetts. These activities are one of the primary economic drivers of the coastal counties of both states, and tourism is a fairly integral component of the coastal economies of Rhode Island and Massachusetts (*see* Table 4-24), supporting local hospitality, entertainment, and transportation businesses.

Table 4-24
Tourism- and Recreation-Related Economy
by County (2009)

	Employment	Wages
Rhode Island Counties		
Bristol	1,522	$24,405,712
Kent	5,506	$90,839,715
Newport	5,697	$115,080,295
Providence	6,911	$124,318,284
Washington	4,681	$81,316,586
Total	**24,317**	**$435,960,592**
Massachusetts Counties		
Barnstable	13,816	$307,469,728
Bristol	2,609	$44,564,092
Dukes	1,355	$39,030,407
Essex	9,638	$167,445,014
Middlesex	4,312	$93,453,821
Nantucket	1,112	$32,186,944
Norfolk	6,232	$122,972,621
Plymouth	6,402	$101,527,130
Suffolk	14,436	$373,619,384
Total	**59,912**	**$1,282,269,141**

Source: National Ocean Economics Program 2009b.

Rhode Island Recreation

Table 4-24 summarizes employment in recreation and tourism-related industries in Rhode Island by county. The National Ocean Economics Program defines tourism-related industries as amusement and recreation services; boat dealers; eating and drinking places; hotels and lodging places; marinas; recreational vehicle parks and campsites; scenic water tours; sporting goods retailers; zoos; and aquaria (Colgan 2007).

Rhode Island's five coastal counties (Bristol, Kent, Newport, Providence, and Washington) contain 233 beaches (*see* Table 4-25) (USEPA 2008). Shore-based activities such as boating, sailing, diving, wildlife-viewing (whale, bird, and shark), and recreational fishing provide a significant source of income for the state (Rhode Island CRMC 2010). Recreational boating, organized sailboat racing, parasailing, canoeing, kayaking, sea duck hunting, and charter boat operations are other common uses of the coastal areas. The coastal communities benefit from the revenue generated by out-of-state visitors who use marina, dining, entertainment, and accommodation services (Rhode Island CRMC 2010).

Table 4-25
Number of Coastal Beaches in Rhode Island and Massachusetts by County

Coastal Counties	Number
Bristol – RI	20
Kent – RI	16
Newport – RI	87
Providence – RI	8
Washington – RI	102
Barnstable – MA	269
Bristol – MA	30
Dukes – MA	45
Essex – MA	98
Nantucket – MA	17
Norfolk – MA	26
Plymouth – MA	97
Suffolk – MA	14
Total	**829**

Source: USEPA 2008.

Massachusetts Recreation

Visitors to Massachusetts' coast engage in a variety of recreational activities such as fishing, marine mammal and bird watching, diving, sea duck hunting, and boating (Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs 2009). Wildlife-watching occurs both on land and offshore. In total, the state's coastal counties with shorelines (Barnstable, Bristol, Dukes, Essex, Nantucket, Norfolk, Plymouth, and Suffolk) contain 596 beaches (*see* Table 4-25) (USEPA 2008).

Rhode Island Visitors

According to the Rhode Island Ocean SAMP, more than 5.7 million visitors were estimated to have visited the region in 2007, with a large portion of visitors coming from out of state (Rhode Island CRMC 2010). Tourism visitation rates in Rhode Island are higher during the summer months. The majority of out-of-state visitors came from Massachusetts, Connecticut, New York, and New Jersey; however, visitors also came from other U.S. East Coast states as well as international locations (Rhode Island Economic Monitoring Collaborative 2008).

Massachusetts Visitors

In fiscal year 2011, Massachusetts hosted 17.3 million domestic visitors (the definition of a visitor is one who travels 50 miles [over 80 kilometers] or more miles one way or who stays overnight). Visitors from all New England states accounted for 57.4 percent of all visitors and the Mid-Atlantic States (New York, New Jersey, and Pennsylvania) accounted for 20.4 percent and both combined accounted for 77.8 percent of all domestic travel to the state. The remainder of all the domestic visitors came from all other U.S. states (Massachusetts Office of Travel and Tourism [MOTT] 2011).

Most of these visitors (32 percent) were Massachusetts residents, followed by visitors from New York State (13.5 percent), Connecticut (9.4 percent), New Hampshire (5.5 percent), and Rhode Island (4.1 percent) (TNS, Travels America, FY2010 and FY2011, *as cited in* MOTT 2011). Visiting friends or relatives was the dominant trip purpose and accounted for 45.8 percent of all domestic trips, personal reasons accounted for 16 percent of trips, entertainment and sightseeing accounted for 11.2 percent of all trips and business accounted for 10.2 percent of all trips (TNS, Travels America, FY2010 and FY2011, *as cited in* MOTT 2011).

In fiscal year 2011, Massachusetts hosted 2 million international visitors. Visitors from Canada accounted for 662,000v visitors and 1.3 million from oversees (after Canada, the primary market was accounted for by United Kingdom, and Germany followed by a secondary market of Japan, France, Italy, and Ireland (MOTT 2011).

4.1.3.9.2 Impact Analysis of Alternative A

Impacts of Routine Activities and Events

BOEM does not anticipate impacts on recreational resources in Rhode Island and Massachusetts associated with Alternative A. As discussed in Section 4.1.3.10, "Other Multiple Use Conflicts," existing ports or industrial areas are expected to be used by vessels associated with implementation of Alternative A, but these facilities would not be modified or expanded. Vessel traffic associated with Alternative A would use USCG-established vessel traffic lanes. Vessels may be sited nearshore during surveys associated with potential transmission corridors to the WEA; however, they would likely spend a minimal amount of time in these areas. Section 4.1.3.1, "Aesthetics and Visual Impacts," addresses the anticipated visibility of the potential meteorological towers from onshore. Due to their distance from shore, the anticipated widths of the structures, and the offshore atmospheric conditions, it is unlikely that the towers would be highly visible from the shoreline.

Recreation and tourism in the coastal communities often includes activities such as whale watching and fishing. Section 4.1.2.4 discusses potential impacts on marine mammals associated with Alternative A. All vessels associated with Alternative A would be subject to seasonal guidelines and guidelines for monitoring, speed, and approach distance with respect to marine mammals. Overall, no significant impacts on marine mammals or the associated wildlife viewing activities are anticipated as a result of Alternative A.

Potential impacts on tourism on the Atlantic coast were discussed in the Programmatic EIS (USDOI, MMS 2007). The MMS concluded that in the context of existing activities in the coastal areas from military, commercial, and recreational water and air vessels, an adverse impact on tourism and recreation from the additional vessels associated with the proposed action is not likely (USDOI, MMS 2007).

Impacts of Non-Routine Events

Vessels transiting to and from lease blocks within the WEA designated for activities associated with Alternative A and vessels surveying potential transmission corridors to shore may have the potential to generate spills during refueling or a potential collision with other vessels. As the WEA is proposed to be located at least 9 NM offshore, the likelihood of the spill from the WEA reaching the coastline is minimal because the spill would likely dissipate and biodegrade within a few days (USDOI, BOEM, OREP 2012b). All vessels would adhere to appropriate response protocol if a collision or spill occurred. The USCG estimates that the average spill size from 2008 to 2009 was 88.36 gallons, not including tanker ships and tank barges (U.S. Department of Homeland Security, USCG 2011 *as cited in* USDOI, BOEM, OREP 2012b).

Another potential issue that could affect recreational activities in Rhode Island and Massachusetts is litter and debris on beaches and in areas where recreational activities are occurring. It is unlikely that these places would be affected by the limited activities described in Alterative A, as potential debris and litter resulting from Alternative A would not likely be large-scale or discernible from other ongoing debris-producing activities in the area.

4.1.3.9.3 Conclusions

No new onshore coastal structures would be built if Alternative A is implemented, and the amount of vessel traffic associated with this alternative is expected to be small, thereby limiting the number of potential spills and vessel traffic. Additionally, because the WEA is proposed to be located more than 9 NM offshore, there would be no visual impacts on recreational resources. Impacts may occur as a result of Alternative A from marine trash and debris. However, it is unlikely that this debris would be differentiated from other sources of trash in the area. Potential impacts on recreational fishing are discussed in Section 4.1.3.3.

4.1.3.10 Other Multiple Use Conflicts

4.1.3.10.1 Description of the Affected Environment

The vessel traffic and structures associated with Alternative A could conflict with other existing and future uses of the OCS within and/or adjacent to the proposed WEA, including underwater cables, other renewable energy projects, and marine minerals program.

Underwater Cables

Six underwater cables, including both in-service and out-of-service telecommunications cables, are currently laid next to the WEA (except Verizon's B-1 offshore telecommunications cable with portions of it within the WEA for Alternative A) (Figure 4-21). AT&T, Verizon, and Reliance Globalcom own and operate the following cables:

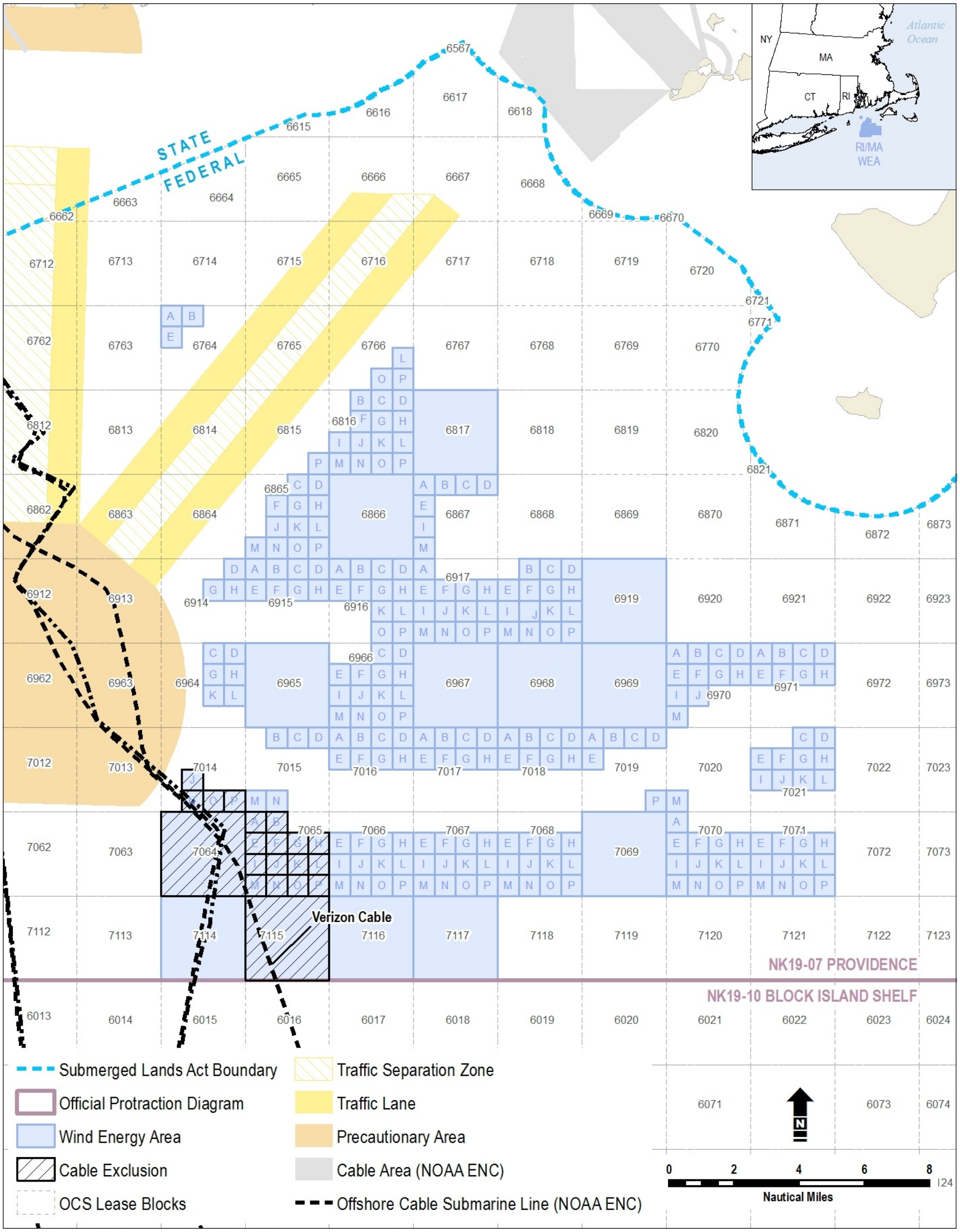
- AT&T operates TAT 12/13 Interlink (in service), which runs to the west of Block Island, and owns TAT 6 (out of service), TAT 10 (out of service), and TAT 12 (in service), which run from Green Hill in South Kingstown, Rhode Island, to the east of Block Island (Wargo pers. comm. *as cited in* Rhode Island CRMC 2010);
- Verizon owns CB-1— Verizon is the owner and Maintenance Authority of the CB-1 (formerly Gemini) underwater telecommunications cable located in coastal Rhode Island waters which further extends onto the continental shelf, ultimately landing in Bermuda. The cable makes landfall at the eastern end of Green Hill Beach Road in the Town of South Kingstown. A portion of the CB-1 underwater telecommunications cable is within the proposed action for Alternative A (crosses portions of OCS blocks 7014, 7064, 7065, and 7115) (*see* Appendix A); and
- Reliance Globalcom owns FA-1 North (in service), formerly FLAG Atlantic North, an international telecommunications cable that originates from the north shore of Long Island, New York, at Crab Meadow (Tegg pers. comm. *as cited in* Rhode Island CRMC 2010).

NOAA nautical charts may list "Cable Areas" but that does not necessarily mean that actual cables are present there. NOAA uses a number of sources in compiling NOAA Electronic Navigational Charts (NOAA ENC®), including USACE surveys, drawings, and permits, USCG Local Notices to Mariners, National Imagery and Mapping Agency Notices to Mariners, NOAA hydrographic surveys, and the largest scale paper chart of an area (NOAA, Office of Coast Survey 2012). Cables are shown on NOAA charts at the request of a data provider such as the USACE or other permitting entity so that mariners do not anchor or drag gear over these areas and damage cables (NOAA 1992 *as cited in* Rhode Island CRMC 2010).

Other Renewable Energy Projects

Another reasonably foreseeable renewable energy activity offshore of Rhode Island could occur in the same timeframe as Alternative A in both state waters and on the OCS. That activity is Deepwater Wind LLC's Block Island Wind Farm Project, where the closest wind turbine generator (WTG) to the WEA is approximately 36.2 NM away. The project is scheduled to be in the construction phase in 2013 or 2014 (Deepwater Wind LLC 2012).

Path: L:\Buffalo\MA_RI_EA\Maps\MXD\EA\Revised_Sept24_2012\CableExclusion_Section4.mxd



Base Map Source:NOAA ENC 2011; ESRI 2010; BOEMRE 2011; URI Environmental Data Center 2009

Figure 4-21. Existing Telecommunications Cable(s).

Deepwater Wind proposes to construct, operate, and decommission an offshore wind energy facility with a maximum output of 28.8 MW to be located in state waters off the southeastern coast of Block Island, Rhode Island. The proposed Block Island Wind Farm project consists of the installation of five 6.0 MW direct drive offshore wind turbines, a buried undersea inter-turbine collector cable that connects the WTG array with a Block Island Power Company (BIPCO) substation and a buried undersea/upland transmission cable/substation in Narragansett that connects the BIPCO substation to a National Grid transmission system on the mainland. National Grid has agreed to buy all of the output from the project under a 20-year power purchase agreement that has been approved by the Rhode Island Public Utilities Commission and the Rhode Island Supreme Court. The offshore wind facility will generate more than 100,000 MW hours annually, supplying the majority of Block Island's electricity needs. Excess power will be exported to the mainland via the bi-directional Block Island Transmission System.

Marine Minerals Program

Massachusetts has the largest number of recreational beaches in New England, but those along the Rhode Island coast are perhaps the most urbanized and have been subject to severe damage during historical hurricanes (Leatherman 1989). Long-term climate change will continue to impact beaches, as evidenced by rising global temperatures, increasing extremes within the hydrologic cycle resulting in more frequent floods and droughts, and rising sea levels. For example, rising sea levels due primarily to climate change are likely to accelerate beach erosion and coastal inundation along Rhode Island and Massachusetts beaches, dunes, and barrier islands, and will make storms and associated floods more intense, likely exacerbating erosion. Loss of sand from coastal storms and hurricanes is a serious problem that affects both the coastal environment and the economy of these two states. Additionally, longshore sediment transport causes sand on the beach to diffuse or spread over time. This is true not only for natural beaches but also for beaches that have been nourished, especially during the period immediately after construction/installation. However, the artificial replacement of lost sand through re-nourishment cycles for beaches or coastal areas requires quantities of sand that are not currently available from state sources (e.g., Rhode Island has a state beach nourishment policy[23] but no dedicated state funding mechanism) (USDOC, NOAA, NOS, OCRM 2000).

In Rhode Island, for example, a 1989 estimate stated that at least 6.970 million cubic yards (5.329 million cubic meters) of sand will be needed to maintain beach profiles, and 3.308 million cubic yards (2.529 million cubic meters) of sand will be needed to maintain an oceanside shoreline 27.2 miles (43.8 kilometers) long (Leatherman 1989). Much of the sand found on Rhode Island beaches currently comes from glacial materials found in upland sources and coastal lagoons (Rhode Island CRMC 2010).

One hundred (100) miles (over 160 kilometers) of shoreline were surveyed in Massachusetts and it was estimated that 27.390 million cubic yards (20.941 million cubic meters) of sand will be needed to maintain beach profiles, and 137.984 million cubic yards (105.496 million cubic meters) of sand will be needed to maintain the oceanside shoreline (Leatherman 1989).

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[23] *See* Rhode Island Coastal Resources Management Program ("Red Book"), Sections 210.7 (C)(3), 300.2, 300.7 (B)(1), and 300.7 (B)(3). http://www.crmc.ri.gov/regulations/ricrmp.pdf.

Borrow areas used to nourish shorelines and maintain oceanside beaches of sufficient quantity and quality of sand must meet engineering design criteria and be both affordable and acceptable from an environmental perspective (Woods Hole Group, Inc. 2011). However, upland sources and desired locations close to beaches have diminished while demand for suitable sand and gravels for beach nourishment continues to rise. Therefore, alternative marine resources located on the OCS are being considered in lieu of traditional onshore sources. This shift to the use of offshore resources will expand, especially in marine areas having large concentrations of glacial deposits (Johnson *et al.* 2008 *as cited in* Rhode Island CRMC 2010). In order to assess offshore geological structure and mineral distribution, a recent survey (August 2011) of Rhode Island Sound was conducted to gather bathymetry and side-scan sonar data for the purposes of wind turbine installation (University of Rhode Island, Graduate School of Oceanography 2011). However, studies indicate that further evaluation of the feasibility of offshore borrow areas is needed (Woods Hole Group, Inc. 2011) because little to no information is currently available about the volume of usable sand or gravel deposits or other aggregated material within and/or adjacent to the WEA for the proposed action.

Liquefied Natural Gas (LNG) Facilities

Currently, there are no existing or proposed offshore LNG terminals in the area of, or adjacent to, the WEA. Import terminals have been proposed in coastal regions throughout the United States, including other coastal areas of Massachusetts, and one proposed for Long Island Sound, New York. Both have withdrawn their applications.

4.1.3.10.2 Impact Analysis of Alternative A

The proposed action would not measurably impact other existing and future uses of the OCS off of Rhode Island and Massachusetts, including underwater cables, other renewable energy projects, and marine minerals program. Given that the underwater telecommunication cables have been identified within the WEA, impacts on such cables are not anticipated in connection with the proposed action. While there is a potential for the construction of the Block Island Wind Project to be ongoing concurrently with the activities associated with Alternative A, the impacts from the proposed action are expected to be negligible due to the distance from the Block Island Wind Project to the WEA (approximately 36.2 NM). Although not formalized, a marine minerals program (USDOC, NOAA, NOS, OCRM 2000), primarily for beach nourishment, has identified borrow pits of sufficient quantity and quality of sand within the littoral zone as opposed to offshore. Therefore, impacts from the proposed action to this program would be negligible.

4.1.3.10.3 Conclusions

The increase in vessel traffic and activities from the installation/operation of the meteorological towers and buoys would not measurably impact other existing and future uses of the OCS, including underwater cables, other renewable energy projects, and marine minerals program.

4.2 Alternative B: Area Exclusion to Protect the North Atlantic Right Whale

4.2.1 Description of Alternative B

To reduce the likelihood of ship strikes from vessels engaged in site characterization surveys and site assessment activities, Alternative B would limit vessel activity by excluding portions of nine OCS blocks (6916, 6965, 6966, 6969, 6970, 6971, 7014, 7015, and 7021) in the WEA proposed in Alternative A in order to protect the critically endangered North Atlantic right whale (*Eubalaena glacialis*) (*see* Appendix A). Vessel traffic associated with periodic maintenance trips to installed meteorological towers and buoys would not be restricted under this alternative.

In Alternative B, the area available for site characterization surveys would be about 11.8 percent smaller than under Alternative A and would result in fewer leaseholds constructed (*see* Section 3.1.3.1, "Meteorological Towers and Foundations," and Section 3.1.3.2, "Meteorological Buoy and Anchor System"), thus possibly reducing future power generation by up to 316 MW, assuming that the remainder of the entire WEA could be leased and developed to its full potential.

Because proposed site characterization surveys and site assessment activities would still occur under leaseholds in Alternative B, this alternative would not decrease or increase total potential impacts on air quality, water quality, coastal habitats, and benthic habitats from that described in Alternative A. Socioeconomic impacts would be similar to those described in Alternative A. Migratory marine mammals other than North Atlantic right whales would likely benefit from exclusion zones as described in Appendix B. Effects on other resources are discussed below.

4.2.2 Effects of Alternative B

4.2.2.1 Physical Resources

Air Quality

Section 4.1.1.1, which describes the reasonably foreseeable impacts of Alternative A on air quality, concluded that, due to the distance from shore and the negligible increase in emissions associated with Alternative A when compared with baseline emissions and existing air quality, neither routine activities nor non-routine events would significantly impact onshore air quality.

The reduced level of activities under Alternative B would produce slightly fewer emissions (fewer vessel trips) in the vicinity of the WEA than would Alternative A. Due to the short duration and relatively low levels of emissions from routine activities in and associated with the WEA, potential impacts on ambient air quality from either Alternative A or Alternative B are expected be minor.

Geology

Section 4.1.1.2 describes the reasonably foreseeable impacts of site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys within the Alternative A WEA. Specifically, HRG site surveys would be used to characterize the potential site of a meteorological tower and to gather the data necessary to submit a COP in the future. As with Alternative A, the HRG surveys associated with Alternative B would involve shallow penetration of the seafloor, and sediment disturbance could result from the surveys as well as from vessel and buoy anchoring and structure installation and removal. Because anchoring vessels and buoys (and anchor removal) take little time, they would cause intermittent disturbance of the seafloor. Short-term impacts on geology are expected to be localized, i.e., within a discrete area of the WEA. These impacts associated with Alternative B are anticipated to be minor.

Physical Oceanography

Section 4.1.1.3, which describes the reasonably foreseeable impacts of Alternative A on physical oceanography, concluded that neither routine activities nor non-routine events within the WEA would be expected to impact physical oceanography. It is expected that the reduced level of activities under Alternative B would also reduce any potential impacts associated with surveys and site assessment activities in and around the WEA to below the already negligible level associated with Alternative A.

Water Quality

Section 4.1.1.4, which describes the reasonably foreseeable impacts of Alternative A on water quality, concluded that impacts on coastal and marine waters from vessel discharges associated with Alternative A would be short-term and minor. Sediment disturbed during anchoring and coring would only temporarily impact local turbidity and water clarity. As a result, sediment disturbance resulting from Alternative A is not anticipated to result in any significant impact on any area within the WEA. Since collisions and allisions occur infrequently and rarely result in a spill, the risk of a spill would be small. In the unlikely event of a fuel spill, it is expected that minor impacts would result because the spill would very likely be small and would dissipate and biodegrade within a short time (*see* Section 3.2.3, "Fuel Spills"). If a spill occurred, the potential impacts on water quality would not be expected to be significant. Moreover, storms may disturb surface waters and cause a faster dissipation of diesel fuel if spilled, and in that case, impacts on water quality would be negligible and of short duration. Therefore, impacts from vessel discharges, sediment disturbance, and potential spills associated with Alternative A on harbors, ports, coastal areas, and the WEA are expected to be minor.

Vessel activity associated with surveys and site assessment in the WEA would be less under Alternative B than under Alternative A, reducing the risk of collisions, allisions, or oil spills in and around the shoreline of Rhode Island and Massachusetts. Similarly, discharges of bilge, wastewater, and waste from vessels would be reduced. It is expected that under Alternative B, the reduced number of bottom-disturbing activities associated with surveys and construction/installation would decrease any reasonably foreseeable impacts on water quality within the vicinity of the Alternative B WEA.

4.2.2.2 Biological Resources

Avian and Bat Resources

Section 4.1.2.1 describes the reasonably foreseeable impacts of the proposed action, Alternative A, on avian and bat species. Birds may be affected by the presence of meteorological towers and buoys, but vessel discharges and accidental fuel releases pose no threat of significant impacts on these animals. Impacts on marine and coastal birds from the discharge of waste materials or the accidental release of fuels are expected to be negligible, because of the very limited amount of vessel traffic and construction activity that might occur with construction/installation, operation and maintenance, and decommissioning of a meteorological tower and buoy placement. The risk of collisions or allisions with towers associated with Alternative A would be minor due to the small number of meteorological towers proposed, their size, and their distance from shore and each other. The impact of meteorological buoys on ESA-listed and non-ESA listed migratory birds (including pelagic species) is expected to be negligible because buoys are much smaller and closer to the water surface than towers and would be similarly dispersed over a wide area as part of Alternative A. Alternative B comprises a smaller area than Alternative A and therefore would present a lesser risk to bird species that would be affected by vessel discharges, accidental fuel releases, or collision or allisions with structures within the WEA.

Federally listed threatened or endangered bat species are not expected to occur within the WEA. While it is rare that bat species would be foraging or migrating through the WEA, these mammals may on occasion be driven to the project area by prevailing winds and weather. If bats are present, impacts would be limited to avoidance or attraction responses. Because of the distance that would be between the meteorological towers and buoys, the small number and low density of the towers, and their small footprint, there would be no additive effect on bats from constructing the meteorological towers or from the placement of buoys. In fact, the anticipated data collection activities (e.g., biological surveys) may assist in future environmental analyses of impacts of OCS activities on bats. To the extent that there would be any impacts on individuals, the overall impact of Alternative A on any bats migrating through the WEA is expected to be negligible. There is a potential for migrating bats to be attracted to artificial lighting present on any vessel traveling at night or to the lighting on the meteorological tower or buoys. Again, however, because of the few numbers and low density of meteorological towers and buoys and the small number of vessel trips associated with Alternative A, bats are not expected to be affected by any additional artificial light sources. Thus, impacts on bats resulting from site characterization and assessment activities as part of Alternative A would be negligible. Since Alternative B comprises a smaller area then Alternative A, Alternative B would present a lesser risk that bats would be affected by structures within the WEA.

Coastal and Benthic Habitats

The conclusion in Section 4.1.2.2, which describes the reasonably foreseeable impacts of Alternative A on benthic resources and coastal and benthic habitat habitats, was that routine activities in the WEA are not expected to have direct impacts on coastal habitats because the proposed site assessment activities would take place approximately 10 NM from the shore. Existing ports are expected to be used to support the proposed action, with no expansion of facilities or dredging requirements. Direct impacts on benthic habitats would be limited to short-term disturbance and only a minimal removal of available benthic habitat in the long-term. Direct contact by anchors, piles, or scour-protection devices could smother or crush benthic communities, but because of the vast size of the WEA area and surrounding ocean environment, these effects are expected to be negligible in effect and extent. Any disturbance of soft-bottom benthic communities would be expected to be temporary, with recovery times in the range of three months to two and one-half years. This recovery time depends on the species present, the specific activity, and environmental conditions (Brooks *et al.* 2006). In addition, per BOEM policies, sensitive benthic areas would be avoided through the site assessment process, minimizing any significant adverse effects.

Wake-induced erosion and increased sedimentation associated with the increase in vessel traffic during routine activities could have indirect impacts on coastal habitat. However, given the level of existing vessel traffic in these areas, implementation of Alternative A is expected to result in a negligible increase of wake erosion in the smaller, non-armored, coastal habitats. Potential impacts from non-routine events, such as a diesel spill, are also anticipated to be negligible because a diesel spill is unlikely, would likely be restricted to the sea surface, and would dissipate rapidly.

Alternative B comprises a smaller area then Alternative A and so would present fewer potential impacts from ocean-bottom disturbance than Alternative A; thus, fewer impacts on benthic habitats are anticipated. Under Alternative B, fewer survey, construction/installation, and support vessel trips would take place in and around the WEA than under Alternative A. This would reduce any increase of wake-induced erosion and risk of diesel spills in coastal waters and reduce the amount of potential vessel discharge in and around the WEA near the Rhode Island and Massachusetts coastline. As a result, it is expected that Alternative B would likely lead to fewer impacts on the coastal and benthic habitat than would Alternative A.

Finfish, Shellfish, and Essential Fish Habitat

Section 4.1.2.3, which describes the reasonably foreseeable impacts of Alternative A on finfish, shellfish, and EFH, concluded that the proposed activities associated with Alternative A and the potential effects of noise from HRG surveys on marine fish are generally expected to be limited. Avoidance of the HRG survey activities is possible for mobile fish, whereas fish eggs and larvae may encounter greater impacts. The activities under the proposed action are anticipated to result in short-term changes in fish behavior. Meteorological tower construction noise associated with Alternative A could disturb normal behavior, including fish avoiding or fleeing from the sound source. Fish that do not leave the immediate action area during pile-driving activities could be exposed to lethal SPLs. However, the SOCs (*see* Appendix B), including the implementation of a "soft start" procedure, would minimize the possibility of exposure to lethal sound levels. Potential population-level impacts on fish, if any, from HRG surveys are expected to be negligible.

Because the geotechnical sampling footprint is expected to be small, sampling activities would have negligible benthic community effects that could impact federally managed or other fish species that may occur in the Alternative A WEA. Impacts related to installation, operation and maintenance, and decommissioning of the meteorological towers and buoys associated with Alternative A are expected to be minor and are not expected to result in changes in local community assemblage and diversity. Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. However, entanglement in or ingestion of trash and debris would not be expected during normal operations. Impacts on fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor due to the limited number of structures and vessels involved in construction/installation, operation and maintenance, and decommissioning.

The level of activity under Alternative B would be less than under Alternative A because the size of the WEA would be smaller, thus reducing the exposure of fish to noise from surveys and vessel traffic. Moreover, the area that could be potentially affected by bottom-disturbing activities that could affect finfish, shellfish, and EFH would be smaller under Alternative B than under Alternative A.

Marine Mammals

Section 4.1.2.4 describes the reasonably foreseeable impacts of Alternative A, which is not expected to result in any significant individual or population-level effects on marine mammals in the WEA or in surrounding waters. The proposed activities, when considered with the SOCs that BOEM will require of the lessee to reduce the potential for vessel strike and harassing levels of noise exposure, may result in minor to adverse effects. The NMFS concurred with this determination regarding threatened and endangered marine mammals in their April 10, 2013, Biological Opinion (*see* Section 5.2.1, "Endangered Species Act"). These potential effects on individuals are expected to be temporary and localized. Population-level impacts are not expected to occur due to the limited spatial and temporal extent of the activities. The primary potential impacts on marine mammals associated with Alternative A are harassment of individual marine mammals from noise or the risk of vessel collisions. Thus, these impacts are not anticipated to result in any population-level impacts to marine mammals.

The lower number of site characterization and site assessment activities associated with Alternative B when compared with Alternative A would reduce the potential exposure of marine mammals to noise from surveys, vessel traffic, and pile-driving in the area associated with Alternative B.

Sea Turtles

Section 4.1.2.5 describes the reasonably foreseeable impacts of Alternative A on sea turtles. Effects on sea turtles in the Alternative A WEA and surrounding waters are expected to be short-term and to result in minor to negligible harassment, depending on the specific activity. Impacts related to noise, minor loss/displacement from forage areas, and the potential for vessel collisions are all considered because the size of the area and time spent on site characterization and site assessment activities and individual components of the activities would be relatively small. Population-level impacts are not expected to occur for these same reasons.

Under Alternative B, the lower level of activity would reduce the potential exposure of sea turtles in the Alternative B WEA to noise from surveys, vessel traffic, and pile-driving. The reduced vessel traffic would lower the risk of vessel/sea turtle collisions and reduce the potential for displacement from forage areas.

Wetland Ecosystems

Section 4.1.2.6, which describes the reasonably foreseeable impacts of Alternative A on wetland ecosystems, concluded that routine activities in the WEA would have no direct impacts on coastal habitats because of its distance from shore. Under Alternative A, existing ports or industrial areas in southern Rhode Island and Massachusetts would be used, and these existing facilities are not expected to be expanded to support Alternative A activities. Indirect impacts such as wake erosion and sedimentation from routine activities and increased vessel traffic could occur. However, given the volume and type of existing vessel traffic in these areas, a negligible increase of wake-induced erosion, if any, could occur around the smaller, non-armored, waterways as a result of Alternative A. If an accidental diesel fuel spill occurred, the potential impacts on coastal habitats would likely be negligible, localized, and temporary.

Under Alternative B, the lower level of activity and decrease in vessel traffic would reduce potential impacts from wake erosion and sedimentation compared with Alternative A. Like Alternative A, routine activities under Alternative B would not have direct impacts on coastal habitats because of the 10 NM distance of the WEA from the shore.

4.2.2.3 Socioeconomic Conditions

Aesthetics/Visual Resources

Section 4.1.3.1, which describes the reasonably foreseeable impacts of Alternative A with respect to aesthetics and visual resources, concluded that the proposed action would have negligible impacts on the aesthetics and visual resources of the coastal communities in Rhode Island and Massachusetts. Alternative B would exclude leasing areas within portions of nine OCS blocks proposed for leasing in the WEA as part of Alternative A, all of which are within 15 NM offshore of Massachusetts. As discussed in Section 3.1.3.1 and analyzed in the visual simulations (*see* Appendix D), the geometry of the views from shore would prevent the potential visibility of the tower base and deck or any of the meteorological buoys. Furthermore, while lighting on meteorological towers may be visible from several miles away at night, the towers' lighting would be faint and difficult to distinguish from other lighting present (e.g., vessel traffic). Weather conditions would also significantly limit the visibility, and fog, haze, clouds, or rough seas would likely prevent any potential visibility of the towers and lighting. Therefore, potential visual and aesthetic impacts of site assessment and characterization activities under Alternative B would be less than the potential impacts associated with Alternative A.

Military Areas and Aviation

Section 4.1.3.2, which describes the reasonably foreseeable impacts of Alternative A on military activities and aviation, concluded that the increase in vessel traffic and activities associated with the construction/installation, operation and maintenance, and decommissioning of the meteorological towers and buoys would not measurably impact current or projected future military or aviation activities. It is unlikely that vessels would collide with meteorological towers or buoys because USCG and FAA guidelines require that meteorological towers or buoys be marked and lighted; in addition, the WEA would not include areas with high-volume traffic, and the few structures planned are small and dispersed over a wide area of ocean. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not likely because these facilities would have a small footprint, would be lighted, and would be marked on navigational charts.

Because Alternative B would comprise an 11.8 percent smaller offshore area than Alternative A, any potential impacts on aviation and military areas offshore of Rhode Island and Massachusetts are expected to be less than the potential impacts associated with Alternative A.

Commercial and Recreational Fishing Activities

Section 4.1.3.3 describes the reasonably foreseeable impacts of Alternative A on commercial and recreational fishing activities, concluding that meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, total catch of fish and shellfish, or navigation over any substantial period of time. Any impacts such as localized fishing displacement and/or lack of target species availability within the immediate area of activities associated with Alternative A would be of short duration, limited area, and temporary, and are expected to result in negligible, if detectable, impacts on fishing.

Compared with Alternative A, Alternative B's smaller area would reduce the potential for fishing-use conflict in and around the WEA.

Cultural Resources

Section 4.1.3.4 concluded that bottom-disturbing activities (e.g., coring, anchoring, and installation of meteorological buoys and/or towers) associated with Alternative A have the potential to affect submerged historic and pre-contact cultural and archaeological resources. These activities, such as geotechnical sampling, may also be used to identify potential cultural resources by identifying relict paleolandforms that might have been suitable for human habitation (USDOI, BOEM, OREP 2012b). If such offshore cultural resources are discovered, BOEM's policy has been and will continue to be avoidance of those areas. For example, the exact location of meteorological towers and buoys would be adjusted to avoid adverse effects to offshore cultural resources, if present. Given BOEM's policy and other existing regulatory measures, along with the unanticipated discoveries requirement, impacts to submerged cultural and archaeological resources would be minor.

Additionally, impacts on onshore cultural resources from meteorological structures and vessel traffic associated with surveys and construction/installation would be negligible. Activities conducted under Alternative B, an area smaller than Alternative A, would reduce the potential for impacts on cultural, historic, and archaeological resources compared with Alternative A.

Demographics and Employment

Section 4.1.3.5, which describes the reasonably foreseeable impacts of Alternative A, concluded that due to the magnitude, dispersed nature, and short duration of survey, construction/installation, and decommissioning activities, any benefit for local economies or employment would be negligible but positive (i.e., a minor increase in temporary employment and population and subsequent spending on support services for the duration of activities).

Compared with Alternative A, the reduced number of site characterization surveys and site assessment activities of Alternative B are expected to produce slightly fewer positive impacts on the population and employment of coastal counties of Rhode Island and Massachusetts.

Environmental Justice

Section 4.1.3.6, which describes the reasonably foreseeable impacts of Alternative A related to environmental justice issues, concluded that because of the distance of the WEA from shore, the short duration of onshore and nearshore activities, and the use of existing fabrication sites, staging areas, and ports, Alternative A is not anticipated to incur disproportionally high or adverse environmental or health effects on minority or low-income populations. However, no expansion of these existing onshore areas is anticipated for either Alternative A or Alternative B, nor are significant increases in activity at these existing facilities expected. As a result, neither Alternative A nor Alternative B is expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

Land Use and Coastal Infrastructure

Section 4.1.3.7, which describes the reasonably foreseeable impacts of Alternative A on land use and coastal infrastructure, concluded that existing ports or industrial areas are expected to be used and that expansion of these existing facilities to support Alternative A is not anticipated. This assumption also applies to Alternative B. Assuming that the Rhode Island and Massachusetts coastal infrastructure would be used to support activities in the WEA, the selection of Alternative B would further reduce the need for coastal infrastructure in those states for survey vessels. As a result, Alternative B is expected to have less impact on land use or coastal infrastructure in Rhode Island and Massachusetts than Alternative A.

Navigation/Vessel Traffic

Section 4.1.3.8, which describes the reasonably foreseeable impacts of Alternative A on navigation and vessel traffic, concludes that the increase in vessel traffic, and activities associated with the installation/operation of the meteorological towers and buoys would not measurably impact current or projected future shipping or navigation. It is unlikely that vessels would collide with meteorological towers or buoys associated with Alternative A because USCG and FAA guidelines require that meteorological towers or buoys be marked and lighted. In addition, the WEA does not include areas with a high volume of traffic, and the few anticipated structures would be small and dispersed over a wide area of ocean. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not reasonably foreseeable due to the small footprint of these facilities, the fact that they would be lighted and marked on navigational charts, and their distance from each other and from shore. Nor is it likely that a meteorological tower would collapse and seriously damage an oil tanker or large ship. In addition, survey activities require relatively calm seas so it is unlikely that the vessel travel and site assessment activities associated with Alternative A would take place during adverse weather when tug/towboat routes may alter course and move into or close to the WEA. As the offshore area associated with Alternative B is less than the WEA proposed for Alternative A, any potential impacts on navigation and vessel traffic would be expected to be less than under Alternative A.

Recreational Resources and Tourism

Section 4.1.3.9, which describes the reasonably foreseeable impacts of Alternative A on recreational resources and tourism, concluded that, due to the distance of the proposed lease areas from shore and the fact that that no new coastal infrastructure is proposed, no impacts on coastal recreational resources from meteorological towers or buoys and spills within the WEA are expected. Section 4.1.3.9 also noted that the increase in vessel traffic associated with Alternative A would not significantly affect recreation or tourism in the coastal areas or oceans outside Rhode Island or Massachusetts. While there could be impacts from marine trash and debris associated with Alternative A, it is unlikely that they would be perceptible to beach users or administrators.

Alternative B would exclude portions of nine OCS lease blocks in the WEA proposed for leasing consideration under Alternative A, thereby reducing the amount of vessel traffic and survey activities compared with Alternative A. Therefore, the risk that vessel traffic and discharges could impact recreational resources is also expected to be less under Alternative B.

Other Multiple Use Conflicts

Section 4.1.3.10, which describes the reasonably foreseeable impacts of Alternative A on other uses of the OCS, concluded that the vessel traffic and structures associated with Alternative A could conflict with other existing and future uses of the OCS, including underwater cables, other renewable energy projects, and the marine minerals program. Under Alternative B, survey and construction/installation activities that could impact vessel traffic density and patterns would occur in a smaller area offshore. Thus, potential impacts on telecommunication cables, the marine minerals program, other renewable energy projects, and the risk of collisions or allisions are expected to be slightly less than would the potential impacts associated with Alternative A.

4.2.3 Summary/Conclusions for Alternative B

The potential impacts associated with Alternative B would be similar to Alternative A with the exception of the portions of the nine OCS blocks in the WEA that would be excluded from consideration for leasing. Potential impacts from bottom-disturbing activities on benthic habitats or cultural resources located within the excluded blocks would be less than potential impacts from Alternative A because the designated area is smaller. The reduction in overall vessel traffic under Alternative B would reduce the potential for vessel-related conflicts. Compared with Alternative A, the reduced level of survey and construction/installation activities under Alternative B would similarly further reduce the impacts on air, geology, noise, physical oceanography, water quality, and benthic resources in Rhode Island and Massachusetts ports and coastal areas and within the vicinity of the WEA. Reduced vessel traffic would reduce the risk of vessel collisions and allisions, reducing the risk of a diesel spill. The lower level of activity would reduce the exposure of marine mammals, sea turtles, shellfish, and finfish to noise from surveys, vessel traffic, and pile-driving offshore of Rhode Island and Massachusetts. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals and sea turtles. There would be less potential loss/displacement of sea turtles from forage areas.

Under Alternative B, the offshore area available for construction/installation of meteorological towers would be smaller than Alternative A, which would reduce the already small risk of bird or bat collisions. While the same existing onshore facilities would be used to support site characterization surveys and the site assessment in the remainder of the WEA, fewer survey, construction/installation, and support vessel trips would reduce the potential for wake-induced erosion and risk of diesel spills in coastal waters and wetlands in Rhode Island and Massachusetts. Alternative B is expected to produce negligibly fewer but positive impacts on the population and employment of coastal counties of Rhode Island and Massachusetts than Alternative A.

Under Alternative B, the reduced level of vessel traffic would reduce the risk of collisions or allisions within the WEA. Therefore, Alternative B is expected to have fewer impacts on navigation, military uses, and recreational activities than Alternative A.

4.3 Alternative C: Area Exclusion within 15 NM of the Massachusetts Coastline

4.3.1 Description of Alternative C

Under Alternative C, lease issuance could occur in all areas of the Rhode Island and Massachusetts WEA, except where potential impacts on visual and cultural resources, i.e., areas within 15 NM of the inhabited Massachusetts coastline, could occur (*see* Figure 2-2). Portions of potential lease areas within 14 OCS blocks (6764, 6816, 6817, 6866, 6867, 6917, 6918, 6919, 6968, 6969, 6970, 6971, 7019, 7021) in the WEA proposed in Alternative A would be excluded from consideration for leasing under Alternative C (*see* Appendix A). The area available for site characterization surveys would be approximately 24.3 percent smaller under Alternative C than under Alternative A.

4.3.2 Effects of Alternative C

4.3.2.1 Physical Resources

Air Quality

Section 4.1.1.1, which describes the reasonably foreseeable impacts of Alternative A on air quality, concluded that, due to the distance from shore and the negligible increase in emissions from baseline emissions and existing air quality, neither routine activities nor non-routine events within the WEA are expected to impact onshore air quality.

The reduced number of survey and construction/installation activities under Alternative C would reduce emissions associated with surveys and site assessment in and around the WEA to below the already minor level associated with Alternative A.

Geology

Section 4.1.1.2 describes the reasonably foreseeable impacts of site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys within the Alternative A WEA. Specifically, HRG site surveys would be used to characterize the potential site of a meteorological tower and to gather the data necessary to submit a COP in the future. As with Alternative A, HRG surveys associated with Alternative C would involve shallow penetration of the seafloor, and sediment disturbance could result from the surveys as well as vessel and buoy anchoring and structure installation and removal. Because anchoring and anchor removal take little times, anchoring vessels and buoys (and anchor removal) is expected to cause intermittent disturbance of the seafloor. Short-term impacts on geology are expected to be localized, i.e., within a discrete area of the WEA. These impacts associated with Alternative C are anticipated to be minor.

Physical Oceanography

Section 4.1.1.3, which describes the reasonably foreseeable impacts of Alternative A on physical oceanography, concluded that neither routine activities nor non-routine events within the WEA are expected to impact physical oceanography. The reduced numbers of survey and construction/installation activities under Alternative C are expected to reduce any potential impacts associated with surveys and site assessment activities in and around the WEA to below the already negligible level associated with Alternative A.

Water Quality

Section 4.1.1.4, which describes the reasonably foreseeable impacts of Alternative A on water quality, concluded that impacts on coastal and marine waters from vessel discharges associated with Alternative A would be short-term and minor, if detectable. Sediment disturbed during anchoring and coring would only temporarily impact local turbidity and water clarity. As a result, sediment disturbance resulting from Alternative A is not anticipated to result in any significant impact on any area within the WEA. Since collisions and allisions occur infrequently and rarely result in a spill, the risk of a spill would be small. In the unlikely event of a fuel spill, minor impacts would result because the spill would very likely be small and would dissipate and biodegrade within a short time (*see* Section 3.2.3, “Fuel Spills”). If a spill occurred, the potential impacts on water quality would not be expected to be significant. Moreover, storms may disturb surface waters and cause a faster dissipation of diesel fuel, if spilled, and in that case impacts on water quality would be negligible and of short duration. Therefore, impacts from vessel discharges, sediment disturbance, and potential spills associated with Alternative A on harbors, ports, coastal areas, and the WEA are expected to be minor, if detectable.

Vessel activity associated with surveys and site characterization in the WEA would be less under Alternative C than under Alternative A, reducing the risk of a collisions, allisions, or oil spills in and around the shoreline of Rhode Island and Massachusetts. Similarly, discharges of bilge, wastewater, and waste from vessels associated with the WEA would be reduced. Under Alternative C, the reduced number of bottom-disturbing activities associated with surveys and construction/installation would reduce the reasonably foreseeable impacts on water quality within the vicinity of Alternative C below that which is anticipated under Alternative A.

4.3.2.2 Biological Resources

Avian and Bat Resources

Section 4.1.2.1 describes the reasonably foreseeable impacts of Alternative A on avian and bat species. Birds may be affected by the presence of meteorological towers and buoys, but vessel discharges and accidental fuel releases pose no threat of significant impacts on these animals. Impacts on marine and coastal birds from the discharge of waste materials or the accidental release of fuels are expected to be negligible, because of the very limited amount of vessel traffic and construction activity that might occur with construction/installation, operation and maintenance, and decommissioning of a meteorological tower and buoy placement. The risk of collisions or allisions with towers associated with Alternative A would be minor due to the small number of meteorological towers proposed, their size, and their distance from shore and each other. The impact of meteorological buoys on ESA-listed and non-ESA-listed migratory birds (including pelagic species) is expected to be negligible because buoys are much smaller and closer to the water surface than towers and would be similarly dispersed over a wide area as part of Alternative A. Alternative C comprises a smaller area than Alternative A and therefore would present a lesser risk that bird species would be affected by vessel discharges, accidental fuel releases, or collision or allision with structures in the WEA.

Federally listed threatened or endangered bat species are not expected to occur within the WEA. While it is rare that bat species would be foraging or migrating through the WEA, these mammals may on occasion be driven to the project area by prevailing winds and weather. If bats are present, impacts would be limited to avoidance or attraction responses. Because of the distance that would be between the meteorological towers and buoys, the small number and low density of the towers, and their small footprint, there would be no additive effect on bats from constructing the meteorological towers or from the placement of buoys. In fact, the anticipated data collection activities (e.g., biological surveys) may assist in future environmental analyses of impacts of OCS activities on bats. To the extent that there would be any impacts on individuals, the overall impact of Alternative A on any bats migrating through the WEA is expected to be negligible. There is the potential for migrating bats to be attracted to artificial lighting present on any vessel traveling at night or to the lighting on the meteorological tower or buoys. Again, however, because of the few numbers and low density of meteorological towers and buoys and the small number of vessel trips associated with Alternative A, bats are not expected to be affected by the additional artificial light sources. Thus, impacts on bats resulting from site characterization activities as part of Alternative A are expected to be negligible. Since Alternative C comprises a smaller area than Alternative A, Alternative C would present a lesser risk.

Coastal and Benthic Habitats

The conclusion in Section 4.1.2.2, which describes the reasonably foreseeable impacts of Alternative A on coastal and benthic habitats, was that routine activities in the WEA would not have direct impacts on coastal habitats because of the distance of the proposed activities from the shore. Existing ports are expected to be used to support the proposed action, with no expansion of facilities or dredging requirements. Direct impacts on benthic habitats would be limited to short-term disturbance and only minimal removal of available benthic habitat in the long-term. Direct contact by anchors, piles, or scour-protection devices could smother or crush benthic communities, but because of the vast size of the WEA area and surrounding ocean environment, these effects are expected to be negligible in effect and extent. Any disturbance of soft-bottom benthic communities would be expected to be temporary, with recovery times in the range of three months to two and one-half years. This recovery time depends on the species present, the specific activity, and environmental conditions (Brooks *et al.* 2006). In addition, per BOEM policies, sensitive benthic areas would be avoided through the site characterization process, minimizing any significant adverse effects.

Wake-induced erosion and increased sedimentation associated with the increase in vessel traffic during routine activities could have indirect impacts on coastal habitats. However, given the level of existing vessel traffic in these areas, Alternative A may result in a negligible increase of wave erosion in the smaller, non-armored, coastal habitats. Potential impacts from non-routine events, such as a diesel spill, are also anticipated to be negligible, because a diesel spill is unlikely, would likely be restricted to the sea surface, and would dissipate rapidly.

Alternative C comprises a smaller area than Alternative A and would present fewer potential impacts from ocean bottom-disturbing activities than Alternative A, e.g., fewer impacts on benthic habitats. Under Alternative C, fewer survey, construction/installation, and support vessel trips would occur in and around the WEA than under Alternative A, thus reducing any increase of wake-induced erosion, risk of diesel spills in coastal waters, and the amount of potential vessel discharge in and around the WEA near the Rhode Island and Massachusetts coastline. As a result, Alternative C is expected to lead to fewer impacts on the coastal and benthic habitat than Alternative A.

Finfish, Shellfish, and Essential Fish Habitat

Section 4.1.2.3, which describes the reasonably foreseeable impacts of Alternative A on finfish, shellfish, and EFH, concluded that the proposed activities associated with Alternative A and the potential effects of HRG survey noise on marine fish are generally expected to be limited to the fish avoiding the HRG survey activities and short-term changes in fish behavior. Avoidance of the HRG survey activities is possible, but fish eggs and larvae may encounter greater impacts than more mobile juvenile and adult fish. The activities under the proposed action are anticipated to result in short-term changes in fish behavior. Meteorological tower construction noise associated with Alternative A could disturb normal behavior, including fish avoiding or fleeing from the sound source. Fish that do not leave the immediate action area during pile-driving activities could be exposed to lethal SPLs. However, the SOCs (*see* Appendix B), including the implementation of a "soft start" procedure, would minimize the possibility of exposure to lethal sound levels. Potential population-level impacts on fish, if any, from HRG surveys are expected to be negligible.

Because the geotechnical sampling footprint is expected to be small, sampling activity is expected to have negligible benthic community effects that could impact federally managed or other fish species that may occur in the Alternative A WEA. Impacts related to construction/installation, operation and maintenance, and decommissioning of the meteorological tower and buoys associated with Alternative A are expected to be minor and are not expected to result in changes in local community assemblage and diversity. Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. However, entanglement in or ingestion of trash and debris would not be expected during normal operations. Impacts on fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor due to the limited number of structures and vessels involved in construction/installation, operation and maintenance, and decommissioning.

Under Alternative C, the level of activity would be less because the size of the WEA would be about 24.3 percent smaller than under Alternative A, thus reducing the exposure of fish to noise from surveys and vessel traffic. Moreover, the area that potentially could be affected by bottom-disturbing activities that could affect finfish, shellfish, and EFH would be smaller under Alternative C than Alternative A.

Marine Mammals

Section 4.1.2.4 describes the reasonably foreseeable impacts of Alternative A, which is not expected to result in any significant individual or population-level effects on marine mammals in the WEA or in surrounding waters. The proposed activities, when considered with the SOCs that BOEM will require of the lessee to reduce the potential for vessel strike and harassing levels of noise exposure, may result in minor to adverse effects. The NMFS concurred with this determination regarding threatened and endangered marine mammals in their April 10, 2013, Biological Opinion (*see* Section 5.2.1, "Endangered Species Act"). These potential effects on individuals are expected to be temporary and localized. Population-level impacts are not expected to occur due to the limited spatial and temporal extent of the activities. The primary potential impacts on marine mammals associated with Alternative A are harassment of individual marine mammals from noise or the risk of vessel collisions. Thus, these impacts are not anticipated to result in any population-level impacts to marine mammals.

Under Alternative C, the lower level of site characterization activity compared with Alternative A would reduce the potential exposure of marine mammals to noise from surveys, vessel traffic, and pile-driving.

Sea Turtles

Section 4.1.2.5 describes the reasonably foreseeable impacts of Alternative A on sea turtles. Effects on sea turtles in the Alternative A WEA and surrounding waters are expected to be short-term and to result in minor to negligible harassment, depending on the specific activity. Impacts related to noise, minor loss/displacement from forage areas, and the potential for vessel collisions are all considered minor because the area and time spent on site characterization activities and individual components of the activities would be relatively small. Population-level impacts are not expected to occur for these same reasons.

Under Alternative C, the lower level of activity compared with Alternative A would reduce potential exposure of sea turtles in the Alternative C WEA to noise from surveys, vessel traffic, and pile-driving. The reduced vessel traffic would lower the risk of vessel collisions with sea turtles and reduce potential displacement from forage areas.

Wetland Ecosystems

Section 4.1.2.6, which describes the reasonably foreseeable impacts of Alternative A on wetland ecosystems, concluded that there are no direct impacts on coastal habitats that would occur from routine activities in the WEA due to its the distance from shore. Under Alternative A, existing ports or industrial areas in southern Rhode Island and Massachusetts would to be used and these existing facilities are not expected to be expanded to support Alternative A activities. Indirect impacts from routine activities such as wake erosion and added sediment caused by increased vessel traffic could occur. However, given the volume and type of existing vessel traffic in these areas, a negligible increase of wake-induced erosion, if any, may occur around the smaller, non-armored waterways as a result of Alternative A. If an accidental diesel fuel spill occurred, the potential impacts on coastal habitats would be expected to be negligible, localized, and temporary.

Under Alternative C, the lower level of activity would reduce potential impacts from wake-induced erosion and sedimentation, compared with Alternative A. Like Alternative A, routine activities under Alternative C are not expected to have direct impacts on coastal habitats because of the distance of the WEA from the shore.

4.3.2.3 Socioeconomic Conditions

Aesthetics/Visual Resources

Section 4.1.3.1, which describes the reasonably foreseeable impacts of Alternative A with respect to aesthetics and visual resources, concluded that the proposed action is expected to have negligible impacts on the aesthetics and visual resources of the coastal communities in Rhode Island and Massachusetts. Alternative C would exclude all proposed blocks of the WEA within 15 NM offshore of inhabited areas of Massachusetts, and thus potential impacts of site assessment and site characterization activities on aesthetics and visual resources are expected to be less than the potential (but negligible) impacts associated with Alternative A.

Military Areas and Aviation

Section 4.1.3.2, which describes the reasonably foreseeable impacts of Alternative A on military areas and aviation, concluded that the increase in vessel traffic and activities associated with the installation/operation of the meteorological towers and buoys are not expected to measurably impact current or projected future military or aviation activities. It is unlikely that vessels would collide with meteorological towers or buoys because USCG and FAA guidelines require that meteorological towers or buoys be marked and lighted; in addition, the WEA does not include areas with high-volume traffic, and the few structures planned are small and would be dispersed over a wide area of ocean. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not likely because these facilities would have a small footprint, would be lighted, and would be marked on navigational charts.

Because Alternative C would comprise a 24.3 percent smaller offshore area than Alternative A, any potential impacts on aviation and military areas offshore of Rhode Island and Massachusetts are expected to be negligible.

Commercial and Recreational Fishing Activities

Section 4.1.3.3 describes the reasonably foreseeable impacts of Alternative A on commercial and recreational fishing activities, concluding that meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, the total catch of fish and shellfish, or navigation over any substantial period of time. Any impacts, such as localized fishing displacement and/or lack of target species availability within the immediate area of activities associated with Alternative A, would be of short duration, limited area, and temporary, and are expected to have negligible impacts on fishing.

Compared with Alternative A, Alternative C's smaller area would reduce the potential for fishing-use conflict in and around the Rhode Island and Massachusetts WEA.

Cultural Resources

Section 4.1.3.4 concluded that bottom-disturbing activities (e.g., coring, anchoring, and installation of meteorological buoys and/or towers) associated with Alternative A have the potential to affect submerged historic and pre-contact cultural and archaeological resources. These activities, such as geotechnical sampling, may also be used to identify potential cultural resources by identifying relict paleolandforms that might have been suitable for human habitation (USDOI, BOEM, OREP 2012b). If such offshore cultural resources are discovered, BOEM's policy has been and will continue to be avoidance of those areas. For example, the exact location of meteorological towers and buoys would be adjusted to avoid adverse effects on offshore cultural resources, if present. Given BOEM's policy and other existing regulatory measures, along with the unanticipated discoveries requirement, impacts on submerged cultural and archaeological resources are expected to be minor.

Additionally, impacts on onshore cultural resources from meteorological structures and vessel traffic associated with surveys and construction/installation also are expected to be very low. Activities conducted under Alternative C, an area smaller than Alternative A, are expected to reduce the potential for impacts on cultural, historic, and archaeological resources as compared with Alternative A.

Demographics and Employment

Section 4.1.3.5, which describes the reasonably foreseeable impacts of Alternative A on demographics and employment, concluded that due to the magnitude, dispersed nature, and short duration of survey, construction/installation, and decommissioning activities, any benefit for local economies or employment is anticipated to be negligible but positive (i.e., a minor increase in temporary employment and population and subsequent spending on support services for the duration of activities). Compared with Alternative A, the reduced number of site characterization surveys and site assessment activities of Alternative C are expected to produce slightly fewer positive impacts on the population and employment of coastal communities in Rhode Island and Massachusetts.

Environmental Justice

Section 4.1.3.6, which describes the reasonably foreseeable impacts of Alternative A related to environmental justice issues, concluded that because of the distance of the WEA from shore, the short duration of onshore and nearshore activities, and the use of existing fabrication sites, staging areas, and ports, Alternative A is not anticipated to cause disproportionally high or adverse environmental or health effects on minority or low-income populations. No expansion of these existing onshore areas is anticipated for either Alternative A or Alternative C, nor are significant increases in activity at these existing facilities expected. As a result, neither Alternative A nor Alternative C is expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

Land Use and Coastal Infrastructure

Section 4.1.3.7, which describes the reasonably foreseeable impacts of Alternative A on land use and coastal infrastructure, concluded that existing ports or industrial areas are expected to be used and that expansion of these existing facilities is not anticipated under Alternative A. This assumption also applies to Alternative C. Assuming that Rhode Island and Massachusetts coastal infrastructure would be used to support activities in the WEA, the selection of Alternative C would reduce (compared with Alternative A) the need for coastal infrastructure in those states for survey vessels. As a result, Alternative C is expected to have less impact on land use or coastal infrastructure in Rhode Island and Massachusetts than Alternative A.

Navigation/Vessel Traffic

Section 4.1.3.8, which describes the reasonably foreseeable impacts of Alternative A on navigation and vessel traffic, concludes that the increase in vessel traffic, and activities associated with the installation/operation of the meteorological towers and buoys would not measurably impact current or projected future shipping or navigation. It is unlikely that vessels would collide with meteorological towers or buoys because the USCG and FAA require that meteorological towers or buoys be marked and lighted. In addition, the WEA does not include areas with a high volume of traffic, and the few anticipated structures are small and dispersed over a wide area of ocean. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not reasonably foreseeable because of the small footprint of these facilities, the fact that they would be lit and marked on navigational charts, and their distance from each other and from shore. Nor is it likely that a meteorological tower would collapse and result in serious damage to an oil tanker or large ship. In addition, survey activities related to Alternative A require relatively calm seas so it is unlikely that the ocean-going vessel activities associated with Alternative A would take place during periods of adverse weather, when tug/towboat routes may alter course and move into or close to the WEA. As the offshore area associated with Alternative C is less than the WEA proposed for Alternative A, any potential impacts on navigation and vessel traffic are expected to be less than under Alternative A.

Recreational Resources and Tourism

Section 4.1.3.9, which describes the reasonably foreseeable impacts of Alternative A on recreational resources and tourism, concluded that because the proposed lease areas are far from the shore and no new coastal infrastructure is proposed, no impacts on coastal recreational resources from meteorological towers or buoys and spills within the WEA are expected. Section 4.1.3.9 also noted that the increase in vessel traffic associated with Alternative A would not significantly affect recreation or tourism in the coastal areas or oceans outside Rhode Island or Massachusetts. While impacts from marine trash and debris associated with Alternative A could occur, it is unlikely that they would be perceptible to beach users or administrators.

Alternative C would exclude portions of OCS lease blocks in the WEA proposed for leasing consideration, thereby reducing the amount of vessel traffic and survey activities compared with Alternative A. Therefore, the risk that vessel traffic and discharges could impact recreational resources is expected to be less under Alternative C.

Other Multiple Use Conflicts

Section 4.1.3.10, which describes the reasonably foreseeable impacts of Alternative A on other uses of the OCS, concluded that the vessel traffic and structures associated with Alternative A could conflict with other existing and future uses of the OCS, including underwater cables, other renewable energy projects, and the marine minerals program. Under Alternative C, survey and construction/installation activities that could impact vessel traffic density and patterns would occur in a smaller area offshore than the WEA proposed as part of Alternative A. Thus, potential impacts on telecommunication cables, the marine minerals program, other renewable energy projects, as well as the risk of collisions or allisions, are expected to be less than the potential impacts associated with Alternative A.

4.3.3 Summary/Conclusions for Alternative C

The potential impacts associated with Alternative C would be similar to Alternative A with the exception of the portions of the 14 OCS blocks in the WEA that would be excluded from consideration for leasing. Potential impacts from bottom-disturbing activities on benthic habitats or cultural resources located within the excluded blocks would be less than potential impacts from Alternative A because the designated area is smaller. The reduction in overall vessel traffic because a portion of the WEA would be excluded under Alternative C would reduce the potential for vessel-related conflicts. Compared with Alternative A, the reduced level of survey and construction/installation activities under Alternative C would similarly further reduce the impacts on air, geology, noise, physical oceanography, water quality, and benthic resources in Rhode Island and Massachusetts ports and coastal areas and within the vicinity of the WEA. Reduced vessel traffic would reduce the risk of vessel collisions and allisions, reducing the risk of a diesel spill. The lower level of activity would reduce the exposure of marine mammals, sea turtles, shellfish, and finfish to noise from surveys, vessel traffic, and pile-driving offshore of Rhode Island and Massachusetts. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals and sea turtles. There would be less potential loss/displacement of sea turtles from forage areas.

Under Alternative C, the offshore area available for construction/installation of meteorological towers and buoys would be smaller than under Alternative A, which would reduce the already small risk of bird or bat collisions. While the same existing onshore facilities would be used to support site characterization surveys and site assessment in the remainder of the WEA, fewer survey, construction/installation, and support vessel trips would reduce the potential for the increase of wake-induced erosion and risk of diesel spills in coastal waters and wetlands in Rhode Island and Massachusetts. Accordingly, Alternative C is expected to produce slightly fewer, but positive, impacts on the population and employment of coastal counties of Rhode Island and Massachusetts.

Under Alternative C, the reduced level of vessel traffic (compared with Alternative A) would reduce the risk of collisions or allisions within the WEA. Therefore, Alternative C is expected to have fewer impacts on navigation, military uses, and recreational activities than Alternative A.

4.4 Alternative D: Area Exclusion within 21 NM of the Massachusetts Coastline

4.4.1 Description of Alternative D

Under Alternative D, lease issuance could occur in all areas of the Rhode Island and Massachusetts WEA, except where potential impacts on visual and aesthetic resources would occur, i.e., areas within 21 NM of the Massachusetts coastline (*see* Figure 2-3). Portions of 32 OCS blocks (6764, 6766, 6815, 6816, 6817, 6865, 6866, 6867, 6914, 6915, 6916, 6917, 6918, 6919, 6965, 6966, 6967, 6968, 6969, 6970, 6971, 7016, 7017, 7018, 7019, 7020, 7021, 7067, 7068, 7069, 7070, and 7071) in the WEA proposed under Alternative A would be excluded from consideration for leasing under Alternative D (*see* Appendix A) and, thus, the area available for site characterization surveys under Alternative D would be approximately 67.2 percent smaller than under Alternative A.

4.4.2 Effects of Alternative D

4.4.2.1 Physical Resources

Air Quality

Section 4.1.1.1, which describes the reasonably foreseeable impacts of Alternative A on air quality, concluded that due to the distance from shore and the negligible increase in emissions—compared with baseline emissions and existing air quality—neither routine activities nor non-routine events within the WEA are expected to impact onshore air quality. The amount of additional vessel traffic associated with Alternative A also is not expected to significantly affect onshore air quality. The reduced number of survey and construction/installation activities under Alternative D is expected to reduce emissions associated with surveys and site assessment in and around the WEA to below the already minor level associated with Alternative A.

Geology

Section 4.1.1.2 describes the reasonably foreseeable impacts of site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys within the Alternative A WEA. Specifically, HRG site surveys would be used to characterize the potential site of a meteorological tower and to gather the data necessary to submit a COP in the future. As with Alternative A, these HRG surveys associated with Alternative D would involve shallow penetration of the seafloor, and sediment disturbance could result from the surveys as well as from vessel and buoy anchoring and from structure installation and removal. Anchoring vessels and buoys (and anchor removal) would cause intermittent disturbance of the seafloor because both processes take little time. Short-term impacts on geology are expected to be localized, i.e., within a discrete area of the WEA. The impacts associated with Alternative D are anticipated to be minor.

Physical Oceanography

Section 4.1.1.3, which describes the reasonably foreseeable impacts of Alternative A on physical oceanography, concluded that neither routine activities nor non-routine events in the WEA would be expected to impact physical oceanography. The reduced number of survey and construction/installation activities under Alternative D would lessen any potential impacts associated with surveys and site assessment activities in and around the WEA to below the already negligible level associated with Alternative A.

Water Quality

Section 4.1.1.4, which describes the reasonably foreseeable impacts of Alternative A on water quality, concluded that impacts on coastal and marine waters from vessel discharges associated with Alternative A are expected to be short-term and minor, if detectable. Sediment disturbed during anchoring and coring would only temporarily impact local turbidity and water clarity. As a result, sediment disturbance resulting from Alternative A is not anticipated to result in any significant impact on any area within the WEA or along any potential transmission corridor. Since collisions and allisions occur infrequently and rarely result in a spill, the risk of a spill would be small. In the unlikely event of a fuel spill, minor impacts are expected because the spill would very likely be small and would dissipate and biodegrade within a short time (*see* Section 3.2.3, "Fuel Spills"). If a spill occurred, the potential impacts on water quality would not be expected to be significant. Moreover, storms may disturb surface waters and cause a faster dissipation of diesel fuel if spilled, and in that case, impacts on water quality would be negligible and of short duration. Therefore, impacts from vessel discharges, sediment disturbance, and potential spills associated with Alternative A on harbors, ports, coastal areas, and the WEA are expected to be minor, if detectable.

Vessel activity associated with surveys and site assessment in the WEA would be less under Alternative D than under Alternative A, reducing the risk of collisions, allisions, or oil spills, in and around the Rhode Island and Massachusetts shoreline. Similarly, discharges of bilge, wastewater, and waste from vessels associated with the WEA would be reduced. Under Alternative D, the reduced level of bottom-disturbing activities associated with surveys and construction/installation is expected to reduce the reasonably foreseeable impacts on water quality compared with Alternative A.

4.4.2.2 Biological Resources

Avian and Bat Resources

Section 4.1.2.1 describes the reasonably foreseeable impacts of Alternative A on avian and bat species. Birds may be affected by the presence of meteorological towers and buoys, but vessel discharges and accidental fuel releases pose no threat of significant impacts on these animals. Impacts on marine and coastal birds from the discharge of waste materials or the accidental release of fuels are expected to be negligible, because of the very limited amount of vessel traffic and construction activity that might occur with construction/installation, operation and maintenance, and decommissioning of a meteorological tower and buoy placement. The risk of collisions or allisions with towers associated with Alternative A would be minor due to the small number of meteorological towers proposed, their size, and their distance from shore and each other. The impact of meteorological buoys on ESA-listed and non-ESA-listed migratory birds (including pelagic species) is expected to be negligible because buoys are much smaller and closer to the water surface than towers and would be similarly dispersed over a wide area as part of Alternative A. Alternative D comprises a smaller area than Alternative A and therefore would present a lesser risk that bird species would be affected by vessel discharges, accidental fuel release, collision, or allision with structures in WEA.

Federally listed threatened or endangered bat species are not expected to occur within the WEA. While it is rare that bat species would be foraging or migrating through the WEA, these mammals may on occasion be driven to the project area by prevailing winds and weather. In the event bats are present, impacts would be limited to avoidance or attraction responses. Because of the distance that would be between the meteorological towers and buoys, the small numbers and low density of the towers, and their small footprint, there would be no additive effect on bats from constructing all the meteorological towers or from placing buoys. In fact, the anticipated data collection activities (e.g., biological surveys) may assist in future environmental analyses of impacts of OCS activities on bats. To the extent that there would be any impacts on individuals, the overall impact of Alternative A on any bats migrating through the WEA is expected to be negligible. Migrating bats could potentially be attracted to artificial lighting on any vessel traveling at night or to the lighting on the meteorological tower or buoys. However, because of the few numbers and low density of meteorological towers and buoys and the small number of vessel trips associated with Alternative A, bats are not expected to be affected by the additional artificial light sources. Thus, impacts on bats resulting from site characterization and assessment activities as part of Alternative A are expected to be negligible. Since Alternative D comprises a smaller area than Alternative A, Alternative D would present a lesser risk.

Coastal and Benthic Habitats

The conclusion in Section 4.1.2.2, which describes the reasonably foreseeable impacts of Alternative A on coastal and benthic habitats, was that routine activities in the WEA are not expected to have direct impacts on coastal habitats because the assessment activities would be 10 NM from the shore. Existing ports are expected to be used to support the proposed action, with no expansion of facilities or dredging requirements. Direct impacts on benthic habitats would be limited to short-term disturbance and only a minimal removal of available benthic habitat in the long-term. Direct contact by anchors, piles, or scour-protection devices could smother or crush benthic communities, but because of the vast size of the WEA area and surrounding ocean environment, these effects are expected to be negligible in effect and extent. Any disturbance of soft-bottom benthic communities is expected to be temporary, with recovery times in the range of three months to two and one-half years. This recovery time depends on the species present, the specific activity, and environmental conditions (Brooks *et al.* 2006). In addition, per BOEM policies, sensitive benthic areas would be avoided through the site assessment process, minimizing any significant adverse effects.

Wake-induced erosion and increased sedimentation associated with the increase in vessel traffic could have indirect impacts on coastal habitats. However, given the level of existing vessel traffic in these areas, Alternative A could result in a negligible increase, if any, of wave erosion in the smaller, non-armored, coastal habitats. Potential impacts from non-routine events, such as a diesel spill, are also anticipated to be negligible because a diesel spill is unlikely, would likely be restricted to the sea surface, and would dissipate rapidly.

Alternative D comprises a smaller area than Alternative A and so would present fewer potential impacts from ocean-bottom disturbance than Alternative A; therefore, fewer potential impacts on benthic habitats are anticipated. Under Alternative D, fewer survey, construction/installation, and support vessel trips would occur in and around the WEA than under Alternative A. This would reduce any increase of wake-induced erosion, the risk of diesel spills in coastal water, and the amount of potential vessel discharge in and around the WEA near the Rhode Island and Massachusetts coastline. As a result, Alternative D is expected to have fewer impacts on the coastal and benthic habitat than Alternative A.

Finfish, Shellfish, and Essential Fish Habitat

Section 4.1.2.3, which describes the reasonably foreseeable impacts of Alternative A on finfish, shellfish, and EFH, concluded that the proposed activities associated with Alternative A and the potential effects of noise from HRG surveys on marine fish are generally expected to be limited to the fish avoiding the HRG survey activities and short-term changes in fish behavior. Avoidance of the HRG survey activities is possible for mobile fish, but fish eggs and larvae may encounter greater impacts. The activities under the proposed action are anticipated to result in short-term changes in fish behavior. Meteorological tower construction/installation noise associated with Alternative A could disturb normal behavior, including fish avoiding or fleeing from the sound source. Fish that do not leave the immediate action area during pile-driving activities could be exposed to lethal SPLs. However, the SOCs (*see* Appendix B), including implementation of a "soft start" procedure, would minimize the possibility of exposure to lethal sound levels. Potential population-level impacts on fish, if any, resulting from HRG surveys are expected to be negligible.

Because the geotechnical sampling footprint is expected to be limited, sampling activity would have negligible benthic community effects that could impact federally managed or other fish species that may occur in the Alternative A WEA. Impacts related to construction/installation, operation and maintenance, and decommissioning of the meteorological towers and buoys associated with Alternative A are expected to be minor and are not expected to result in changes in local community assemblage and diversity. Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. However, entanglement in or ingestion of trash and debris would not be expected during normal operations. Impacts on fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor due to the limited number of structures and vessels involved in construction/installation, operation and maintenance, and decommissioning as part of Alternative A.

Under Alternative D, the level of activity would be less because the size of the WEA would be 67.2 percent less than Alternative A, thus reducing the exposure of fish to noise from surveys and vessel traffic. Moreover, the area that could be potentially affected by bottom-disturbing activities that could affect finfish, shellfish, and EFH, would be smaller under Alternative D than under Alternative A.

Marine Mammals

Section 4.1.2.4 describes the reasonably foreseeable impacts of Alternative A, which is not expected to result in any significant individual or population-level effects on marine mammals in the WEA or in surrounding waters. The proposed activities, when considered with the SOCs that BOEM will require of the lessee to reduce the potential for vessel strike and harassing levels of noise exposure, may result in minor to adverse effects. The NMFS concurred with this determination regarding threatened and endangered marine mammals in their April 10, 2013, Biological Opinion (*see* Section 5.2.1, "Endangered Species Act"). These potential effects on individuals are expected to be temporary and localized. Population-level impacts are not expected to occur due to the limited spatial and temporal extent of the activities. The primary potential impacts on marine mammals associated with Alternative A are harassment of individual marine mammals from noise or the risk of vessel collisions. Thus, these impacts are not anticipated to result in any population-level impacts to marine mammals.

Under Alternative D, the level of site characterization and site assessment activity would be less than under Alternative A and would therefore reduce the potential exposure of marine mammals to noise from surveys, vessel traffic, and pile-driving offshore of Rhode Island and Massachusetts. Reduced vessel traffic would lower the risk of vessel collisions with marine mammals in the same proportion that vessel traffic would be reduced.

Sea Turtles

Section 4.1.2.5 describes the reasonably foreseeable impacts of Alternative A on sea turtles. Effects on sea turtles in the WEA and surrounding waters under Alternative A are expected to be short-term and to cause minor to negligible harassment, depending on the specific activity. Impacts related to noise, minor loss/displacement from forage areas, and the potential for vessel collisions are all considered minor due to the spatial and temporal context of the site characterization and site assessment activities and individual components of the activities. Population-level impacts are not expected to occur for these same reasons.

The lower level of activity under Alternative D is expected to reduce the potential exposure of sea turtles in the Alternative D WEA to noise from surveys, vessel traffic, and pile-driving compared with Alternative A. The reduced vessel traffic would lower the risk of vessel collisions with sea turtles and reduce potential displacement from forage areas.

Wetland Ecosystems

Section 4.1.2.6, which describes the reasonably foreseeable impacts of Alternative A on wetland ecosystems, concluded that routine activities in the WEA are expected to have no direct impacts on coastal habitats because of its distance from shore. Under Alternative A, existing ports or industrial areas in southern Rhode Island and Massachusetts would be used and these existing facilities are not expected be expanded to support Alternative A activities. Indirect impacts such as wake erosion and sedimentation from routine activities and increased vessel traffic could occur. However, given the volume and type of existing vessel traffic in these areas, a negligible increase of wake-induced erosion, if any, may occur around the smaller, non-armored waterways as a result of Alternative A. If an accidental diesel fuel spill occurred, the potential impacts on coastal habitats would be expected to be negligible, localized, and temporary.

Under Alternative D, the lower level of activity would reduce potential impacts from wake-induced erosion and sedimentation when compared with Alternative A. Like Alternative A, routine activities under Alternative D are not expected to have direct impacts on coastal habitats because of the distance of the WEA from shore.

4.4.2.3 Socioeconomic Conditions

Aesthetics/Visual Resources

Section 4.1.3.1, which describes the reasonably foreseeable impacts of Alternative A with respect to aesthetics and visual resources, concluded that the proposed action is expected to have negligible impacts on the aesthetics and visual resources of the coastal communities in Rhode Island and Massachusetts. Alternative D would exclude proposed lease areas in 32 OCS blocks of the Alternative A WEA within 21 NM offshore of inhabited areas of Rhode Island and Massachusetts. Therefore, potential visual and aesthetic impacts are expected to be less than the potential negligible impacts associated with Alternative A.

Military Areas and Aviation

Section 4.1.3.2, which describes the reasonably foreseeable impacts of Alternative A on aviation and military activities, concluded that the increase in vessel traffic and activities associated with the installation/operation of the meteorological towers and buoys is not expected to measurably impact current or projected future military or aviation activities. It is unlikely that vessels would collide with meteorological towers or buoys because the USCG and FAA require meteorological towers or buoys to be marked and lighted; in addition, the WEA would not include areas of high-volume traffic, and the few structures planned would be small and dispersed over a wide area of ocean. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not reasonably foreseeable because these facilities would have a small footprint, would be lighted, and would be marked on navigational charts.

Because Alternative D would comprise a 67.2 percent smaller offshore area than Alternative A, with the nearest proposed OCS leasing block being located approximately 2 NM from the nearest USCG-designated vessel traffic lane, any potential impacts on aviation and military areas offshore of Rhode Island and Massachusetts are expected to be negligible.

Commercial and Recreational Fishing Activities

Section 4.1.3.3 describes the reasonably foreseeable impacts of Alternative A on commercial and recreational fishing activities, concluding that meteorological towers and buoys are not expected to measurably impact commercial or recreational fishing activities, the total fish and shellfish catch, or navigation over any substantial period of time. Any impacts, such as localized fishing displacement and/or lack of target species availability within the immediate area of activities associated with Alternative A, would be of short duration, limited area, and temporary, and are expected to be negligible.

Compared with Alternative A, Alternative D’s smaller area would reduce the potential for fishing-use conflict within and around the WEA.

Cultural Resources

Section 4.1.3.4 concluded that bottom-disturbing activities (e.g., coring, anchoring, and installation of meteorological buoys and/or towers) associated with Alternative A have the potential to affect submerged historic and pre-contact cultural and archaeological resources. These activities, such as geotechnical sampling, may also be used to identify potential cultural resources by identifying relict paleolandforms that might have been suitable for human habitation (USDOI, BOEM, OREP 2012b). If such offshore cultural resources are discovered, BOEM’s policy has been and will continue to be avoidance of those areas. For example, the exact location of meteorological towers and buoys would be adjusted to avoid adverse effects on offshore cultural resources, if present. Given BOEM’s policy and other existing regulatory measures, along with the unanticipated discoveries requirement, impacts on submerged cultural and archaeological resources are expected to be minor.

Additionally, impacts on onshore cultural resources from meteorological structures and vessel traffic associated with surveys and construction/installation are expected to be negligible. Activities conducted under Alternative D, in an area smaller than Alternative A, are expected to reduce the potential for impacts on cultural, historic, and archaeological resources compared with Alternative A.

Demographics and Employment

Section 4.1.3.5, which describes the reasonably foreseeable impacts of Alternative A on demographics and employment, concluded that due to the magnitude, dispersed nature, and short duration of survey, construction/installation, operation and maintenance, and decommissioning activities, any benefit for local economies or employment in the coastal communities of Rhode Island and Massachusetts is anticipated to be negligible but positive (i.e., a minor increase in temporary employment and population and subsequent spending on support services for the duration of activities). Compared with Alternative A, the reduced level of site characterization surveys activities under Alternative D is expected to produce fewer positive impacts on the population and employment in the coastal communities of Rhode Island and Massachusetts.

Environmental Justice

Section 4.1.3.6, which describes the reasonably foreseeable impacts of Alternative A related to environmental justice issues, concluded that because of the distance of the WEA from the shore, the short duration of onshore and nearshore activities, and the use of existing fabrication sites, staging areas, and ports, Alternative A is not anticipated to incur disproportionally high or adverse environmental or health effects on minority or low-income populations. However, no expansion of these existing onshore areas is anticipated for either Alternative A or Alternative D, nor are significant increases in activity at these existing facilities anticipated as a result of either Alternative A or Alternative D. As a result, neither Alternative A nor Alternative D is expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

Land Use and Coastal Infrastructure

Section 4.1.3.7, which describes the reasonably foreseeable impacts of Alternative A on land use and coastal infrastructure, concluded that existing ports or industrial areas are expected to be used and that expansion of these existing facilities is not anticipated under Alternative A. This assumption also applies to Alternative D. Assuming that the existing Rhode Island and Massachusetts coastal infrastructure would be used to support activities in the WEA, the selection of Alternative D would reduce the use of existing coastal infrastructure in those states for survey vessels. As a result, Alternative D is expected to have less impact on land use or coastal infrastructure in Rhode Island and Massachusetts than Alternative A.

Navigation/Vessel Traffic

Section 4.1.3.8, which describes the reasonably foreseeable impacts of Alternative A on navigation and vessel traffic, concludes that the increase in vessel traffic and activities associated with the installation/operation of the meteorological towers and buoys is not expected to measurably impact current or projected future shipping or navigation. It is unlikely that vessels would collide with meteorological towers or buoys because USCG and FAA guidelines require that meteorological towers or buoys be marked and lighted. In addition, the WEA does not include high-volume traffic areas, and the few anticipated structures would be small and dispersed over a wide area of ocean. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not likely due to the small footprint of these facilities, the fact that they would be lit and marked on navigational charts, and their distance from each other and from shore. Nor is it likely that a meteorological tower would collapse, resulting in serious damage to an oil tanker or large ship. In addition, survey activities related to Alternative A require relatively calm seas, so it is unlikely that the vessel activities associated with Alternative A would take place during adverse weather, when tug/towboat routes may alter course and move into or close to the WEA. Because the offshore area associated with Alternative D is smaller than the WEA proposed for Alternative A, and approximately 2 NM away from the nearest USCG traffic lane, any potential impacts on navigation and vessel traffic are expected to be less than under Alternative A.

Recreational Resources and Tourism

Section 4.1.3.9, which describes the reasonably foreseeable impacts of Alternative A on recreational resources and tourism, concluded that because of the distance of the proposed lease areas from shore and because no new coastal infrastructure is proposed, no impacts on coastal recreational resources from meteorological towers or buoys and spills within the WEA are expected. Section 4.1.3.8 also noted that the increase in vessel traffic associated with Alternative A is not expected to significantly affect recreation or tourism in the coastal areas or oceans outside Massachusetts or Rhode Island. While impacts from marine trash and debris associated with Alternative A could occur, they would not be likely to be perceptible to beach users or administrators.

Alternative D would exclude blocks that are located at least 21 NM offshore, thereby reducing the amount of vessel traffic and survey activities compared with Alternative A. Therefore the risk that vessel traffic and discharges could impact recreational resources would also be reduced as part of Alternative D.

Other Multiple Use Conflicts

Section 4.1.3.10, which describes the reasonably foreseeable impacts of Alternative A on other uses of the OCS, concluded that the vessel traffic and structures associated with Alternative A could pose a conflict with other existing and future uses of the OCS, including underwater cables, other renewable energy projects, the marine minerals program. Under Alternative D, survey and construction/installation activities that would impact vessel traffic density and patterns would occur in a smaller area offshore than the WEA proposed as part of Alternative A. Therefore, for Alternative D, the potential impacts on telecommunication cables, the marine minerals program, other renewable energy projects, and the risk of spills, collisions, and allisions are expected to be slightly less than the potential impacts associated with Alternative A.

4.4.3 Summary/Conclusions for Alternative D

The potential impacts of Alternative D would be similar to Alternative A with the exception of the portions of the 32 OCS block areas in the WEA that would be excluded from consideration for leasing. Potential impacts from bottom-disturbing activities on benthic habitats or archaeological resources located within the excluded blocks would be less than potential impacts from Alternative A because the designated area is smaller. The reduction in overall vessel traffic under Alternative D would reduce the potential for vessel-related conflicts. Compared with Alternative A, the reduced level of survey and construction/installation activities under Alternative D would similarly further reduce the impacts on air, geology, noise, physical oceanography, water quality, and benthic resources in Rhode Island and Massachusetts ports and coastal areas and within the vicinity of the WEA. Reduced vessel traffic would reduce the risk of vessel collisions and allisions, reducing the risk of a diesel spill. The lower level of activity would reduce the exposure of marine mammals, sea turtles, shellfish, and finfish to noise from surveys, vessel traffic, and pile-driving offshore of Rhode Island and Massachusetts. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals and sea turtles. There would be less potential loss/displacement of sea turtles from forage areas.

Under Alternative D, the offshore area available for constructing meteorological towers and buoys would be smaller than under Alternative A, which would reduce the already small risk of bird or bat collisions. While the same existing onshore facilities would be used to support of the site characterization activities in the remainder of the WEA, fewer survey, construction/installation, operation and maintenance and support vessel trips would reduce the potential for an increase in wake-induced erosion and risk of diesel spills in coastal waters and wetlands in Rhode Island and Massachusetts. Accordingly, Alternative D is expected to produce negligibly fewer but positive impacts on the population and employment of coastal counties of Rhode Island and Massachusetts.

Under Alternative D, the reduced level of vessel traffic (compared with Alternative A) would reduce the risk of collisions, allisions, and oil spills within the WEA. Therefore, Alternative D is expected to have fewer impacts on navigation, military uses, and recreational activities than Alternative A.

4.5 Alternative E: Area Exclusion for Telecommunication Cables

4.5.1 Description of Alternative E

Under Alternative E, leases could be issued in all areas of the Rhode Island and Massachusetts WEA, except where potential impacts on telecommunications cables, i.e., in the areas identified by Verizon as containing telecommunications cable(s), are located (*see* Figure 4-21). OCS lease blocks 7064 and 7115 and portions of OCS lease blocks 7014 and 7065 in the WEA proposed under Alternative A would be excluded from consideration for leasing under Alternative E (*see* Final Area Identification Document [BOEM February 24, 2012]). These blocks would not be excluded from site assessment activities, but meteorological towers or buoys would be restricted from these areas due to the potential for bottom disturbance to impact cable areas. However, it is important to note that there are both in-service and out-of-service telecommunications cables adjacent to the WEA (*see* Figure 4-21). In addition to Verizon, AT&T and Reliance Globalcom own and operate cables (*see* Section 4.1.3.10, “Other Multiple

Use Conflicts"). The area available for lease issuance would be 10.8 percent smaller than under Alternative A thus potentially reducing future power generation reduction by up to 196 MW, assuming that the remainder of the entire WEA could be leased and developed to its full potential.

4.5.2 Effects of Alternative E

4.5.2.1 Physical Resources

Air Quality

Section 4.1.1.1, which describes the reasonably foreseeable impacts of Alternative A on air quality, concluded that due to the distance from shore and the negligible increase in emissions associated with Alternative A compared with baseline emissions and existing air quality, neither routine activities nor non-routine events are expected to significantly impact onshore air quality. The reduced number of activities under Alternative E would reduce emissions associated with surveys and site assessment in and around the WEA below the already minor level associated with Alternative A.

Geology

Section 4.1.1.2 describes the reasonably foreseeable impacts of site characterization surveys and the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys within the Alternative A WEA. Specifically, HRG site surveys would be used to characterize the potential site of the meteorological tower and to gather the data necessary to submit a COP in the future. As with Alternative A, these HRG surveys associated with Alternative E would involve shallow penetration of the seafloor, and sediment disturbance could result from the surveys as well as vessel and buoy anchoring and structure installation and removal. Because anchoring vessels and buoys (and anchor removal) take little time, disturbance of the seafloor would be intermittent. Short-term impacts on geology are expected to be localized—within a discrete area of the WEA. These impacts associated with Alternative E are anticipated to be minor.

Physical Oceanography

Section 4.1.1.3, which describes the reasonably foreseeable impacts of Alternative A on physical oceanography, concluded that neither routine activities nor non-routine events in the WEA would impact physical oceanography. Since the numbers of survey and construction/installation activities under Alternative E would be less than those associated with Alternative A, any potential impacts associated with surveys and site assessment activities in and around the Alternative E WEA would be expected to below the already negligible level associated with Alternative A.

Water Quality

Section 4.1.1.4, which describes the reasonably foreseeable impacts of Alternative A on water quality, concluded that impacts on coastal and marine waters from vessel discharges associated with Alternative A are expected to be short-term and minor. Sediment disturbed during anchoring and coring would only temporarily impact local turbidity and water clarity. As a result, sediment disturbance resulting from implementing Alternative A is not anticipated to result in any significant impact on any area in the WEA. Since collisions and allisions occur infrequently and rarely result in a spill, the risk of a spill would be small. In the unlikely event of a fuel spill, minor impacts are expected because the spill would very likely be small and would dissipate and biodegrade within a short time (*see* Section 3.2.3, "Fuel Spills"). If a spill occurred, the potential impacts on water quality would not be expected to be significant. Moreover, storms may disturb surface waters and cause a faster dissipation of diesel fuel if spilled, and in that case, impacts on water quality would be negligible and of short duration. Therefore, impacts on harbors, ports, coastal areas, and the WEA from vessel discharges, sediment disturbance, and potential spills associated with Alternative E are expected to be minor.

Vessel activity associated with surveys and site assessment activities in the WEA would be less under Alternative E than under Alternative A, reducing the risk of collisions, allisions, and oil spills primarily in and around the shoreline of Rhode Island and Massachusetts. Similarly, discharges of bilge, wastewater, and waste from vessels associated with the WEA would be reduced. Under Alternative E, the reduced number of bottom-disturbing activities associated with surveys and construction/installation would reduce the reasonably foreseeable impacts on water quality within the vicinity of the WEA to below that which is anticipated under Alternative A.

4.5.2.2 Biological Resources

Avian and Bat Resources

Section 4.1.2.1 describes the reasonably foreseeable impacts of the proposed action, Alternative A, on avian and bat species. Birds may be affected by the presence of meteorological towers and buoys, but vessel discharges, and accidental fuel releases pose no threat of significant impacts on these animals. Impacts on marine and coastal birds from the discharge of waste materials or the accidental release of fuels are expected to be negligible, because of the very limited amount of vessel traffic and construction activity that might occur with construction/installation, operation and maintenance, and decommissioning of a meteorological tower and buoy placement. The risk of collisions or allision with towers associated with Alternative A is expected to be minor due to the small number of meteorological towers proposed, their size, and their distance from shore and from each other. The impact of meteorological buoys on ESA-listed and non-ESA listed migratory birds (including pelagic species) is expected to be negligible because buoys are much smaller and closer to the water surface than towers and would be similarly dispersed over a wide area as part of Alternative A. Alternative E comprises a slightly smaller area than Alternative A and therefore would present a lesser risk that birds species would be affected by vessel discharges, accidental fuel releases, or collision or allision with structures in the WEA.

Federally listed threatened or endangered bat species are not expected to occur within the WEA. While it is rare that bat species would be foraging or migrating through the WEA, these mammals may on occasion be driven to the project area by prevailing winds and weather. If bats are present, impacts are expected to be limited to avoidance or attraction responses. Because of the distance that would be between the meteorological towers and buoys, the small number and low density of the towers, and their small footprint, there would be no additive effect on bats from constructing all the anticipated meteorological towers or from placing buoys. In fact, the anticipated data collection activities (e.g., biological surveys) may assist in future environmental analyses of impacts of OCS activities on bats. To the extent that there would be any impacts on individuals, the overall impact of Alternative A on any bats migrating through the WEA is expected to be negligible. Migrating bats potentially could be attracted to artificial lighting on any vessel traveling at night or to the lighting on the meteorological tower or buoys. Again, however, because of the few numbers and low density of meteorological towers and buoys and the small number of vessel trips associated with Alternative A, bats are not expected to be affected by any additional artificial light sources. Thus, impacts on bats resulting from site characterization and assessment activities as part of Alternative A are expected to be negligible. Since Alternative E comprises a smaller area then Alternative A, Alternative E would present a lesser risk.

Coastal and Benthic Habitats

The conclusion in Section 4.1.2.2, which describes the reasonably foreseeable impacts of Alternative A on benthic resources and coastal and benthic habitat habitats, was that routine activities in the WEA would not have direct impacts on coastal habitats because the proposed site assessment activities would take place 10 NM from the shore. Existing ports are expected to be used to support the proposed action, with no expansion of facilities or dredging requirements expected. Direct impacts on benthic habitats would be limited to short-term disturbance and only minimal removal of available benthic habitat in the long-term. Direct contact by anchors, piles, or scour-protection devices could smother or crush benthic communities, but because of the vast size of the WEA area and surrounding ocean environment, these effects are expected to be negligible in effect and extent. Any disturbance of soft-bottom benthic communities would be expected to be temporary, with recovery times in the range of three months to two and one-half years. This recovery time depends on the species present, the specific activity, and environmental conditions (Brooks *et al.* 2006). In addition, per BOEM policies, sensitive benthic areas would be avoided through the site assessment process, minimizing any significant adverse effects.

Wake-induced erosion and increased sedimentation associated with the increase in vessel traffic during routine activities is expected to have indirect impacts on coastal habitats. However, given the level of existing vessel traffic in these areas, Alternative A could result in a negligible increase, if any, of wake erosion in the smaller, non-armored, coastal habitats. Potential impacts from non-routine events, such as a diesel spill, also are anticipated to be negligible because a diesel spill is unlikely, would likely be restricted to the sea surface, and would dissipate rapidly.

Alternative E comprises a smaller area then Alternative A and so would present fewer potential impacts from ocean-bottom disturbance. Thus, fewer impacts on benthic habitats are anticipated. Under Alternative E, fewer survey, construction/installation, operation and maintenance and support vessel trips would take place in and around the WEA than under Alternative A. This would reduce any increase of wake-induced erosion and risk of diesel fuel spills in coastal waters and reduce the amount of potential vessel discharge in and around the WEA. As a result, Alternative E would likely lead to fewer impacts on the coastal and benthic habitat than would Alternative A.

Finfish, Shellfish, and Essential Fish Habitat

Section 4.1.2.3, which describes the reasonably foreseeable impacts of Alternative A on finfish, shellfish, and EFH, concluded that the proposed activities associated with Alternative A and the potential effects of noise from HRG surveys on marine fish are generally expected to be limited to the fish avoiding the HRG survey activities and short-term changes in fish behavior. Avoidance of the HRG survey activities is possible for mobile fish, but fish eggs and larvae may encounter greater impacts. The activities under the proposed action are anticipated to result in short-term changes in fish behavior. Meteorological tower construction/installation noise associated with Alternative A could disturb normal behavior, including fish avoiding or fleeing from the sound source. Fish that do not leave the immediate action area during pile-driving activities could be exposed to lethal SPLs. However, the SOCs (*see* Appendix B), including the implementation of a "soft start" procedure, would minimize the possibility of exposure to lethal sound levels. Potential population-level impacts on fish, if any, resulting from HRG surveys are expected to be negligible.

Because the geotechnical sampling footprint is expected to be small, sampling activities would have negligible benthic community effects that could impact federally managed or other fish species that may occur in the WEA under Alternative A. Impacts related to installation, operation and maintenance, and decommissioning of the meteorological towers and buoys associated with Alternative A are expected to be minor and are not expected to result in changes in local community assemblage and diversity. Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. However, entanglement in or ingestion of trash and debris would not be expected during normal operations. Impacts on fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor due to the limited number of structures and vessels involved with the structures' construction/installation, operation and maintenance, and decommissioning. Under Alternative E, the level of activity would be less because the size of the WEA would be 10.8 percent less, thereby reducing the exposure of fish to noise from surveys and vessel traffic. Moreover, the area that could be potentially affected by bottom-disturbing activities that could affect finfish, shellfish and EFH would be smaller under Alternative E than under Alternative A.

Marine Mammals

Section 4.1.2.4 describes the reasonably foreseeable impacts of Alternative A, which is not expected to result in any significant individual or population-level effects on marine mammals in the WEA or in surrounding waters. The proposed activities, when considered with the SOCs that BOEM will require of the lessee to reduce the potential for vessel strike and harassing levels of noise exposure, may result in minor to adverse effects. The NMFS concurred with this determination regarding threatened and endangered marine mammals in their April 10, 2013, Biological Opinion (*see* Section 5.2.1, "Endangered Species Act"). These potential effects on individuals are expected to be temporary and localized. Population-level impacts are not expected to occur due to the limited spatial and temporal extent of the activities. The primary potential impacts on marine mammals associated with Alternative A are harassment of individual marine mammals from noise or the risk of vessel collisions. Thus, these impacts are not anticipated to result in any population-level impacts to marine mammals.

Under Alternative E, the lower number of site characterization and site assessment activities when compared with Alternative A would therefore reduce the potential exposure of marine mammals to noise from surveys, vessel traffic, and offshore pile-driving. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals.

Sea Turtles

Section 4.1.2.5 describes the reasonably foreseeable impacts of Alternative A on sea turtles. Effects on sea turtles are expected to be short-term and would result in minor to negligible harassment, depending on the specific activity at issue. Impacts related to noise, minor loss/displacement from forage areas, and the potential for vessel collisions are all considered because the area and time spent on site characterization and site assessment activities and individual components of the activities would be relatively small. Population-level impacts are not expected to occur for these same reasons.

Under Alternative E, the lower level of anticipated activity is expected to reduce potential exposure of sea turtles to noise from surveys, vessel traffic, and pile-driving in the Alternative E WEA. The reduced vessel traffic would lower the risk of vessel/sea turtle collisions and reduce the potential for displacement from forage areas.

Wetland Ecosystems

Section 4.1.2.6, which describes the reasonably foreseeable impacts of Alternative A on wetland ecosystems, concluded that routine activities in the WEA are not expected to have direct impacts on coastal habitats because of the distance from the shore. Under Alternative A, existing ports or industrial areas in southern Rhode Island and Massachusetts would be used. These existing facilities are not expected to be expanded to support Alternative A activities. Indirect impacts such as wake-induced erosion and sedimentation from routine activities and increased vessel traffic could occur. However, given the volume and type of existing vessel traffic in these areas, a negligible increase of wake-induced erosion, if any, could occur around the smaller, non-armored, waterways. If an accidental diesel fuel spill occurred, the potential impacts on coastal habitats would be expected to be negligible, localized, and temporary.

Under Alternative E, the lower level of activity and decreased vessel traffic would reduce potential impacts from wake-induced erosion and sedimentation compared with Alternative A. Like Alternative A, Alternative E would not have direct impacts on coastal habitats because of the 10 NM distance of the WEA from shore.

4.5.2.3 Socioeconomic Conditions

Aesthetics/Visual Impacts

Section 4.1.3.1, which describes the reasonably foreseeable impacts of Alternative A with respect to aesthetics and visual resources concluded that the proposed action would have negligible impacts on the aesthetics and visual resources of the coastal communities in Rhode Island and Massachusetts. Because the Alternative E WEA is smaller than Alternative A, potential impacts on aesthetics visual resources are expected to be further reduced in comparison with the potential negligible impacts associated with Alternative A.

Military Areas and Aviation

Section 4.1.3.2, which describes the reasonably foreseeable impacts of Alternative A on aviation and military activities, concluded that the increase in vessel traffic and activities associated with the installation/operation of the meteorological towers and buoys would not measurably impact current or projected future military or aviation activities. It is unlikely that vessels would collide with meteorological towers or buoys because USCG and FAA guidelines require that meteorological towers or buoys be marked and lighted; in addition, the WEA does not include areas of high-volume traffic and the few structures planned are small and dispersed over a wide area of ocean. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not reasonably foreseeable because these facilities would have a small footprint, would be lighted, and would be marked on navigational charts.

Because Alternative E would be 10.8 percent smaller than Alternative A, any potential impacts on aviation and military areas offshore of Rhode Island and Massachusetts are expected to be negligible.

Commercial and Recreational Fishing Activities

Section 4.1.3.3 describes the reasonably foreseeable impacts of Alternative A on commercial and recreational fishing activities, concluding that meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, the total fish and shellfish catch, or navigation over any substantial period of time. Any impacts, such as localized fishing displacement and/or lack of target species availability within the immediate area of activities associated with Alternative A, would be of short duration, limited area, and temporary and are expected to have negligible impacts on fishing.

Compared with Alternative A, Alternative E would reduce the potential for fishing-use conflict in and around the WEA.

Cultural Resources

Section 4.1.3.4 concluded that bottom-disturbing activities (e.g., coring, anchoring, and installation of meteorological buoys and/or towers) associated with Alternative A have the potential to affect submerged historic and pre-contact cultural and archaeological resources. These activities, such as geotechnical sampling, may also be used to identify potential cultural resources by identifying relict paleolandforms that might have been suitable for human habitation (USDOI, BOEM, OREP 2012b). If such offshore cultural resources are discovered, BOEM's policy has been and will continue to be avoidance of those areas. For example, the exact location of meteorological towers and buoys would be adjusted to avoid adverse effects on offshore cultural resources, if present. Given BOEM's policy and other existing regulatory measures, along with the unanticipated discoveries requirement, impacts on submerged cultural and archaeological resources would be minor.

Under Alternative E, exclusions of certain blocks would reduce the potential for impacts on cultural, historic, and archaeological resources, and therefore the potential for impacts on these resources is expected to be less than under Alternative A.

Demographics and Employment

Section 4.1.3.5, which describes the reasonably foreseeable impacts of Alternative A, concluded that due to the magnitude, dispersed nature, and short duration of survey, construction/installation, operation and maintenance and decommissioning activities, any benefit for local economies or employment would be negligible but positive, with a minor increase in temporary employment and population and subsequent spending on support services for the duration of activities.

Compared with Alternative A, the reduced number of site characterization surveys and site assessment activities of Alternative E are expected to produce slightly fewer positive impacts on the population and employment of coastal counties of Rhode Island and Massachusetts.

Environmental Justice

Section 4.1.3.6, which describes the reasonably foreseeable activities of Alternative A related to environmental justice issues, concluded that because of the distance of the WEA from the shore, the short duration of onshore and nearshore activities, and the use of existing fabrication sites, staging areas, and ports, Alternative A is not anticipated to incur disproportionally high or adverse environmental or health effects on minority or low-income populations. However, no expansion of these existing onshore areas is anticipated for either Alternative A or Alternative E, nor are significant increases in activity at these existing facilities anticipated. As a result, neither Alternative A nor Alternative E is expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

Land Use and Coastal Infrastructure

Section 4.1.3.7, which describes the reasonably foreseeable impacts of Alternative A on land use and coastal infrastructure, concluded that existing ports or industrial areas are expected to be used and that expansion of these existing facilities is not anticipated under Alternative A. This assumption also applies to Alternative E. Assuming that Rhode Island and Massachusetts coastal infrastructure would be used to support activities in the WEA, the selection of Alternative E would further reduce the need for coastal infrastructure in those states for survey vessels. As a result, Alternative E is expected to have less impact on land use or coastal infrastructure in Rhode Island and Massachusetts than Alternative A.

Navigation/Vessel Traffic

Section 4.1.3.8, which describes the reasonably foreseeable impacts of Alternative A on navigation and vessel traffic, concludes that the increase in vessel traffic and activities associated with the construction/installation, operation and maintenance and decommissioning of the meteorological towers and buoys is not expected to measurably impact current or projected future shipping or navigation. It is unlikely that vessels would collide with meteorological towers or buoys associated with Alternative A because USCG and FAA guidelines require that meteorological towers or buoys be marked and lighted. In addition, the WEA does not include areas of high-volume traffic, and the few anticipated structures would be small and dispersed over a wide area of ocean. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not reasonably foreseeable because of the small footprint of these facilities, the fact that they would be lighted and marked on navigational charts, and their distance from each other and from shore. Nor is it likely that a meteorological tower would collapse and seriously damage an oil tanker or large ship. In addition, survey activities require relatively calm seas, so it is unlikely that the vessel travel and site assessment activities associated with Alternative A would take place during adverse weather, when tug/towboat routes may alter course and move into or close to the WEA. Because the offshore area associated with Alternative E is smaller than the WEA proposed for Alternative A, any potential impacts on navigation and vessel traffic are expected to be less than under Alternative A.

Recreational Resources and Tourism

Section 4.1.3.9, which describes the reasonably foreseeable impacts of Alternative A on recreational resources and tourism, concluded that because of the distance of the proposed lease areas from shore and because no new coastal infrastructure is proposed, no impacts on coastal recreational resources from meteorological towers or buoys and spills within the WEA are expected. Section 4.1.3.9 also noted that the increase in vessel traffic associated with Alternative A would not significantly affect recreation or tourism in the coastal areas or oceans outside Rhode Island or Massachusetts. While there could be impacts from marine trash and debris, it is unlikely that they would be perceptible to beach users or administrators.

Vessel traffic and survey activities under Alternative E would be reduced when compared with Alternative A. Therefore, the risk that vessel traffic and discharges could impact recreational resources within Rhode Island and Massachusetts are expected to be reduced correspondingly.

Other Multiple Use Conflicts

Section 4.1.3.10, which describes the reasonably foreseeable impacts of Alternative A on other uses of the OCS, concluded that the vessel traffic and structures associated with Alternative A could pose a conflict with other existing and future uses of the OCS, other renewable energy projects, and the marine minerals program. Alternative E excludes from consideration all areas identified by Verizon as containing telecommunications cable(s), thus avoiding potential impacts on telecommunication cables from site characterization and assessment activities. Under Alternative E, survey and construction/installation activities that could impact vessel traffic density and patterns would occur in a smaller area offshore. Therefore, the risk of collisions or allisions under Alternative E is expected to be less than under Alternative A.

4.5.3 Summary/Conclusions for Alternative E

The potential impacts associated with Alternative E would be similar to Alternative A, with the exception of the portions of the four OCS blocks in the southwestern part of the WEA that would be excluded from consideration for leasing. The potential of bottom-disturbing activities to affect benthic habitats or cultural resources located within the excluded blocks is expected to be less than potential impacts from Alternative A because the designated area is smaller. The reduction in overall vessel traffic under Alternative E would reduce the potential for vessel-related conflicts. Compared with Alternative A, the reduced level of survey and construction/installation activities under Alternative E would similarly reduce the impacts on air, geology, noise, physical oceanography, water quality, and benthic resources in Rhode Island and Massachusetts ports and coastal areas and in the vicinity of the WEA. Reduced vessel traffic would reduce the risk of vessel collisions and allisions, reducing the risk of a diesel fuel spill. The lower level of activity would reduce the exposure of marine mammals, sea turtles, shellfish, and finfish to noise from surveys, vessel traffic, and offshore pile-driving. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals and sea turtles. There would be less potential loss/displacement of sea turtles from forage areas.

Under Alternative E, the offshore area available for construction/installation of meteorological towers and buoys would be 10.8 percent less than under Alternative A, which would reduce the already small risk of bird or bat collisions. While the same existing onshore facilities would be used for site characterization surveys and site assessment in the remainder of the WEA, fewer survey, construction/installation, operation and maintenance and support vessel trips would reduce the potential for the increase of wake-induced erosion and risk of diesel fuel spills in coastal waters and wetlands in Rhode Island and Massachusetts. Accordingly, Alternative E is expected to produce negligibly fewer but positive impacts on the population and employment of coastal counties of Rhode Island and Massachusetts.

The reduced level of vessel traffic would reduce the risk of collisions, allisions, and oil spills within the WEA. Therefore, Alternative E is expected to have fewer impacts on navigation, military uses, and recreational activities than Alternative A. In addition, Alternative E is expected to avoid potential impacts on offshore telecommunication cables as a result of site characterization and assessment activities.

4.6 Alternative F: No Action

4.6.1 Description of Alternative F

Under the No Action Alternative, no commercial or research leases to develop wind energy would be issued and there would be no approval of additional site assessment activities within the Rhode Island and Massachusetts WEA at this time.

4.6.2 Effects of Alternative F

Any potential environmental and socioeconomic impacts described in Section 4.1.3 would not occur. Opportunities to collect meteorological, oceanographic, and biological data offshore of Rhode Island and Massachusetts also would not occur.

4.6.3 Summary/Conclusions for Alternative F

Any potential environmental and socioeconomic impacts, as described in Section 4.1, would not occur. Opportunities to collect meteorological, oceanographic, and biological data offshore of Rhode Island and Massachusetts also would not be available for potential applicants or would be postponed. Under the No Action Alternative, the data needed to successfully determine the feasibility of potential proposed lease areas for commercial wind energy development would not be collected and site characterization surveys would not likely occur.

4.7 Cumulative Impacts

Cumulative impacts are the incremental effects of the preferred action, Alternative A, on the environment when added to other past, present, or reasonably foreseeable future actions taking place within the Rhode Island and Massachusetts WEA, regardless of what agency or person undertakes such other actions (*see* 40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a given period. Section 7.6.2 of the Programmatic EIS (USDOI, MMS 2007) discusses generic cumulative impacts on individual environmental and socioeconomic resources in proposed leasing areas. This revised EA focuses on the implementation of Alternative A in the context of past and present activities and future increases in vessel traffic, e.g., increases in shipping (*see* Section 4.1.3.8 'Navigation and Vessel Traffic") and is not considered in isolation.

The purpose of the proposed action is to issue leases and approve SAPs to provide for the responsible development of wind energy resources within the Rhode Island and Massachusetts WEA. Surveys and meteorological measurement devices would be used to assess the wind resources in the lease area and characterize the environmental and socioeconomic resources and conditions so that a lessee can determine whether a site is suitable for commercial development. BOEM is not currently reviewing any COP nor has any COP been submitted for the agency's consideration in the WEA. If an area is determined suitable by a lessee, the lessee would submit a COP for BOEM to review. Additional analysis under NEPA would be required before any future decision is made regarding construction or operation of any wind energy facilities on leases that may be issued within the Rhode Island and Massachusetts WEA.

The following section summarizes the cumulative impacts on both on- and offshore areas over the five-year life of the proposed action, focusing on the incremental impact of Alternative A when added to other current and reasonably foreseeable future actions. Potential impact-producing factors of the proposed action include discharges; bottom disturbance during surveying, anchoring, and structure placement; disturbance and collision risk from an increase in vessel traffic; and disturbance, space-use conflicts, and collision risk due to the presence of meteorological towers. The major cumulative activities that would likely occur offshore of Rhode Island and Massachusetts during the life of the proposed action (up to five years) are an increase in vessel traffic (military, commercial, and recreational) (*see* Sections 4.1.3.2, "Military Areas and Aviation," and 4.1.3.3, "Commercial and Recreational Fishing Activities") and other multiple use conflicts (*see* Section 4.1.3.10). These cumulative activities would have similar impact-producing factors, but impacts would occur much more frequently and would impact a larger area than the proposed action. For example, approximately 930 to 1,970 vessel trips (round trips) associated with all site characterization surveys are expected to occur as a result of the proposed action over five years, from 2013 to 2018 (*see* Section 4.1.3.8, "Navigation and Vessel Traffic."). All of these vessel trips collectively would contribute to discharges affecting water quality, bottom disturbances from anchoring that could impact offshore biologically sensitive areas and cultural resources, and the risk of collisions with marine mammals. In addition, renewable energy development projects such as the Block Island Wind Project with five 6.0 MW direct-drive offshore wind turbines with a total capacity of 30 MW, would have larger footprints than the proposed meteorological towers and an increased risk of encountering biologically sensitive areas and cultural resources during construction/installation.

It is not anticipated that commercial and recreational fishing activities and recreational boating would be precluded from using the area surrounding the proposed meteorological towers or that these towers would interfere with military activities and vessel traffic, as opposed to future renewable energy development projects that may restrict fishing in large areas and interfere with military activities and vessel traffic. It is recognized that the home port of the Atlantic scallop fleet is from Massachusetts to North Carolina and that vessels routinely transit to fishing grounds away from their home port, either due to choice or regulatory requirements (Kelley Drye & Warren LLP 2011b). Consideration will be given to the cumulative effect of multiple offshore wind facilities because fishing vessels may not be affected by a single offshore wind facility, but by a range of them. The incremental contribution of the proposed action to cumulative impacts on the environmental and socioeconomic resources described in Section 4.1 is expected to be negligible to minor.

4.7.1 Onshore

Due to their proximity to the WEA, the coastal areas of Rhode Island and Massachusetts are anticipated to host the majority of activities associated with the WEA offshore of those states. As discussed in Section 4.1.3.8, "Navigation and Vessel Traffic," there are large commercial ports and numerous smaller commercial ports in Narragansett Bay that could support Alternative A activities, i.e., site assessment surveys (if those ports meet the requirements). These ports would be accessed by Narragansett Bay and Buzzards Bay, part of the Atlantic Intracoastal Waterway system. Both bays are ecologically and commercially important to the region. The Narragansett Bay National Estuarine Research Reserve (NBNERR), in the heart of Narragansett Bay, protects approximately 4,400 acres of land and water (NBNERR Reserve n.d.) (*see* Section 4.1.3.7, "Land Use and Coastal Infrastructure"). Like Narragansett Bay, Buzzards Bay and its watershed is in one of the 28 national estuary programs in the United States created for the protection and restoration of water quality and living resources (Buzzards Bay National Estuary Program 1997). As discussed in Section 4.1.3.5, "Demographics and Employment," Rhode Island and Massachusetts, like the rest of the Atlantic region, comprise heterogeneous sociocultural and economic systems. In 2010, the shoreline counties of these two states had a combined population of more than 7 million, with nearly 7,000 businesses, more than 110,000 jobs, and nearly $2 million in wages (*see* Section 4.1.3.5).

As discussed in Section 4.1.2.6, "Coastal Wetland Habitats and Ecosystems," while Rhode Island and Massachusetts have a complex range of diverse coastal habitats consisting of barrier islands, sand spits, beaches, dunes, tidal and non-tidal wetlands, mudflats, and estuaries, much of the Atlantic shoreline in these states has been altered in some degree, and most of the coastal habitats have been impacted by human activities. Much of this alteration has been from development, agriculture, maritime activities, beach replenishment, or shore-protection structures such as groins and jetties (USDOI, MMS, 2007a).

Incremental Contribution of Alternative A

Approximately 40 round trips by various vessels are expected during construction/installation of each meteorological tower over a five-year period, assuming using a total of 160 vessels if the entire area of the WEA were leased and the maximum number of site characterization surveys were conducted in the leased areas of the WEA (*see* Section 3.1.3.1, "Meteorological Towers and Foundations"). One vessel would typically take one or two days to install meteorological buoys. One round trip is assumed for the installation of each buoy and again for its decommissioning. If each potential lessee decides to install meteorological buoys on its leasehold, a total of 16 to 32 round trips are estimated for the installation and decommissioning of the up to eight anticipated meteorological buoys. Assuming a single maintenance trip to each meteorological tower weekly to quarterly and/or to each buoy monthly to quarterly, the proposed action would result in an additional 48 to 312 vessel trips per year, or 240 to 1,560 vessel trips over a five-year period. The total vessel traffic estimated as a result of the construction/installation, operation and maintenance, and decommissioning of the meteorological towers and buoys that could be reasonably anticipated in connection with the proposed action would range from 576 to 1,912 round trips over a five-year period (*see* "Operation and Maintenance of Towers," in Section 3.1.3.1) recognizing that these vessel trips may be spread over multiple construction seasons due to the various times at which lessees acquire their leases, weather and sea state conditions, assessing suitable site(s), acquiring the necessary permits, and availability of vessels, workers, and tower components.

Since Alternative A would be supported by several existing port facilities , the proposed action would add a relatively minor amount of additional vessel traffic over a five-year period, and as a result the incremental impacts on coastal habitats and the economy from onshore activities associated with Alternative A are expected to be negligible.

4.7.2 Offshore

Potential activities that would occur offshore of Rhode Island and Massachusetts during the five year life of Alternative A include activities related to renewable energy facilities (i.e., wind facilities), and commercial fishing. Of the other activities, the chief impact-producing activity would be vessel traffic. For example, one of the primary threats for the North Atlantic right whale is collisions with vessels (ship strikes).

With the exception of other renewable energy activities, the past, present, and reasonably foreseeable future actions discussed in this section are not unique to the Rhode Island and Massachusetts WEA or the Northeast region. Migratory species, which may be impacted by Alternative A, would also experience impacts from other actions while outside of the WEA and Northeast region. Sections 4.1.2.1 ("Avian and Bat Resources"), 4.1.2.4 ("Marine Mammals"), and 4.1.2.5 ("Sea Turtles") discuss cumulative impacts specific to those migratory species.

The Alternative A WEA is located at or near the entrances to major ports and the Atlantic Intracoastal Waterway system. Like the inland waterways that would support Alternative A, offshore waters from the shoreline to the boundary of the WEA are also heavily trafficked by commercial, private, or military vessels, as evidenced by the number of ports located in Rhode Island and Massachusetts (*see* Section 4.1.3.7, "Land Use and Coastal Infrastructure"). Millions of military, commercial, and recreational vessel trips are projected to occur during the five years of site assessment if Alternative A is implemented (USDOI, MMS, 2007a). No meteorological towers are currently located in the WEA; however, NDBC Station 44097, located at 40.981 N 71.117 W (40°58'52" N 71°7'1" W), is located within the WEA and within OCS block # 7116 (NK19-07 protraction unit) (NOAA NDBC 2012). Additionally, meteorological, oceanographic, and navigational buoys are located between the WEA and shore and in Narragansett Bay (e.g., Northeastern Regional Association of Coastal and Ocean Observing Systems, Gulf of Maine Ocean Observing System, the University of New Hampshire Coastal Ocean Observing Center, the Long Island Sound Integrated Coastal Observing System, and the Narragansett Bay Water Quality Monitoring Network) (*see* National Ocean Service 2012). Section 3 of this revised EA describes the reasonably foreseeable scenario regarding the placement of meteorological buoys within the WEA, which is projected to be a maximum of eight for the Rhode Island and Massachusetts WEA. When added to the existing buoys offshore of these two states, the buoys associated with Alternative A are not anticipated to result in significant environmental consequences.

With a range of 1,500 to 4,000 round trips expected for site characterization and assessment activities associated with Alternative A over a five- year period, this is relatively minor when compared with existing vessel traffic from commercial shipping, personal recreational vessels, passenger vessels, military vessels, and commercial/recreational fishing vessels. In addition to site characterization and site assessment activities in the Rhode Island and Massachusetts WEA, BOEM is also considering lease issuance along the Atlantic Coast from Maine to North Carolina as described in the following Calls for Information:

- Maine: Unsolicited request for a commercial lease from Statoil North America Inc. (Hywind Maine Pilot Project proposed 12 NM offshore of Maine in the Gulf of Maine) (USDOI, BOEM n.d.[a]);
- Massachusetts: *Commercial Leasing for Wind Power on the Outer Continental Shelf Offshore Massachusetts—Call for Information and Nominations (Call)* [Docket No. BOEM–2011–0097], published February 6, 2012, BOEM received ten nominations of interest wishing to obtain a commercial lease for a wind energy project;
- Rhode Island/Massachusetts: *Commercial Leasing for Wind Power on the Outer Continental Shelf (OCS) Offshore Rhode Island and Massachusetts—Call for Information and Nominations (Call)* [Docket No. BOEM–2011–0049], published August 18, 2011, BOEM received eight indications of interest from eight parties wishing to obtain a commercial lease for a wind energy project;
- New Jersey: *Commercial Leasing for Wind Power on the Outer Continental Shelf (OCS) Offshore New Jersey—Call for Information and Nominations (Call)* Docket No. BOEM–2011–0005], published April 21, 2011, BOEM received eleven indications of interest wishing to obtain a commercial lease for a wind energy project;
- Delaware: *Commercial Leasing for Wind Power on the Outer Continental Shelf (OCS) Offshore Delaware—Request for Interest (RFI)* [Docket No. MMS–2010–OMM–0017], published April 26, 2010, BOEM received two indications of interest from parties wishing to obtain a commercial lease for a wind energy project;
- Maryland: *Commercial Leasing for Wind Power on the Outer Continental Shelf Offshore Maryland—Call for Information and Nominations (Call)* [Docket No. BOEM–2011–0058], published February 3, 2012, BOEM received six nominations of interest wishing to obtain a commercial lease for a wind energy project; and
- Virginia: *Commercial Leasing for Wind Power Development on the Outer Continental Shelf (OCS) Offshore Virginia—Call for Information and Nomination (Call)* [Docket No. BOEM–2011-0093], published February 3, 2012, BOEM received eight nominations of interest wishing to obtain a commercial lease for a wind energy project (*see generally* USDOI, BOEM n.d.[b]).

Fishing vessels with a home port in southern New England and the mid-Atlantic often have a fishing range well beyond their home port and thus utilize much of the U.S. EEZ from Maine to North Carolina. These vessels could potentially be impacted by site assessment and site characterization activities throughout their fishing range. However, the total increase in vessel traffic from renewable energy leasing, as well as other sources, is not likely to impede fishing as a whole along the Atlantic Coast. The additional vessel traffic generated by Alternative A and the environmental consequences associated with this vessel traffic would likely be undetectable compared with the impacts of millions of military, commercial, and recreational vessel trips projected to occur during the same five-year period.

4.7.2.1 Cape Wind Energy Project

Energy Management Inc. is the developer of the Cape Wind Energy Project, 130 wind turbines proposed to produce 420 MW in Horseshoe Shoal, toward the center of Nantucket Sound offshore of Massachusetts. Cape Wind would be 5.2 miles from Point Gammon, a private island in South Yarmouth, 5.6 miles from Cotuit, 6.5 miles from Craigville Beach on Cape Cod, 9.3 miles from Oak Bluffs, and 13.8 miles from the Town of Nantucket (Cape Wind Associates, LLC 2012b).

Project construction is expected to begin in 2014 and terminate approximately two years later. There would be four distinct phases of construction: turbine manufacturing, upland (land) cable, offshore electric cabling, and park construction (Cape Wind Associates, LLC 2012c). The two phases of construction that would contribute to increased vessel traffic consist of offshore electric cabling where the undersea cables will be deployed. The cables from the individual turbines would connect to the electrical service platform, which serves as the main connection point and the offshore maintenance facility. The offshore wind facility would then connect to the Northeast electrical grid via two undersea cables. The second phase would be the construction of the wind facility where the turbines would be installed using specially developed offshore equipment and construction techniques.

In accordance with federal and state permitting requirements, the following studies of the proposed site and project have been conducted (Cape Wind Associates, LLC 2012d):

- Avian species (i.e., wintering seaducks, migrating species, endangered and protected species);
- Marine mammals;
- Benthic infauna and shellfish resources;
- Essential fish habitat;
- Commercial and recreational fisheries;
- Air and water quality;
- Visual impact;
- Noise assessment;
- Alternative site analysis;
- Marine archaeological and cultural resources;
- Air and sea navigation;
- Local meteorological conditions;

- Sediment transport patterns;
- Local geological conditions; and
- Economic impacts.

Incremental Contribution of the Proposed Action

While a range of 1,500 to 4,000 round trips are anticipated for site characterization and assessment activities associated with the proposed action over a five-year period, this number is relatively minor when compared with existing traffic and future traffic related to the Cape Wind Energy Project. The additional traffic generated by the proposed action would likely be undetectable when compared with the military, commercial, and recreational vessel trips projected to occur during the same five-year period.

4.7.2.2 Block Island Wind Farm

The proposed Block Island Wind Farm would be a 30 MW (nameplate) demonstration-scale wind facility located approximately 3 miles offshore of Block Island, Rhode Island, entirely in state waters. With five planned turbines for the project, the wind facility would generate more than 100,000 MW-hours annually, supplying the majority of Block Island's electricity needs. Excess power would be exported to mainland Rhode Island along the south coast via a subsea transmission cable traversing both state and federal waters. It is estimated that Deepwater Wind LLC, owner and operator of the proposed project, would begin construction of the project in 2013 (Deepwater Wind LLC 2012a).

In September 2011, marine surveys involving several vessels equipped with sonar, depth finders, and magnetometers were conducted in order to create a three-dimensional map of the sea floor of the proposed project area, including where both the wind facility and the transmission cable would be installed (Deepwater Wind LLC 2012b). The information collected during the month-long study by trained engineers, biologists, a marine archaeologist, and a member of the Narragansett Indian Tribe consisted of geophysical, geotechnical, archaeological, and benthic data to determine the precise locations for the turbine foundations; the cable that will connect the Block Island Wind Farm to Block Island; and the cable that will connect the island to the mainland grid. Survey techniques using high definition aerial videography and offshore avian acoustics were used to compile in-depth offshore avian and bat study plans, which were factors in successful negotiations with the USFWS and RIDEM. It is not anticipated that further offshore avian and bat surveys related to the Block Island Wind Farm project will be conducted.

Onshore, Deepwater Wind, LLC will continue to collect wind, avian, and bat data from the radar systems and meteorological mast located on Block Island and conduct surveys for the onshore route of the cables on both Block Island and the mainland. The cables need to interconnect with existing BIPCO and National Grid transmission facilities (Deepwater Wind LLC 2012b).

Vessel traffic in both Rhode Island and Block Island Sounds will increase once construction of the Block Island Wind Farm commences. Because the Port of Quonset Point is the proposed staging area, as well as the entrance and exit site for construction and operation activities, there will also be increased vessel traffic in Narragansett Bay.

Incremental Contribution of the Proposed Action

The range of 1,500 to 4,000 round trips anticipated from site characterization and assessment activities associated with the proposed action over a five-year period is relatively minor when compared with existing traffic and future traffic related to the Block Island Wind Farm project. The additional traffic generated by the proposed action would likely be undetectable compared with the military, commercial, and recreational vessel trips project to occur during the same five-year period.

4.7.2.3 LNG Facilities

Currently, there are no existing or proposed offshore LNG terminals in the area of, or adjacent to, the WEA. Import terminals have been proposed in coastal regions throughout the United States, including other coastal areas of Massachusetts, and one proposed for Long Island Sound, New York. The LNG terminals located in the Northeast are as follows:

- Canaport LNG Terminal located in Saint John, New Brunswick, Canada. Owned and operated by the Canaport LNG Limited Partnership, a partnership between Fort Reliance and Repsol YPF, S.A. subsidiaries (Canaport LNG 2009);
- Neptune LNG located 10 miles off the coast of Gloucester, Massachusetts. Owned and operated by GDF SUEZ. Project delivers LNG to offshore deepwater ports, serviced by two state-of-the-art shuttle and regasification vessels and two offloading buoys for re-gasification and shipment to shore by pipeline;
- Northeast Gateway Deepwater Port located 13 miles offshore of Boston, Massachusetts. Owned and operated by Excelerate Energy. The project consists of a dual submerged turret-loading buoy system and an approximately 16-mile pipeline connecting to the existing HubLine pipeline operated by Algonquin Gas Transmission (Excelerate Energy 2012); and
- Everett Marine Terminal located in Everett, Massachusetts, along the Mystic River. Import and regasification facility owned and operated by GDF SUEZ – Distrigas of Massachusetts, LLC. Since 1971, this facility has received more than 1,000 shipments of LNG imported from various international sources (GDF Suez GAS NA 2012).

Incremental Contribution of the Proposed Action

A range of 1,500 to 4,000 vessel trips are anticipated from site characterization and assessment activities associated with the proposed action over a five-year period. This is relatively minor when compared with existing traffic and future traffic related to the abovementioned LNG terminals. The additional traffic generated by the proposed action would likely be undetectable compared with the military, commercial, and recreational vessel trips project to occur during the same five-year period.

4.7.3 Global Climate Change

Cumulative activities, which include Alternative A, could impact global climate change. Section7.6.1.4 of the Programmatic EIS (USDOI, MMS 2007) describes global climate change with respect to renewable energy development. The following is a summary of that information and incorporates new information specific to Alternative A.

The temperature of the earth's atmosphere is regulated by a balance between the radiation received from the sun, the amount reflected by the earth's surface and clouds, the amount of radiation absorbed by the earth, and the amount re-emitted to space as long-wave radiation. GHGs keep the earth's surface warmer than it would otherwise be because they absorb infrared radiation from the earth and, in turn, radiate this energy back down to the surface. While these gases occur naturally in the atmosphere, there has been a rapid increase in concentrations of GHGs in the earth's atmosphere from human sources since the start of industrialization, which has caused concerns over potential changes in the global climate. The primary GHGs produced by human activities are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and halocarbons (USDOI, MMS 2007).

The surveying, construction/installation, operation and maintenance, and decommissioning activities associated with Alternative A would produce GHG emissions. It is currently beyond the scope of existing science to identify a specific source or discrete amount of GHG emissions and designate it as the cause of specific climate impacts at any particular location (USDOI, USGS, 2009 *as cited in* USDOI, BOEM, OREP 2012b) because the nature of the climate change phenomena thus far has precluded the identification of a causal relationship between discrete GHG emissions and specific environmental effects. However, the causes and effects of climate change can be summarized as follows. First, GHGs are emitted into the atmosphere, causing global warming (i.e., an aggregate average increase in the temperature of the earth's atmosphere). Second, global warming induces the climate to change in disparate ways at various places around the globe, altering global precipitation regimes, decreasing the salinity of the oceans, and altering the seasons. Finally, climate change leads to direct impacts on the environment such as changes in the structure of an ecosystem, changes in air quality, a reduced supply and increased cost of food, warming polar regions, higher precipitation totals, sea level rise, extreme temperatures, and severe weather events (USEPA 2011 *as cited in* USDOI, BOEM, OREP 2012b).

In general, while it can be assumed that the GHG emissions associated with Alternative A would contribute to climate change; these contributions are so small compared with the aggregate global emissions of GHGs that they cannot be deemed significant, if their impact could even be detected. The additional 1,500 to 4,000 vessel trips anticipated with Alternative A would have a negligible incremental contribution to existing GHG emissions and, therefore, would have an exceedingly minor effect on the environment via contributions to climate change.

4.7.4 Conclusions

Section 4.1 concluded that the proposed action is expected to have a negligible to minor impact on environmental and socioeconomic resources. Offshore activities would result in localized impacts, but impacts of individual meteorological towers and their associated activities would not overlap. Therefore, there would be no additive effect on offshore environmental resources of multiple locations.

The affected environment considered in this revised EA is the existing environment with past, present, and foreseeable human- and other-induced impacts over an extended period of time. The incremental contribution of the proposed action and alternatives to other past, present, and reasonably foreseeable actions that may affect the environment would be negligible to minor. Moreover, the proposed action and alternatives would facilitate the collection of meteorological, oceanographic, and biological data for the environments offshore in the Rhode Island and Massachusetts WEA.

5 CONSULTATIONS AND COORDINATION

BOEM conducted early coordination with appropriate federal and state agencies, tribal governments, and other concerned parties to discuss and coordinate the development and refinement of the WEA under the Secretary's "Smart from the Start" initiative (*see* Section 1.3.2, "Smart from the Start' Atlantic Wind Energy Initiative" and Section 1.5, "Development of the Wind Energy Area"). Formal consultations and cooperating agency exchanges are detailed below. In addition, BOEM regularly coordinated informally with these agencies through dialogue, teleconferences, and in-person meetings. Key agencies included the Rhode Island CRMC (RICRMC), the Commonwealth of Massachusetts EEA, the State Historic Preservation Offices (SHPOs) of Rhode Island and Massachusetts, the ACHP, the NMFS, the USFWS, the DOD, the FAA, the USACE, the USCG, the USEPA, and the NPS.

5.1 Public Involvement

5.1.1 Notice of Intent

On August 18, 2011, BOEM announced an NOI to prepare this EA in the *Federal Register* (76 FR 51391). The NOI solicited public input on issues and alternatives to be considered and analyzed in the EA. BOEM accepted comments until October 3, 2011. In total, 24 comments were received during the 45-day comment period. Issues identified to be analyzed included integration of coastal and marine spatial planning tools into the EA; seasonal prohibitions on some or all survey and site characterization activities; mitigation measures to reduce or eliminate the chance of vessels striking North Atlantic right whales; evaluation/timing of alternative project locations, configurations/scales and energy-generation technology scenarios; proper characterization of environmental impacts of activities proposed by developers in SAPs; implementation of BMPs, adaptive management and monitoring programs; analysis of conflicts with vessel traffic; expanded EFH assessment; impacts on current and future fishing activities; and analysis of noise impacts, collision risks, and the impacts of geological and geophysical surveys. The comments can be viewed at http://www.regulations.gov by searching for Docket ID BOEM-2011-0063.

5.1.2 Notice of Availability

On July 2, 2012, the EA was made available for public review and comment for 30 days following the publication of the NOA in the *Federal Register* (77 FR 39508). The EA was posted on BOEM's website at http://www.boem.gov/Renewable-Energy-Program/Smartfrom-the-Start/Index.aspx. Intergovernmental renewable energy task force members were notified by email. During the comment period, BOEM conducted public information meetings to give stakeholders an overview of the EA. Attendees included intergovernmental renewable energy task force members, nongovernmental organizations, and entities that respond to planning notices for the Rhode Island and Massachusetts WEA. All comments received during the public comment period, public information meetings, stakeholder outreach, required consultations, and the Task Force meetings were considered by BOEM in the preparation of this revised EA and in determining whether the proposed action and alternatives would lead to significant environmental impacts. Comment letters received in response to the NOA can be viewed at http://www.regulations.gov by searching for Docket ID BOEM-2012-0048.

5.1.3 Cooperating Agencies

Section 1500.5(b) of the CEQ implementing regulations (40 CFR 1500.5(b)) encourages agency cooperation early in the NEPA process. A federal agency can be a lead or a joint lead, or can act as a cooperating agency. A lead agency manages the NEPA process and is responsible for preparing an EA or EIS. A joint lead agency shares these responsibilities, and a cooperating agency is one that has jurisdiction by law or special expertise with respect to any environmental issue and that participates in the NEPA process upon the request of the lead agency. The NOI included an invitation to other federal agencies and state, tribal, and local governments to consider becoming cooperating agencies in the preparation of this EA. Nine cooperating agencies were identified and five participated in the development and review of this EA. The agencies' jurisdictions and/or expertise are described below.

Section 4(e) of the OCS Lands Act extends the USACE's authority to prevent obstruction of navigation in the navigable waters of the U.S. to OCS facilities. Such obstruction could include the construction/installation of meteorological towers and installation of buoys proposed by lessees. BOEM invited the USACE in a letter dated February 15, 2012, to participate as a cooperating agency on this EA. That invitation was accepted by the USACE's New England District in an email to BOEM dated March 26, 2012. The USACE is also a co-consulting agency on the Section 106 EFH and ESA consultations described below.

On January 5, 2012, BOEM sent letters inviting the Mashpee Wampanoag Tribe, the Narragansett Indian Tribe, the Shinnecock Indian Nation, and the Wampanoag Tribe of Gay Head (Aquinnah) to participate as cooperating agencies. BOEM requested the Tribes' assistance in the preparation of the EA due to their special expertise with respect to environmental impacts and effects on historic properties, including traditional cultural properties. On February 17, 2012, the Mashpee Wampanoag Tribe and BOEM entered into an MOU establishing a cooperating agency relationship for the preparation of this EA. BOEM continues to discuss the EA in government-to-government consultation with the Narragansett Indian Tribe, the Shinnecock Indian Nation, and the Wampanoag Tribe of Gay Head (Aquinnah).

On February 15, 2012, BOEM sent a letter inviting the USCG to participate as a cooperating agency, and the USCG accepted. BOEM requested the USCG's assistance because of its jurisdiction and expertise with port usage vessel traffic, lighting requirements/mitigation measures for meteorological towers and buoys, and spill risk and response.

Also on February 15, 2012, BOEM sent a letter inviting the NMFS to participate as a cooperating agency. BOEM requested the NMFS's assistance in the preparation of the EA due to its data-rich resources concerning habitat, benthos, protected resource species, fishery and impact metrics, and expertise concerning fishing activity and associated fishery resources and protected species and habitat. In a letter to BOEM dated March 5, 2012, the NMFS respectfully declined as the MOU in place between BOEM and the NMFS already governs and encourages an exchange of information between the agencies.

On March 5, 2012, BOEM sent a letter inviting the Rhode Island CRMC to participate as a cooperating agency. BOEM requested and welcomed the Rhode Island CRMC's assistance in the preparation of the EA due to its special expertise in biological and socioeconomic resources and local issues as identified in the Rhode Island SAMP. On March 14, 2012, BOEM and the Rhode Island CRMC entered into an MOU establishing a cooperating agency relationship for the preparation of this EA.

On March 5, 2012, BOEM sent a letter inviting the EEA to participate as a cooperating agency. BOEM requested EEA assistance in the preparation of the EA due to its special expertise with the environmental and socioeconomic issues considered in the EA. On March 20, 2012 BOEM and the EEA entered into an MOU establishing a cooperating agency relationship for the preparation of this EA.

5.1.4 Questions and Comments Received During the Comment Period

It is important to note that the subject of this revised EA is the issuance of wind energy leases within all or some of the Rhode Island and Massachusetts WEA, and the planning, coordination, execution, and reporting of site characterization and assessment activities within those lease blocks. Analyzing the specific environmental consequences of construction and operation of wind facilities is not within the scope of this revised EA.

The public comment period for the EA dated June 2012 closed on August 2, 2012. BOEM compiled the comments on the June 2012 EA from letters received during the comment period, comments and questions that arose during the July 16 and 17, 2012, public information meetings, and comments received from consultations with the states. Table 5-1 provides a summary of the comments and questions received and, where applicable, they are categorized by resource or issue.

Table 5-1
Number of Comments and Questions Received During Comment Period for the EA

	Topic	Number of Comments
Purpose and Need/Proposed Action, Alternatives and Proposed Activities		
1	NEPA-related Questions and Comments	10
2	Purpose and Need/Proposed Action	2
3	Alternatives	11
4	General about Proposed Site Characterization and Assessment Activities	17
5	Standard Operating Conditions/ Monitoring/Surveys and Mitigation	42
	Subtotal of Items 1 thru 5	**82**
Comments Requiring Response by Resource or Issue		
	Physical Resources	
6	Air Quality	0
7	Geology	2
8	Physical Oceanography	2
9	Water Quality	10
	Subtotal by Resource/Issue Items 6 thru 9	**14**
	Biological Resources	
10	Avian and Bat Resources	40
11	Coastal and Benthic Habitats	5
12	Finfish, Shellfish, and Essential Fish Habitat	14
13	Marine Mammals and Sea Turtles	35
14	Coastal Wetland Habitats and Ecosystems	0
	Subtotal by Resource/Issue Items 10 thru 14	**94**
	Socioeconomic Resources	
15	Aesthetics and Visual Impacts	1
16	Military Areas and Aviation	2
17	Commercial and Recreational Fishing Activities	8
18	Cultural Resources	1
19	Demographics and Employment	0
20	Environmental Justice	2
21	Land Use and Coastal Infrastructure	5
22	Navigation and Vessel Traffic	10
23	Recreational Resources and Tourism	0
24	Other Multiple Use Conflicts	2
	Subtotal by Resource/Issue Items 15 thru 24	**31**
Other Comments		
25	Other Miscellaneous Comments That do Not Fit in Any of the Above-Listed Categories	12
26	Comments Outside the Scope of the Draft EA	86
27	General Comments or Statements Noted	147
	Subtotal of Items 25 and 27	**245**
	Total of Questions and Comments Received During the Comment Period for the EA	**466**

General Comment Content by Category

Following are general summaries of the various types of comments and questions received by BOEM during the comment period; the summaries are presented by resource or by issue.

Purpose and Need/Proposed Action, Alternatives, and Proposed Activities

NEPA-related Questions and Comments

The majority of NEPA-related questions centered on the preparation of an EIS as opposed to an EA for the issuance of leases on the OCS. The general response is that to facilitate future analysis, BOEM may prepare an EA even if the agency plans to eventually prepare an EIS for an action (i.e., approval of a COP). BOEM will uphold its mandate pursuant to NEPA to evaluate whether or not its federal action would have a significant impact on the environment within the Rhode Island and Massachusetts WEA (The Proposed Action – Alternative A). The purpose of the EA is to foster BOEM's planning objectives and decision-making and/or to provide sufficient evidence for determining whether an EIS is required (40 CFR 1501.3(b), 1978). Section 1 of the EA discusses BEOM's planning process and compliance with NEPA. BOEM made no substantive changes to the revised EA based on these comments.

Comments were received about possible segmentation of the project during the NEPA analysis and consideration of cumulative effects. The purpose of this revised EA is to consider the reasonably foreseeable environmental consequences associated with issuing leases and approving SAPs in the WEA. Additional analysis under NEPA will be required before any future decisions are made regarding construction/installation, operation and maintenance, or decommissioning of any future wind energy facility to be sited in the Rhode Island and Massachusetts WEA and cannot be construed as possible project segmentation. Section 1 of the EA discusses BOEM's planning process and compliance with NEPA. BOEM made no substantive changes to the revised EA based on these comments.

Purpose and Need/Proposed Action

The comments received focused on the effects of the proposed action on the environment and the economy of the region. The general response is that the proposed action that is the subject of this revised EA is the issuance of wind energy leases within all or some of the Rhode Island and Massachusetts WEA and the approval of site assessment and site characterization activities within those lease blocks. The development of resources on the OCS is outside the scope of this EA; however, BOEM will uphold its mandate pursuant to NEPA to evaluative whether or not its federal action would have a significant impact on the environment within the Rhode Island and Massachusetts WEA (The Proposed Action – Alternative A). Sections 1.1 and 1.2 discuss the Proposed Action and Purpose and Need. BOEM made no substantive changes to the revised EA based on these comments.

Alternatives

Several comments focused on the level of analysis of alternatives and the criteria used in determining the Rhode Island and Massachusetts WEA (The Proposed Action – Alternative A). The general response from BOEM is that the alternatives presented in the revised EA are the result of extensive meetings with the intergovernmental renewable energy task forces of both

Rhode Island and Massachusetts, relevant consultations with federal, state, and local agencies, and potentially affected Native American Tribes, and input from the public and potentially affected stakeholders. Through the BOEM Rhode Island and Massachusetts intergovernmental renewable energy task forces and through public meetings, BOEM received useful environmental, economic, use conflict, and safety-related information gathered in response to the Call and NOI comment periods. The alternatives were identified and defined by excluding certain areas of the WEA due to the potential for conflict with fisheries resources, North Atlantic right whales, visual/cultural resources, telecommunications cables, and vessel traffic in the general vicinity. Section 2 and Sections 4.2 to 4.6 discuss alternatives. BOEM made no substantive changes to the revised EA based on these comments.

General Comments about Proposed Site Characterization and Assessment Activities

The majority of the comments received centered on how the proposed site characterization activities (i.e., surveys of the lease area) and site assessment activities (i.e., construction/installation and operation of meteorological towers and/or buoys) on the leases would be conducted. Section 3 discusses scenarios for the Proposed Action. BOEM made no substantive changes to the revised EA based on these comments.

Standard Operating Conditions and Monitoring

A number of comments were received about the adequacy and applicability of the SOCs and about the performance of effective monitoring for the leases (up to four) to be awarded by BOEM. BOEM developed the SOCs (*see* Appendix B) to reduce or eliminate the potential environmental risks to or conflicts with individual environmental and socioeconomic resources. The SOCs were developed through the analyses presented in the EA and through consultation with other federal and state agencies. BOEM will continue to refine the SOCs and subsequent NEPA documentation based upon staff recommendations and consultations with the NMFS and the USFWS pursuant to obligations under the ESA, the Magnuson-Stevens Act, and stakeholder input. Development of any additional measures addressing these resources and potential impacts related to construction and operation of a wind facility will be considered at a future time as part of the COP and are not part of the scope of this revised EA. BOEM added and revised text in the revised EA in Sections 4.1.2.3; 4.1.2.4, 4.1.2.5, and Appendix B (see SOCs).

Physical Resources

Water Resources

A few comments were received regarding the protection of water resources and possible impacts to its quality. Some commenters asked about the possibility of wastewater discharge or disposal of solid debris into offshore/coastal waters from OCS structures and/or from vessels conducting site characterization and assessment activities and how this would be controlled to prevent impacts to water resources. Water resources are discussed in Section 4.1.1.4. BOEM made no substantive changes to the revised EA based on these comments.

Biological Resources

Avian and Bat Resources

Commenters suggested that data gaps exist regarding the abundance of birds in the offshore environment and the need to understand abundance and distribution of birds across the WEA. In response, BOEM has indicated in this revised EA that the document titled "Spatial Distribution, Abundance, and Flight Ecology of Birds in Nearshore and Offshore Waters of Rhode Island: January 2009 to August 2010, Interim Technical Report for the Rhode Island Ocean Special Area Management Plan" (Winiarski *et al*. 2011) provides a historical summary and quantitative estimates of the spatial distribution and abundance of birds in the nearshore and offshore waters of Rhode Island (Ocean SAMP area), an area that includes the WEA in its offshore portion. The results of this study have been incorporated into this revised EA to include information about all of the avian guilds with the potential to occur in the WEA as well as potential impacts to those guilds. The amount of information presented in Winiarski *et al*. (2011) is sufficient for the scope of assessing potential impacts to avian guilds that could occur in the WEA as a result of commercial wind lease issuance and site assessment activities, including the installation of meteorological towers and buoys. Additional research on the use of the Rhode Island and Massachusetts WEA by coastal and marine birds will be the responsibility of wind energy developers as they pursue offshore commercial wind leases. As such, no additional studies will be conducted or are presented in this revised EA. As indicated in this revised EA, the analysis of the specific environmental consequences of project construction and operation for wind facilities is not within the scope of this revised EA.

Some commenters suggested that BOEM should require bird monitoring surveys as a condition of any lease to fill the existing data gaps and to ensure site-specific data are available to make informed siting and permitting decisions in the months ahead. BOEM agrees with this suggestion and has added language in this revised EA.

Some commenters requested additional information about all bird species known to forage and rest in or near the WEA, including those species protected under the MBTA. BOEM has added additional text to the revised EA to include such information.

Finfish, Shellfish, and Essential Fish Habitat

Some commenters expressed concern about the presence of ecologically important glacial moraines and sought protection of these areas from the proposed activities. Glacial moraines are identified as Areas of Particular Concern as designated by the Rhode Island CRMC; however, because the WEA falls outside of state waters, this designation does not apply. BOEM will consult with the NMFS regarding any special leasing considerations to minimize or avoid impacts essential fish habitat and HAPCs and will review submitted plans to ensure that sensitive benthic habitats are avoided in the siting of meteorological towers and/or buoys. The Ocean SAMP, 1160.2 Areas of Particular Concern, page 31, states: "*Areas of Particular Concern (APCs) have been designated in **<u>state waters</u>** through the Ocean SAMP process with the goal of protecting areas that have high conservation value, cultural and historic value, or human use value from Large-Scale Offshore Development*" (emphasis added).

Some comments were received concerning the development by the NEFMC of new EFH designations and measures to mitigate the impacts of fishing on EFHs. The development of new EFH measures by the NEFMC has been addressed by BOEM in this revised EA.

Some comments were received about the potential to spatially constrict scallop fishing grounds within the Rhode Island and Massachusetts WEA due to displacement and navigational hazards associated with the proposed action. In this regard, BOEM conducted consultations with federal and state fisheries managers. In addition, BOEM held several public meetings, as well as meetings with fishing groups including the Rhode Island Fisheries Advisory Board and Massachusetts Fisheries Working Group prior to defining the Rhode Island and Massachusetts WEA as the proposed action (Alternative A). These groups were composed of fishermen (including scallop fishermen) who provided information on fishing activity that was reflected in the AreaID. Scallop fishing effort data were obtained from the NMFS. These areas included those locations that were considered "High Value Fishing Areas." As a result, the proposed action (alternative) remains unaltered and BOEM made no substantive changes to the revised EA based on these comments.

Marine Mammals

The majority of the comments pertaining to marine mammals were related to the North Atlantic right whale and potential impacts due to proposed activities. BOEM has consulted with the NMFS under the ESA and will follow several reasonable and prudent measures required through the Biological Opinion dated April 10, 2013, in addition to the SOCs as revised in this EA (*see* Appendix B) put forth by BOEM. These measures include coordination in the review of lessee-submitted plans. In addition, individual lessees are explicitly required under BOEM's implementing regulations (see 30 CFR Part 585.801) to comply with the MMPA. Accordingly, lessees would need to consult with the NMFS to ensure that necessary authorizations (such as IHAs) are obtained in a timely manner, when necessary.

Some commenters provided additional information about feeding grounds or sightings of North Atlantic right whales within the WEA and its proximity. BOEM has explained in this revised EA that there are no federally protected feeding grounds (e.g., critical habitat) in or near the WEA. Only opportunistic feeding has been recorded within the area. The following language has been added to the revised EA to clarify further: "*Although sporadic feeding behavior has recently been reported within and near the WEA (Kraus et al. 2013), the closest known feeding grounds in regular use by North Atlantic right whales are in the Great South Channel which is located approximately 75 NM east of the WEA and has been designated as critical habitat for the species.*"

Some commenters requested the inclusion of additional mitigation measures such as larger exclusion zones, longer seasonal prohibitions, and use of acoustic monitoring to detect presence of marine mammals and sea turtles. Based on the analysis in this revised EA, consultation with the NMFS and the USFWS pursuant to obligations under the ESA, the Magnuson-Stevens Act, and public comments received, several SOCs were revised (*see* Appendix B). Development of any conditions related to the potential impacts from the construction and operation of a commercial offshore wind facility will be considered at a future time as part of the COP and are not part of the scope of this revised EA.

Some commenters indicated the need to impose more stringent speed limit restrictions for all vessels of any length involved in the performance of site assessment and site characterization activities to avoid or minimize potential impacts to marine mammals and sea turtles. Based on consultations with the NMFS, BOEM has revised the SOCs included in Appendix B of this revised EA to avoid or minimize potential impacts to marine mammals and sea turtles from vessel strikes.

Other commenters expressed concern about underwater noise that could be caused by geological and geophysical survey activities and the impacts they may have on marine mammals that are sensitive to noise and depend on sound for communication (e.g., the endangered North Atlantic right whale). BOEM has added text in this revised EA to discuss impacts from the proposed activities (Section 4.1.2.4.2).

Socioeconomic Resources

Commercial and Recreational Fishing Activities

Some comments were received concerning notification procedures to inform recreational and commercial fishing communities about any fishing restrictions during the performance of site assessment and site characterization surveys. BOEM has added text to Sections 4.1.3.3.2 and 4.1.3.8.2 to the revised EA based on these comments.

Navigation and Vessel Traffic

Some commenters suggested that vessel traffic impacts for the proposed action may have been underestimated when compared to existing and future vessel traffic for the Rhode Island and Massachusetts WEA. BOEM provided additional information in this revised EA to clarify the projected impact that the proposed action may have to existing and future vessel traffic for the Rhode Island and Massachusetts WEA (Section 4.1.3.8).

Some commenters expressed concerns about navigational safety issues. BOEM has been coordinating with the USCG on navigational issues. The USCG anticipates providing BOEM with additional navigational safety recommendations when the ACPARS is completed, which is expected to be during 2014. BOEM made no substantive changes to the revised EA based on these comments.

Other Issues

Cumulative Impacts

Some comments received centered on project fragmentation/ segmentation and proper evaluation of cumulative impacts. Section 1 of the EA discusses BOEM's planning process and compliance with NEPA and Section 4.7 discusses cumulative impacts. BOEM made no substantive changes to the revised EA based on these comments.

Comments Outside the Scope of the EA

A total of 86 questions and/or comments were outside the scope of this EA. The purpose of this EA is to consider the reasonably foreseeable environmental consequences associated with issuing leases and approving SAPs in the Rhode Island and Massachusetts WEA. Additional analysis under NEPA will be required before any future decisions are made regarding construction/installation, operation and maintenance, or decommissioning of any future wind energy facility to be sited in the WEA. BOEM is not currently reviewing any COP, nor has any COP been submitted for the agency's consideration. The purpose of conducting surveys and installing meteorological measurement devices is to assess the wind resources in any particular lease area and to characterize the environmental and socioeconomic resources and conditions so that a lessee can determine whether the site is suitable for commercial development and, if so, submit a COP for BOEM review. Thus, comments/questions beyond the scope of this EA do not warrant responses.

General Comments or Statements

A total of 147 general comments or statements were made regarding the content of the EA and these were noted. Each comment will be considered in the decision-making process led by BOEM.

5.2 Consultations

5.2.1 Endangered Species Act

As required by Section 7 of the ESA, BOEM has consulted with the NMFS and the USFWS on assessing the potential impacts of the proposed action on endangered/threatened species and designated critical habitat under their jurisdiction. In a letter dated November 1, 2012, the USFWS concurred with BOEM's determination that the proposed action is not likely to adversely affect piping plovers, red knots, and roseate terns. On April 10, 2013, the NMFS issued a Biological Opinion concluding that the proposed action may adversely affect, but is not likely to jeopardize, the continued existence of Kemp's ridley, green, or leatherback sea turtles; the northwest Atlantic DPS of loggerhead sea turtles; North Atlantic right, humpback, fin, sei, or sperm whales, or the Gulf of Maine, New York Bight, Chesapeake Bay or South Atlantic DPSs of Atlantic sturgeon. Because no critical habitat is designated in the action area, none would be affected by the action. BOEM's SOCs, the reasonable and prudent measures (from the Biological Opinion[24]) to protect endangered species, and other appropriate requests/requirements from the ESA consultations will be included as a condition on any leases and/or SAPs issued or approved under this decision.

As per BOEM's regulations at 30 CFR Part 585.801(b), the lessee must not conduct any activity that may result in an incidental taking of marine mammals until the appropriate authorization has been issued under the MMPA. The lessee's activities would likely require an IHA from the NMFS, which would very likely require that similar measures to those described

[24] *See* http://www.nero.noaa.gov/protected/section7/bo/actbiops/boem_ocs_wind_energy_april_2013.pdf.

in the Biological Opinion or additional measures be implemented. Information regarding NMFS permitting can be found at http://www.nmfs.noaa.gov/pr/permits/.

5.2.2 Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Act, federal agencies are required to consult with the NMFS on any action that may result in adverse effects on EFH. NMFS regulations implementing the EFH provisions of the Magnuson-Stevens Act can be found at 50 CFR 600. Certain OCS activities authorized by BOEM may result in adverse effects on EFH and, therefore, require consultation with the NMFS.

As required by the Magnuson-Stevens Act, BOEM initiated consultation with the NMFS in a letter dated July 2, 2012, on the effects of the following on fish and EFH: (1) issuing leases; (2) site characterization activities that lessees may undertake on those leases (e.g., geophysical, geotechnical, archaeological, and biological surveys); and (3) the subsequent approval of site assessment activities on the leaseholds (e.g., installation and operation of meteorological towers and buoys) in the Rhode Island and Massachusetts WEA. BOEM has determined that the proposed action would not significantly affect the quality and quantity of EFH in the action area. There are no EFH HAPCs in the proposed action area.[25] In a letter dated July 30, 2012, the NMFS concurred with several of BOEM's SOCs in regard to protections they will confer to marine fish and did not raise any objections to lease issuance. However, since the exact placement of meteorological towers and buoys within the WEA is currently unknown, the NMFS has requested to participate in the review of individual SAPs in order to make final conclusions regarding the impacts to EFH from site assessment activities. BOEM is committed to working with the NMFS in the review of plans and other recommendations to meet NMFS information needs regarding EFH under the Magnuson-Stevens Act.

5.2.3 Coastal Zone Management Act

The CZMA requires that federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of the state's federally approved coastal management program (15 CFR 930 Subpart C). BOEM has prepared a Consistency Determination (CD) under 15 CFR 930.36(a) to determine whether issuing leases and approving site assessment activities (including the construction/installation, operation and maintenance, and decommissioning of meteorological towers and buoys) in the Rhode Island and Massachusetts WEA is consistent to the maximum extent practicable with the provisions identified as enforceable by the Coastal Zone Management Programs (CZMPs) of the State of Rhode Island and the Commonwealth of Massachusetts.

This CD was sent to both the State of Rhode Island and the Commonwealth of Massachusetts for their review on August 20, 2012, and it was finalized and submitted by BOEM to both states

[25] The NEFMC is currently in the process of developing and updating EFH designations for the Northeast multispecies, Atlantic sea scallop, monkfish, Atlantic herring, skates, Atlantic salmon, and Atlantic deep-sea crab. These changes will be prepared and presented as an Essential Fish Habitat Omnibus Amendment to the FMPs of these species (77 FR 44214).

on November 30, 2012 (USDOI, BOEM 2012b; Bornholdt 2012a and 2012b). The EA provides the comprehensive data and information required under 30 CFR 939.39 to support BOEM's CD. BOEM has determined that the activities described in this revised EA are consistent to the maximum extent practicable with the enforceable policies of the CZMPs of Rhode Island and Massachusetts.

On January 22, 2013, the Rhode Island CRMC concluded that the proposed federal actions are consistent to the maximum extent practicable with the CZMP including the applicable enforceable policies and standards as part of the Ocean SAMP (Rhode Island CRMC 2010). On January 30, 2013, the Commonwealth of Massachusetts concurred with BOEM's determination that the activity's effects on resources and uses in the Massachusetts coastal zone as proposed are consistent with the CZMP enforceable policies.

Pursuant to 30 CFR 585.611(b), if a lessee submits a SAP that shows changes in impacts from those identified in the CD prepared for this proposed action, BOEM may determine that the SAP is subject to a federal CD. In that case, the lessee would submit a CD under 15 CFR Part 930, Subpart E. BOEM would then submit the SAP and the CD to the affected states for CZMA review. In addition, pursuant to Rhode Island's Federal Consistency List (Table 2, viii) a federal consistency review must occur for *"meteorological towers deployed in lease blocks within the Area of Mutual Interest (AMI area) between Rhode Island and Massachusetts where mobile gear fishing activity is prevalent (OCS lease blocks 6816, 6817, 6864, 6865, 6866, 6867, 6914, 6915, 6916, 6964, 6965, 6966, 6967, 6968, 7014, 7015, 7016, 7017, 7018, 7019, 7020, 7021, 7064, 7065, 7066, 7067, 7068, 7069, 7070, 7071, 7114, 7115, 7116, and 7117)."* However, the deployment of meteorological towers in lease blocks within the AMI area where mobile gear fishing is not prevalent (OCS lease blocks 6764, 6765, 6766, 6814, 6815, 6917, 6918, 6919, 6969, 6970, and 6971) is considered to have either no reasonably foreseeable coastal effect or insignificant effects and does not warrant federal consistency review.

5.2.4 National Historic Preservation Act

Section 106 of the NHPA (16 U.S.C. 470f), and implementing regulations (36 CFR Part 800) require federal agencies to consider the effects of their actions on historic properties and afford the ACHP a reasonable opportunity to comment. BOEM has determined that the following activities in the WEA constitute undertakings subject to Section 106 of the NHPA:

1. Lease issuance (including reasonably foreseeable consequences associated with shallow hazards, geological, geotechnical, and archaeological resource surveys).
2. Approval of SAPs (including reasonably foreseeable consequences associated with the installation and operation of meteorological tower(s) and/or meteorological buoy(s)).

On February 9, 2011, BOEM formally notified the public through the *Federal Register* (pages 7226-7228), that it was initiating the "Smart from the Start" wind energy initiative and that it would involve federal agencies, states, tribes, local governments, wind power developers and the public as BOEM conducted the NEPA process and engaged in consultation. In August 2011, BOEM identified and initiated a request for NHPA Section 106 consultation through correspondence with the appropriate SHPOs and potentially affected federally recognized tribes, local governments, and other individuals and organizations with a potential interest in the undertaking to obtain further information and to learn their concerns regarding the proposed undertakings' potential effects on historic properties. The entities contacted by BOEM are listed in Table 5-2. In June-July 2011, September 2011, and April-May 2012, BOEM consulted with the Mashpee Wampanoag Tribe, the Narragansett Indian Tribe, and the Wampanoag Tribe of Gay Head (Aquinnah). BOEM will continue to consult with these federally recognized tribes on a government-to-government basis, in accordance with Executive Order 13175.

Table 5-2
Entities Solicited for Information and Concerns Regarding Historic Properties and the Proposed Undertakings

Consulting Party Type	Organization
Advisory Council on Historic Preservation	Advisory Council on Historic Preservation
Federally Recognized Tribal Government	Mashpee Wampanoag Tribe
	Narragansett Indian Tribe
	Shinnecock Indian Nation
	Wampanoag Tribe of Gay Head (Aquinnah)
Local Government	Barnstable County
	Cape Cod Commission
	City of Cranston
	City of East Providence
	City of New Bedford
	City of Pawtucket
	City of Providence
	City of Warwick
	Dukes County Commission
	Martha's Vineyard Commission
	Nantucket Planning and Economic Development Commission
	Nantucket Planning Board
	Town of Aquinnah
	Town of Barrington
	Town of Bristol
	Town of Charlestown
	Town of Chilmark
	Town of Dartmouth
	Town of East Greenwich
	Town of Edgartown
	Town of Gosnold
	Town of Jamestown
	Town of Little Compton
	Town of Middleton
	Town of Nantucket
	Town of Narragansett
	Town of New Shoreham
	Town of North Kingstown
	Town of Oak Bluffs

(continued on next page)

Table 5-2. Entities Solicited for Information and Concerns Regarding Historic Properties and the Proposed Undertakings (continued)

Consulting Party Type	Organization
Local Government *(continued)*	Town of Portsmouth
	Town of South Kingstown
	Town of Tisbury
	Town of Tiverton
	Town of Warren
	Town of West Tisbury
	Town of Westerly
	Town of Westport
Other Tribal Government	Mashantucket Pequot Tribal Nation
	Mohegan Indian Tribe of Connecticut
	Oneida Indian Nation
State Historic Preservation Office(r) (SHPO)	Connecticut SHPO
	Massachusetts SHPO
	New York SHPO
	Rhode Island SHPO

On October 27, 2011, BOEM requested public input on the potential impacts on historic properties from commercial wind lease issuance and site characterization and site assessment activities on the Atlantic OCS. The comment period on the proposed undertaking as it pertained to historic properties closed on November 10, 2011. BOEM received three comments in response to this solicitation. These comments from the Alliance to Protect Nantucket Sound, Mainstream Renewable Power, and Offshore Wind Development Coalition can be viewed at regulations.gov by searching for Docket ID BOEM-2011-0115.

BOEM has prepared a Programmatic Agreement to guide its Section 106 activities for these undertakings pursuant to 36 CFR 800.14(b) (*see* Appendix E). Requested signatories to the Programmatic Agreement include the SHPOs of Rhode Island and Massachusetts, the Mashpee Wampanoag Tribe, the Narragansett Indian Tribe, The Wampanoag Tribe of Gay Head (Aquinnah), and the ACHP. The Programmatic Agreement provides for Section 106 consultation to continue through both the leasing process and BOEM's decision-making process regarding the approval, approval with modification, or disapproval of lessees' SAP and allows a phased identification and evaluation of historic properties. The Programmatic Agreement also establishes a process for determining and documenting the APE for each undertaking to further identify historic properties located within each undertaking's APE that are listed in or eligible for listing in the National Register of Historic Places (National Register) and to assess the potential adverse effects and to avoid, reduce, or resolve any such effects.

On December 14, 2011, and February 21, 2012, BOEM held Section 106 consultation webinars to discuss the proposed undertakings and BOEM's intention to prepare a Programmatic Agreement. BOEM provided a draft of the Programmatic Agreement to the consulting parties on March 26 and May 8, 2012, BOEM held another webinar to review comments on the draft Agreement, discuss changes, and prepare a revised draft in preparation for signing. The Programmatic Agreement will be executed and in force when all required signatures have been received.

5.2.5 Federal Aviation Administration

BOEM consulted with the FAA on April 26, 2012, regarding the activities in the WEA. Normally, any structure higher than 200 feet above ground level at its site and within 12 NM of shore would require an evaluation by the FAA under 14 CFR 77. The FAA will determine if a notice is required and the applicant would need to file a “Notice of Proposed Construction or Alteration” with the FAA in accordance with 14 CFR 77.9 for an appropriate aeronautical study. The FAA would determine any impacts on aviation operations, including military and civilian radar systems, and potential mitigation measures would be evaluated and discussed on a case-by-case basis. An aeronautical study, if required, would conclude with a final agency Determination of No Hazard to Air Navigation or a Determination of Hazard to Air Navigation. Any Determinations of No Hazard to Air Navigation will include marking and lighting recommendations, if appropriate.

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APPENDIX A
Announcement of Area Identification

ANNOUNCEMENT OF AREA IDENTIFICATION

**Commercial Wind Energy Leasing on the Outer Continental Shelf
Offshore Rhode Island and Massachusetts**

February 24, 2012

The Bureau of Ocean Energy Management (BOEM) is proceeding with competitive commercial wind energy leasing on the Outer Continental Shelf (OCS) offshore Rhode Island and Massachusetts, as set forth by 30 CFR 585.211 through 585.225. The next step in the competitive leasing process, and the purpose of this announcement, is Area Identification. BOEM defined a Wind Energy Area (WEA) offshore Rhode Island and Massachusetts pursuant to the Secretary of the Interior's *Smart from the Start* Atlantic Offshore Wind Initiative. This entire area will be considered for leasing and approval of site assessment plans as the proposed action under the National Environmental Policy Act (NEPA) (42 U.S.C. §§ 4321-4370f). BOEM also has identified alternatives to the proposed action that entail considering the exclusion of certain portions of the WEA and the issuance of leases and approval of site assessment in the remaining portions. This announcement also identifies mitigation measures and other issues to be considered further in the NEPA document.

On August 18, 2011, BOEM published in the *Federal Register* the *Commercial Leasing for Wind Power on the Outer Continental Shelf (OCS) Offshore Rhode Island and Massachusetts-Call for Information and Nominations* (Call) (76 FR 51383-51391) and *Notice of Intent to Prepare an Environmental Assessment* (NOI) (76 FR 51391-51393). The area identified in the Call and NOI is located within the Area of Mutual Interest (AMI), as described by a Memorandum of Understanding between the Governors of Rhode Island and Massachusetts.

The Call included certain areas that, if ultimately developed with commercial wind energy facilities, would likely cause substantial conflict with existing fishing uses. BOEM has excluded these "high value" fishing grounds from the WEA. Therefore, these areas will not be considered for leasing or approval of site assessment plans in this NEPA document. The remainder of the Call Area will be considered for leasing and approval of site assessment plans in an environmental assessment (EA) (see Figure 1, Alternative A). Figure 1 depicts the high value fishing grounds removed from leasing consideration as "Excluded Area."

Alternatives to the proposed action (Alternative A) were defined by excluding certain areas of the WEA because of the following considerations:

- Areas identified as having occurrences of North Atlantic right whales, which are of concern due to potential impacts to this species (see Figure 2, Alternative B);
- All areas within 15 nautical miles of the inhabited coastline of Massachusetts, which are of concern due to potential visual impacts (see Figure 3, Alternative C)
- All areas within 21 nautical miles of the inhabited coastline of Massachusetts, which are of concern due to potential visual impacts (see Figure 4, Alternative D); and

- All areas identified by Verizon Communications Inc. as containing telecommunication cable(s), which are of concern due to potential interference or other impacts (see Figure 5, Alternative E).

The agency is currently only considering the issuance of leases and approval of site assessment plans in this area. BOEM is not considering, and the EA does not support, any decision(s) regarding the construction and operation of any wind energy facility on leases that may be issued in this WEA. If, after leases are issued, a lessee proposes to construct a commercial wind energy facility, it would submit a construction and operations plan. If and when BOEM receives such a plan, it would prepare a site-specific NEPA document for the project proposed, that would include the lessee's proposed transmission line(s) to shore. These cable routes would underlie areas outside of the WEA, and may include areas beneath these "high value" fishing grounds.

BOEM has also identified mitigation measures that may reduce the potential for adverse impacts to North Atlantic right whales. Such measures include seasonal restrictions, vessel speed restrictions, and enhanced monitoring. These measures, and possibly others, will be analyzed in the EA, and if adopted, could be imposed as binding requirements in the form of stipulations in the lease instrument and/or conditions of approval of a site assessment plan. Based upon staff recommendations; consultations with Federal agencies, states, local governments, and affected Indian tribes; and public comments received, BOEM will continue to consider additional measures that may reduce the potential for adverse environmental consequences, and may identify other issues to be considered in the EA.

Figure 1. Wind Energy Area identified offshore Rhode Island and Massachusetts for analysis as the Proposed Action (Alternative A) in the EA.

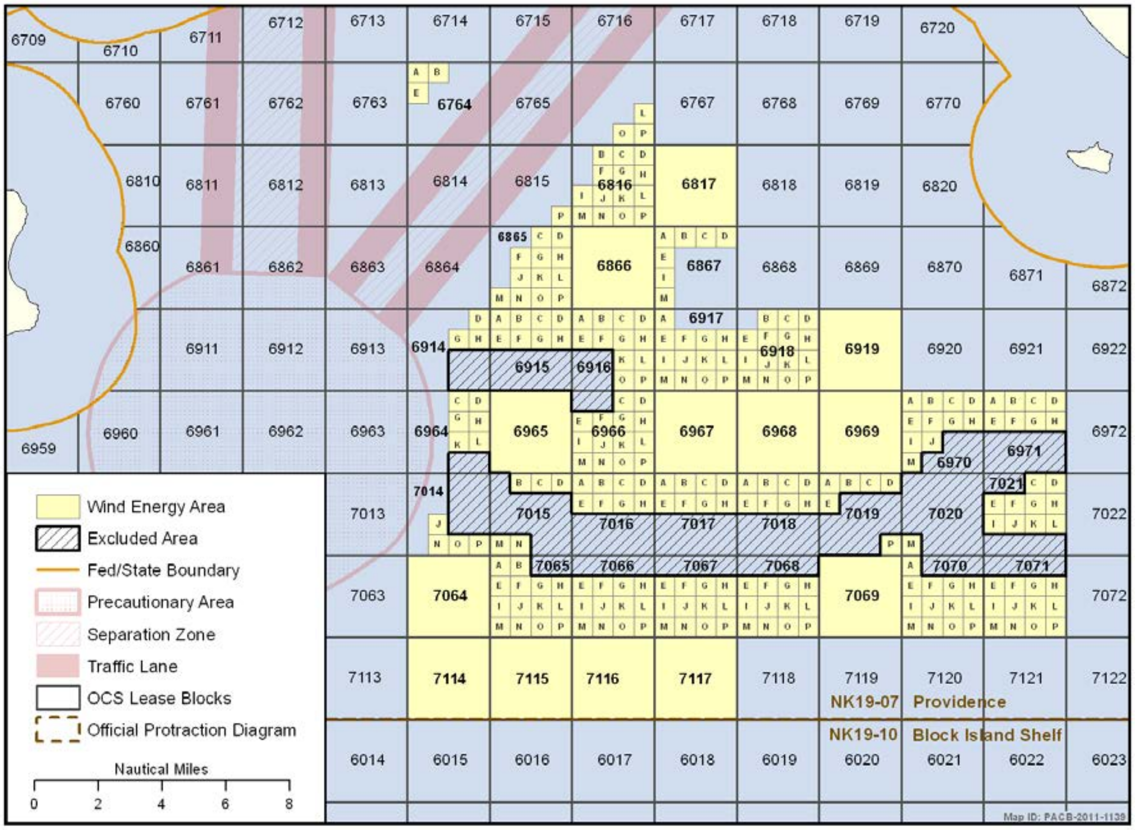


Figure 2. Areas identified as having occurrences of North Atlantic right whales for analysis as Alternative B in the EA.

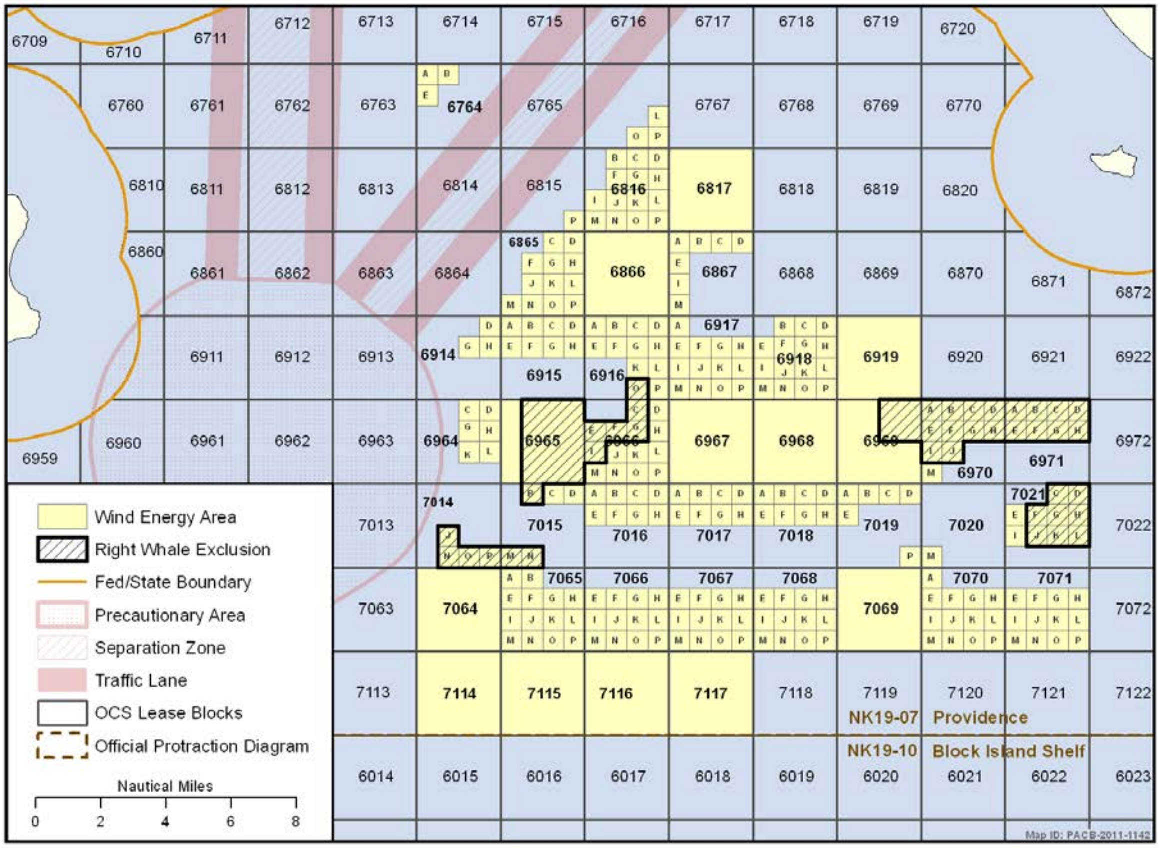


Figure 3. Areas within 15 nautical miles of the inhabited coastline of Massachusetts identified for analysis as Alternative C in the EA.

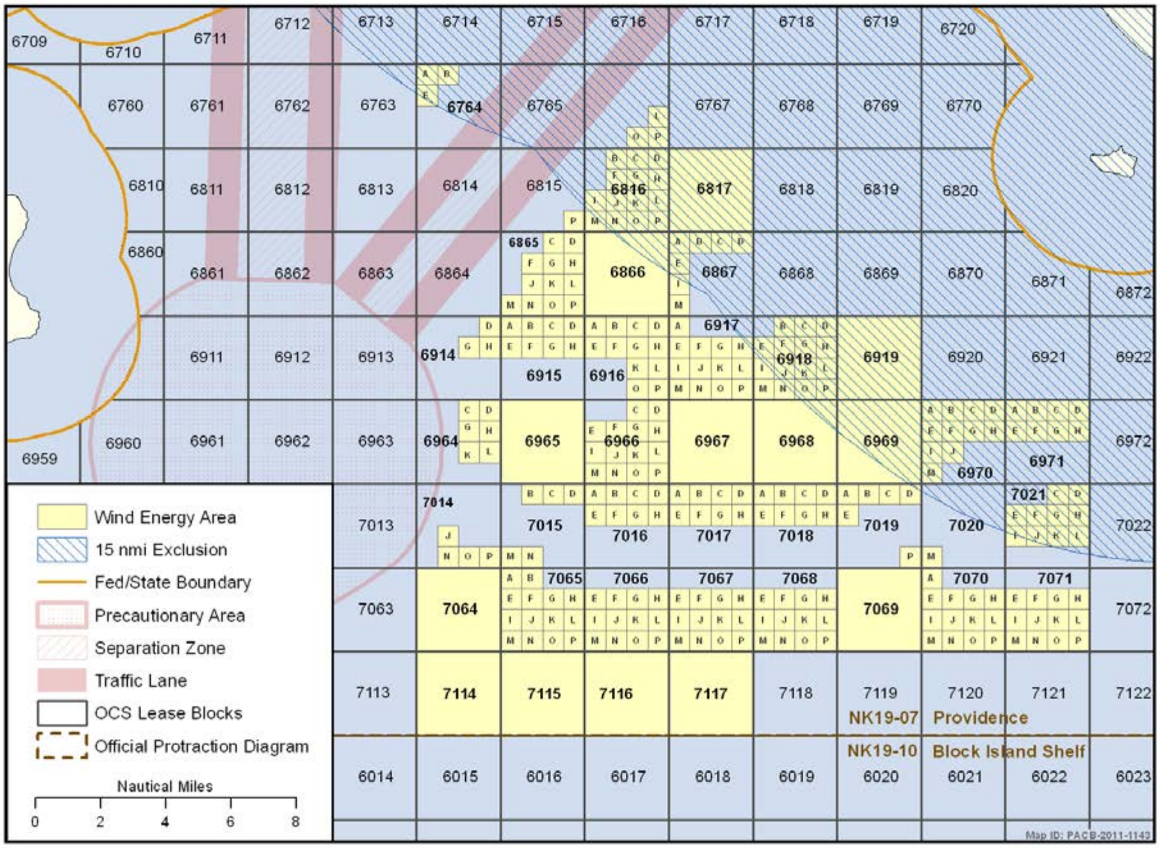


Figure 4. Areas within 21 nautical miles of the inhabited coastline of Massachusetts identified for analysis as Alternative D in the EA.

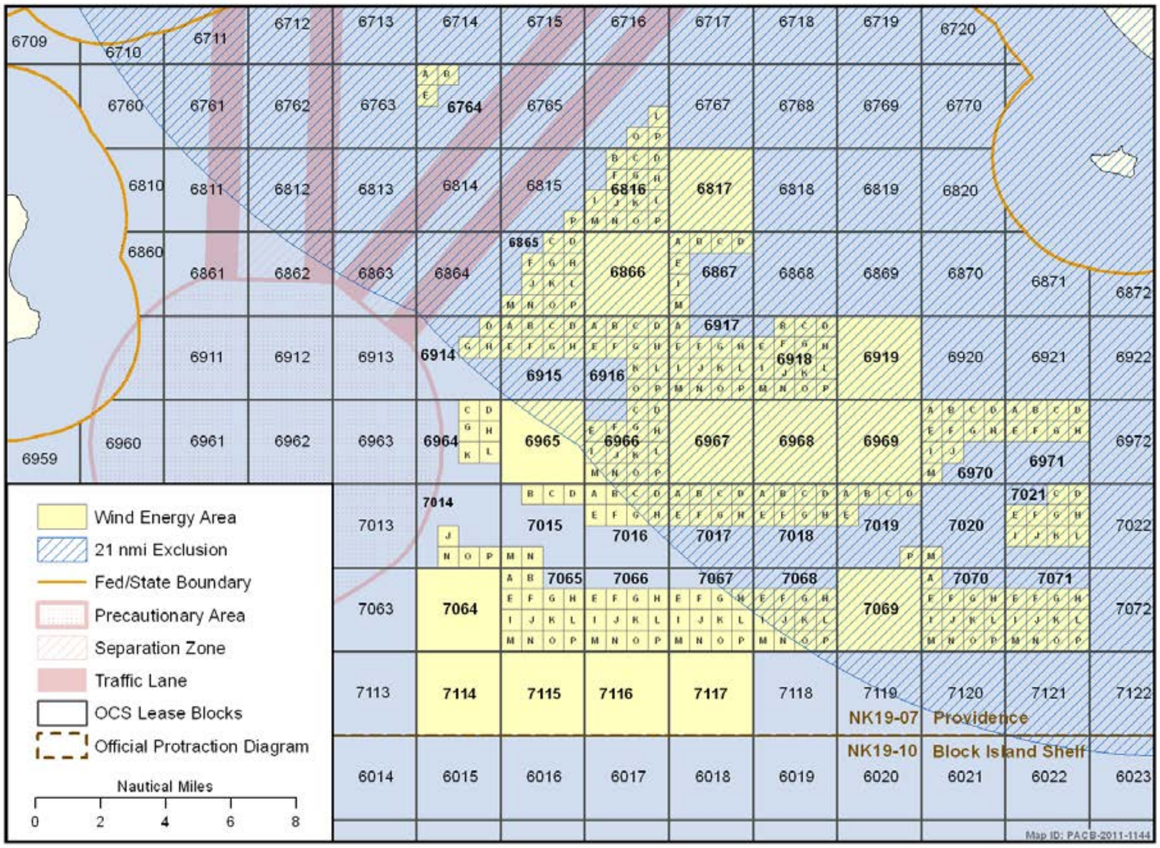
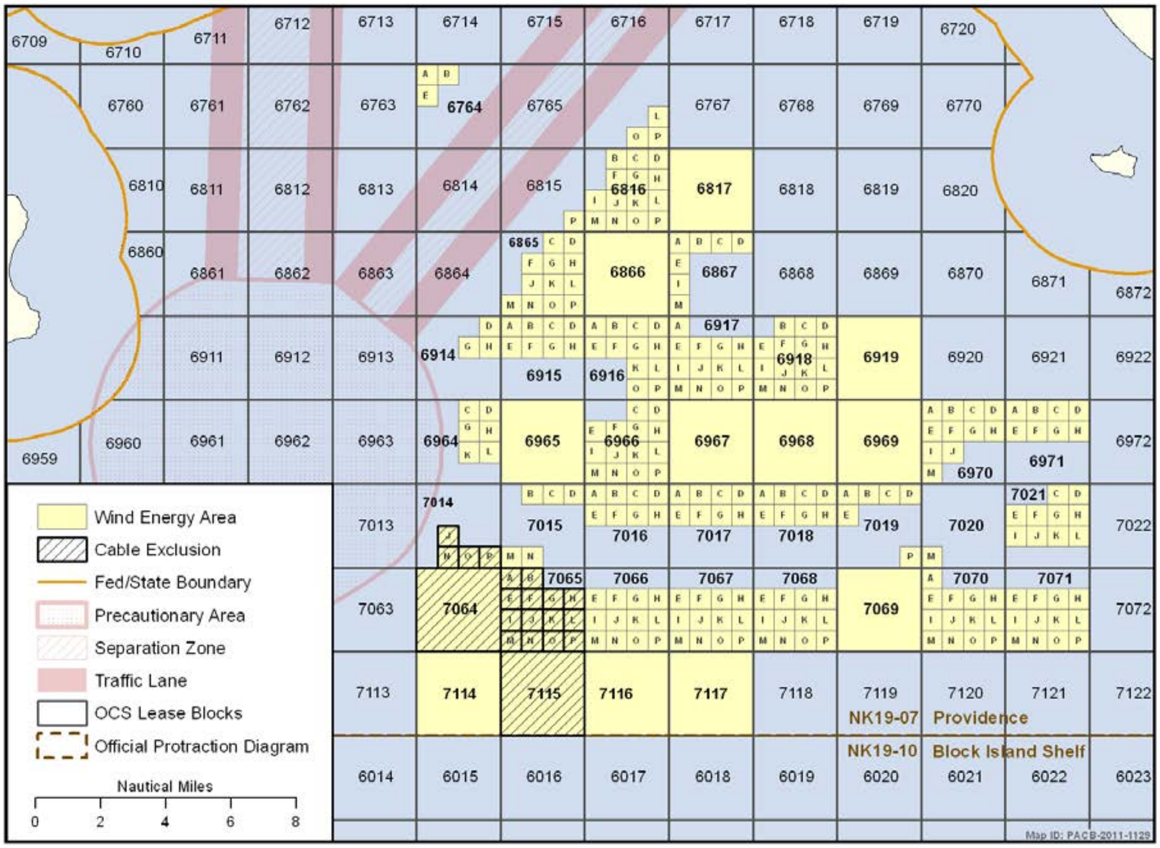


Figure 5. Areas identified by Verizon, Inc. as containing telecommunication cable(s) identified as Alternative E in the EA.



APPENDIX B
Standard Operating Conditions

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

Revised Environmental Assessment

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

STANDARD OPERATING CONDITIONS

Table of Contents

INTRODUCTION

These Standard Operating Conditions (SOCs) were developed by the Bureau of Ocean Energy Management (BOEM) and refined during consultations under Section 106 of the National Historic Preservation Act and under Section 7 of the Endangered Species Act. As BOEM develops lease sale procedures and documents, these SOCs may be further refined.

B.1 STANDARD OPERATING CONDITIONS FOR CULTURAL RESOURCES

BOEM has determined that geotechnical (sub-bottom) sampling may impact historic properties. If the lessee conducts high-resolution geophysical (HRG) surveys prior to conducting geotechnical (sub-bottom) sampling, the lessee will be able to avoid impacts on historic properties. Therefore, BOEM will require the lessee to conduct HRG surveys prior to conducting geotechnical (sub-bottom) sampling and, when a potential historic property is identified, the lessee will be required to avoid it. Inclusion of the following elements in the lease will ensure avoidance of historic properties and is a requirement of this finding.

The lessee may only conduct geotechnical (sub-bottom) sampling activities in areas of the leasehold in which an analysis of the results of geophysical surveys has been completed for that area. The geophysical surveys must meet BOEM's minimum standards (*see Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 285*), and the analysis must be completed by a qualified marine archaeologist who both meets the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44738-44739) and has experience analyzing marine geophysical data. This analysis must include a determination whether any potential archaeological resources are present in the area and the geotechnical (sub-bottom) sampling activities must avoid potential archaeological resources by a minimum of 50.0 meters (m; 164.0 feet [ft]). The avoidance distance must be calculated from the maximum discernible extent of the archaeological resource. Finally, in no case may the lessee impact a potential archaeological resource without BOEM's prior approval.

Therefore, *no historic properties will be affected* for this lease issuance undertaking.

The following post-review discoveries clause will be included in the lease:

> If the Lessee, while conducting activities, discovers a potential archaeological resource, such as the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock), prehistoric artifacts, and/or relict landforms, etc. within the project area, the Lessee must:
>
> - Immediately halt seafloor/bottom-disturbing activities within the area of discovery;
> - Notify the Lessor within 24 hours of discovery;
> - Notify the Lessor in writing via report to the Lessor within 72 hours of its discovery;

- Keep the location of the discovery confidential and take no action that may adversely affect the archaeological resource until the Lessor has made an evaluation and instructs the applicant on how to proceed; and
- Conduct any additional investigations as directed by the Lessor to determine if the resource is eligible for listing in the National Register of Historic Places (30 CFR 585.802(b)). The Lessor will do this if:
  (1) the site has been impacted by the Lessee's project activities; or
  (2) impacts to the site or to the area of potential effect cannot be avoided.
  If investigations indicate that the resource is potentially eligible for listing in the National Register of Historic Places, the Lessor will tell the Lessee how to protect the resource or how to mitigate adverse effects to the site. If the Lessor incurs costs in protecting the resource, under Section 110(g) of the National Historic Preservation Act, the Lessor may charge the Lessee reasonable costs for carrying out preservation responsibilities under the Outer Continental Shelf Lands Act (30 CFR 585.802(c-d)).

B.2 STANDARD OPERATING CONDITIONS FOR PROTECTED SPECIES VESSEL STRIKE AVOIDANCE

The lessee must ensure that all vessels conducting activity in support of a plan (i.e., Site Assessment Plan [SAP] and/or Construction and Operation Plan [COP]) comply with the vessel strike avoidance measures specified below except under extraordinary circumstances when the safety of the vessel or crew are in doubt or the safety of life at sea is in question.

1. The lessee must ensure that vessel operators and crews maintain a vigilant watch for cetaceans, pinnipeds, and sea turtles and slow down or stop their vessel to avoid striking protected species.

2. The lessee must ensure that all vessels 65 feet in length or greater, operating from November 1 through July 31, operate at speeds of 10 knots (<18.5 kilometers per hour [km/h]) or less. In addition, vessel operators must comply with 10 knot (<18.5 km/h) speed restrictions in any Dynamic Management Area (DMA). Vessel operators may send a blank email to ne.rw.sightings@noaa.gov for an automatic response listing all current Seasonal Management Areas (SMAs) and DMAs.

3. North Atlantic right whales
   (a) The lessee must ensure all vessels maintain a separation distance of 500 m (1,640 ft) or greater from any sighted North Atlantic right whale(s).
   (b) The lessee must ensure that the following avoidance measures are taken if a vessel comes within 500 m (1,640 ft) of a right whale(s):
      (i) The lessee must ensure that while underway, any vessel must steer a course away from the right whale(s) at 10 knots (< 18.5 km/h) or less until the 500 m (1,640 ft) minimum separation distance has been established (unless (ii) below applies).
      (ii) The lessee must ensure that when a North Atlantic right whale is sighted in a vessel's path, or within 100 m (328 ft) to an underway vessel, the underway vessel must reduce speed and shift the engine to neutral. The lessee must not

engage the engines until the right whale(s) has moved outside of the vessel's path and beyond 100 m (328 ft).

(iii) The lessee must ensure that if a vessel is stationary, the vessel must not engage engines until the North Atlantic right whale(s) has moved beyond 100 m (328 ft), at which time refer to point 3(b)(i).

(iv) The lessee must ensure that any vessel must reduce vessel speed to 10 knots (<18.5 km/h) or less within any DMA.

4. Non-delphinoid cetaceans other than the North Atlantic right whale
   (a) The lessee must ensure all vessels maintain a separation distance of 100 m (328 ft) or greater from any sighted non-delphinoid cetacean(s).
   (b) The lessee must ensure that the following avoidance measures are taken if a vessel comes within 100 m (328 ft) of a non-delphinoid cetacean(s):
      (i) The lessee must ensure that when a non-delphinoid cetacean(s) (other than a North Atlantic right whale) is sighted, the vessel underway must reduce speed and shift the engine to neutral, and must not engage the engines until the non-delphinoid cetacean(s) has moved outside of the vessel's path and beyond 100 m (328 ft).
      (ii) The lessee must ensure that if a vessel is stationary, the vessel must not engage engines until the non-delphinoid cetacean(s) has moved out of the vessel's path and beyond 100 m (328 ft).

5. Delphinoid cetaceans
   (a) The lessee must ensure all vessels maintain a separation distance of 50 m (164 ft) or greater from any sighted delphinoid cetacean(s).
   (b) The lessee must ensure that the following avoidance measures are taken if the vessel comes within 50 m (164 ft) of a delphinoid cetacean(s):
      (i) The lessee must ensure that any vessel underway remain parallel to a sighted delphinoid cetacean's course whenever possible, and avoid excessive speed or abrupt changes in direction. Course and speed may be adjusted once the delphinoid cetacean(s) has moved beyond 50 m (164 ft) and/or the delphinoid cetacean(s) has moved abeam of the underway vessel.
      (ii) In addition, the lessee must ensure that any vessel underway reduce vessel speed to 10 knots (<18.5 km/h) or less when pods (including mother/calf pairs) or large assemblages of delphinoid cetaceans are observed. Course and speed may be adjusted once the delphinoid cetaceans have moved beyond 50 m (164 ft) and/or abeam of the underway vessel.

6. Sea turtles. The lessee must ensure all vessels maintain a separation distance of 50 m (164 ft) or greater from any sighted sea turtle(s).

7. The lessee must ensure that vessel operators are briefed to ensure they are familiar with the above requirements.

B.3 MARINE DEBRIS AWARENESS

The lessee must ensure that vessel operators, employees and contractors engaged in activity in support of a plan (i.e., SAP and/or COP) are briefed on marine trash and debris awareness elimination as described in the Bureau of Safety and Environmental Enforcement Notice to Lessees (NTL) No. 2012-G01 ("Marine Trash and Debris Awareness and Elimination"). BOEM (the Lessor) will not require the applicant to undergo formal training or post placards, as described under this NTL. Instead, the lessee must ensure that its employees and contractors are made aware of the environmental and socioeconomic impacts associated with marine trash and debris and their responsibilities for ensuring that trash and debris are not intentionally or accidentally discharged into the marine environment. The above referenced NTL provides information the applicant may use for this awareness training.

B.4 STANDARD OPERATING CONDITIONS FOR PROTECTED SPECIES — GEOLOGICAL AND GEOPHYSICAL (G&G) SURVEY REQUIREMENTS

The lessee must ensure that all vessels conducting activity in support of a plan (i.e., SAP and/or COP) comply with the geological and geophysical survey requirements specified below except under extraordinary circumstances when the safety of the vessel or crew are in doubt or the safety of life at sea is in question:

1) Visibility. The lessee must not conduct G&G surveys in support of plan (i.e., SAP and/or COP) submittal at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevents visual monitoring of the exclusion zones for HRG surveys and geotechnical surveys as specified below. This requirement may be modified as specified below.

2) Modification of Visibility Requirement. If the lessee intends to conduct G&G survey operations in support of a plan at night or when visual observation is otherwise impaired, an alternative monitoring plan detailing the alternative monitoring methodology (e.g. active or passive acoustic monitoring technologies) must be submitted to the Lessor for consideration. The Lessor may, after consultation with the National Marine Fisheries Service (NMFS), decide to allow the lessee to conduct G&G surveys in support of a plan at night or when visual observation is otherwise impaired using the proposed alternative monitoring methodology.

3) Protected-Species Observer (PSO). The lessee must ensure that the exclusion zone for all G&G surveys performed in support of plan (i.e., SAP and/or COP) submittal is monitored by a NMFS-approved PSO. The lessee must provide to the Lessor a list of observers and their résumés no later than forty-five (45) calendar days prior to the scheduled start of surveys performed in support of plan submittal. The résumés of any additional observers must be provided fifteen (15) calendar days prior to each observer's start date. The Lessor will send the observer information to NMFS for approval.

4) Optical Device Availability. The lessee must ensure that reticuled binoculars or other suitable equipment are available to each observer to adequately perceive and monitor distant objects within the exclusion zone during surveys conducted in support of plan (i.e., SAP and/or COP) submittal.

B.4.1 High Resolution Geophysical (HRG) Survey Requirements

The following requirements will apply to all HRG survey work actively using electromechanical survey equipment where one or more acoustic sound source is operating at frequencies below 200 kHz:

1) Establishment of Exclusion Zone. The lessee must ensure that a 200m default exclusion zone for cetaceans, pinnipeds, and sea turtles will be monitored by a protected species observer around a survey vessel actively using electromechanical survey equipment where one or more acoustic sound sources is operating at frequencies below 200 kiloHertz (kHz). In the case of the North Atlantic right whale, the minimum separation distance of 500 m (1,640 ft) is in effect when the vessel is underway as described in the vessel-strike avoidance measures.
   (a) If the Lessor determines that the exclusion zone does not encompass the 180-decibel (dB) Level A harassment radius calculated for the acoustic source having the highest source level, the Lessor will consult with NMFS about additional requirements.
   (b) The Lessor may authorize surveys having an exclusion zone larger than 200 m (656 ft) to encompass the 160-dB Level B harassment radius if the lessee can demonstrate the zone can be effectively monitored.

2) Field Verification of Exclusion Zone. The lessee must conduct field verification of the exclusion zone for specific HRG survey equipment operating below 200 kHz. The lessee must take acoustic measurements at a minimum of two reference locations and be sufficient to establish the following: source level (peak at 1 m) and distance to the 180, 160, and 150 dB_{rms} re 1μPa sound pressure level (SPL) isopleths as well as the 187 dB re 1μPa cumulative sound exposure level (cSEL). Sound measurements must be taken at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 m above the seafloor). An infrared range finder may be used to determine distance from the sound source to the reference location.

3) Modification of Exclusion Zone. The lessee may use the field-verification method described above to modify the HRG survey exclusion zone for specific HRG survey equipment operating below 200 kHz. This modified exclusion zone may be greater than or less than the 200m default exclusion zone depending on the results of the field tests. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the target (160 dB or 180 dB) zone. This modified zone must be used for all subsequent use of field-verified equipment and may be periodically reevaluated based on the regular sound monitoring. The lessee must obtain Lessor approval of any new exclusion zone before it may be implemented.

4) Clearance of Exclusion Zone. The lessee must ensure that active acoustic sound sources must not be activated until the protected species observer has reported the exclusion zone clear of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

5) Electromechanical Survey Equipment Ramp-Up. The lessee must ensure that when technically feasible a "ramp-up" of the electromechanical survey equipment occur at the start or re-start of HRG survey activities. A ramp-up would begin with the power of the smallest acoustic equipment for the HRG survey at its lowest power output. The power output would be gradually turned up and other acoustic sources added in a way such that the source level would increase in steps not exceeding 6 dB per 5-min period.

6) Shut Down for Non-Delphinoid Cetaceans and Sea Turtles. If a non-delphinoid cetacean or sea turtle is sighted at or within the exclusion zone, an immediate shutdown of the electromechanical survey equipment is required. The vessel operator must comply immediately with such a call by the observer. Any disagreement or discussion should occur only after shut-down. Subsequent restart of the electromechanical survey equipment must use the ramp-up provisions described above and may only occur following clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

7) Power Down for Delphinoid Cetaceans and Pinnipeds. If a delphinoid cetacean or pinniped is sighted at or within the exclusion zone, the electromechanical survey equipment must be powered down to the lowest power output that is technically feasible. The vessel operator must comply immediately with such a call by the observer. Any disagreement or discussion should occur only after power-down. Subsequent power up of the electromechanical survey equipment must use the ramp-up provisions described above and may occur after (1) the exclusion zone is clear of a delphinoid cetacean and/or pinniped or (2) a determination by the protected species observer after a minimum of 10 minutes of observation that the delphinoid cetacean and/or pinniped is approaching the vessel or towed equipment at a speed and vector that indicates voluntary approach to bow-ride or chase towed equipment. An incursion into the exclusion zone by a non-delphinoid cetacean or sea turtle during a power-down requires implementation of the shut-down procedures described above.

8) Pauses in Electromechanical Survey Sound Source. The lessee must ensure that if the electromechanical sound source shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid cetacean or sea turtle, including, but not limited to, mechanical or electronic failure, resulting in the cessation of the sound source for a period greater than 20 minutes, the lessee must restart the electromechanical survey equipment using the full ramp-up procedures and clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes. If the pause is less than 20 minutes the equipment may be re-started as soon as practicable at its operational level as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of cetaceans, pinnipeds, and sea turtles. If visual surveys were not continued diligently during the pause of 20-

minutes or less, the lessee must restart the electromechanical survey equipment using the full ramp-up procedures and clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

B.4.2 Requirements for Geotechnical Sampling

The following requirements will apply to all geotechnical survey work:

1) Establishment of Exclusion Zone. The lessee must ensure that a 200m radius exclusion zone for all cetaceans, pinnipeds, and sea turtles will be monitored by a protected species observer around any vessel conducting geotechnical surveys (i.e. drilling, cone penetrometer tests, etc.).

2) Modification of Exclusion Zone. The lessee may use the field-verification method as described below to modify the geotechnical survey exclusion zone for specific geotechnical sampling equipment being utilized. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the 120-dB zone. This modified zone must be used for all subsequent use of field-verified equipment and may be periodically reevaluated based on the regular sound monitoring described below. The lessee must obtain Lessor approval of any new exclusion zone before it may be implemented.

3) Field Verification of Exclusion Zone. If the lessee wishes to modify the exclusion zone as described above, the lessee must conduct field verification of the exclusion zone for specific geotechnical sampling equipment. The results of the measurements from the equipment must be used to establish a new exclusion zone, which may be greater than or less than the 200-m default exclusion zone depending on the results of the field tests. The lessee must take acoustic measurements at a minimum of two reference locations and be sufficient to establish the following: source level (peak at 1 m) and distance to the 180, 160, and 150 dB_{rms} re 1µPa SPL isopleths as well as the 187 dB re 1µPa cSEL. Sound measurements must be taken at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 m above the seafloor). An infrared range finder may be used to determine distance from the sound source to the reference location.

4) Clearance of Exclusion Zone. The lessee must ensure that geotechnical sound source must not be activated until the protected species observer has reported the exclusion zone clear of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

5) Shut Down for Non-Delphinoid Cetaceans and Sea Turtles. If any non-delphinoid cetaceans or sea turtles are sighted at or within the exclusion zone, an immediate shutdown of the geotechnical survey equipment is required. The vessel operator must comply immediately with such a call by the observer. Any disagreement or discussion should occur only after shut-down. Subsequent restart of the geotechnical survey equipment may only occur following clearance of the exclusion zone for 60 minutes.

6) Pauses in Geotechnical Survey Sound Source. The lessee must ensure that if the geotechnical sound source shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid cetacean or sea turtle, including, but not limited to, mechanical or electronic failure, resulting in the cessation of the sound source for a period greater than 20 minutes, the lessee must ensure clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes. If the pause is less than 20 minutes the equipment may be re-started as soon as practicable as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of cetaceans, pinnipeds, and sea turtles. If visual surveys were not continued diligently during the pause of 20-minutes or less, the lessee must restart the geotechnical survey equipment only after the clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

B.5 STANDARD OPERATING CONDITIONS FOR PROTECTED SPECIES— CONSTRUCTION OF METEOROLOGICAL TOWERS AND INSTALLATION OF METEOROLOGICAL BUOYS

The lessee must ensure that all vessels conducting activity in support of a plan (i.e., SAP and/or COP) comply with the construction of meteorological tower and installation of meteorological buoy requirements specified below except under extraordinary circumstances when the safety of the vessel or crew are in doubt or the safety of life at sea is in question:

1) Visibility. The lessee must not conduct pile-driving for a meteorological tower foundation at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevents visual monitoring of the exclusion zones for meteorological tower foundation pile-driving as specified below. This requirement may be modified as specified below.

2) Modification of Visibility Requirement. If the lessee intends to conduct pile-driving for a meteorological tower foundation at night or when visual observation is otherwise impaired, an alternative monitoring plan detailing the alternative monitoring technologies (e.g. active or passive acoustic monitoring technologies) must be submitted to the Lessor for consideration. The Lessor may, after consultation with NMFS, decide to allow the lessee to conduct pile-driving for a meteorological tower foundation at night or when visual observation is otherwise impaired.

3) Protected-Species Observer (PSO). The lessee must ensure that the exclusion zone for all pile-driving for a meteorological tower foundation is monitored by a NMFS-approved PSO. The lessee must provide to the Lessor a list of observers and their résumés no later than forty-five (45) calendar days prior to the scheduled start of meteorological tower construction activity. The résumés of any additional observers must be provided fifteen (15) calendar days prior to each observer’s start date. The Lessor will send the observer information to NMFS for approval.

4) Optical Device Availability. The lessee must ensure that reticuled binoculars or other suitable equipment are available to each observer to adequately perceive and monitor

distant objects within the exclusion zone during meteorological tower construction activities.

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

B.5.1 Requirements for Pile-Driving

1) Prohibition on Pile-Driving. The lessee must ensure that no pile-driving activities (e.g. pneumatic, hydraulic, or vibratory installation of foundation piles) occur from November 1 – April 30 nor during an active Dynamic Management Area (DMA) if the pile-driving location is within the boundaries of the DMA as established by the National Marine Fisheries Service or within 1 kilometer of the boundaries of the DMA.

2) Establishment of Exclusion Zone. The lessee must ensure the establishment of a default 1,000 m (3,281 ft) radius exclusion zone for cetaceans, sea turtles, and pinnipeds around each pile-driving site. The 1,000 m (3,281 ft) exclusion zone must be monitored from two locations. One observer must be based at or near the sound source and will be responsible for monitoring out to 500 m (1,640 ft) from the sound source. An additional observer must be located on a separate vessel navigating approximately 1,000 m (3,281 ft) around the pile hammer and will be responsible for monitoring the area between 500 m (1,640 ft) to 1,000 m (3,281 ft) from the sound source.

3) Field Verification of Exclusion Zone. The lessee must conduct acoustic monitoring of pile-driving activities during the installation of each meteorological tower requiring pile-driving. The lessee must take acoustic measurements at a minimum of two reference locations and be sufficient to establish the following: source level (peak at 1 m) and distance to the 180, 160, and 150 dB_{rms} re 1µPa SPL isopleths as well as the 187 dB re 1µPa cSEL. Sound measurements must be taken at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 m above the seafloor). An infrared range finder may be used to determine distance from the sound source to the reference location

4) Modification of Exclusion Zone. The lessee may use the field verification method described above to modify the default exclusion zone provided above for pile-driving activities. Results of the field verification must be submitted to the Lessor after the pile-driving of the first pile and before the pile-driving of subsequent piles for a multiple pile foundation. The results of the measurements must be used to establish a new exclusion zone which may be greater than or less than the 1,000 m (3,281 ft)

default exclusion zone, depending on the results of the field tests. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the target (180 dB or 160 dB) zone.

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

6) Implementation of Soft Start. The lessee must ensure that a "soft start" be implemented at the beginning of each pile installation in order to provide additional protection to cetaceans, pinnipeds, 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 three (3) strikes from the impact hammer at 40 percent energy with a one minute waiting period between subsequent 3-strike sets.

7) Shut Down for Cetaceans, Pinnipeds, and Sea Turtles. The lessee must ensure that any time a cetacean, pinniped, and/or sea turtle is observed within the exclusion zone, the observer must notify the Resident Engineer (or other authorized individual) and call for a shutdown of pile-driving activity. The pile-driving activity must cease as soon as it is safe to do so. Any disagreement or discussion should occur only after shut-down, unless such discussion relates to the safety of the timing of the cessation of the pile-driving activity. Subsequent restart of the pile-driving equipment may only occur following clearance of the exclusion zone of any cetacean, pinniped, and/or sea turtle for 60 minutes.

8) Pauses in Pile-Driving Activity. The lessee must ensure that if pile-driving ceases for 30 minutes or more and a cetacean, pinniped, and/or sea turtle is sighted within the exclusion zone prior to re-start of pile-driving, the observer(s) must notify the Resident Engineer (or other authorized individual) that an additional 60 minute visual and acoustic observation period must be completed, as described above, before restarting pile-driving activities. A pause in pile-driving for less than 30 minutes must still begin with soft start but will not require the 60 minute clearance period as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of cetaceans, pinnipeds, and sea turtles. If visual surveys were not continued diligently during the pause of 30-minutes or less, the lessee must clear the exclusion zone of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

B.6 PROTECTED SPECIES REPORTING REQUIREMENTS

The lessee must ensure compliance with the following reporting requirements for site characterization activities performed in support of plan (i.e., SAP and/or COP) and must use contact information provided by the Lessor, to fulfill these requirements:

1) Reporting Injured or Dead Protected Species. The lessee must ensure that sightings of any injured or dead protected species (e.g., marine mammals or sea turtles) are reported to the NMFS Northeast Region's Stranding Hotline (866-755-6622 or current) within 24 hours of sighting, regardless of whether the injury or death is caused by a vessel. In addition, if the injury or death was caused by a collision with a project-related vessel, the lessee must ensure that the Lessor is notified of the strike within 24 hours. The notification of such strike must include the date and location (latitude/longitude) of the strike, the name of the vessel involved, and the species identification or a description of the animal, if possible. If the lessee's activity is responsible for the injury or death, the lessee must ensure that the vessel assist in any salvage effort as requested by the NMFS.

2) Reporting Observed Impacts to Protected Species. The observer must report any observations concerning impacts on Endangered Species Act listed marine mammals or sea turtles to the Lessor and the NMFS within 48 hours. Any injuries or mortalities must be documented on the NMFS Incident Report (see Attachment B-1). Any observed 'Takes' of listed marine mammals or sea turtles resulting in injury or mortality must be reported within 24 hours to the Lessor and the NMFS.

3) Report Information. Data on all protected-species observations must be recorded based on standard marine mammal observer collection data by the protected-species observer. This information must include: dates, times, and locations of survey operations; time of observation, location and weather; details of marine mammal sightings (e.g., species, numbers, and behavior); and details of any observed Taking (e.g., behavioral disturbances or injury/mortality).

4) HRG Plan for Field Verification of the Exclusion Zone. The lessee must submit a plan for verifying the sound source levels of any electromechanical survey equipment operating at frequencies below 200 kHz to the Lessor no later than 45 days prior to the commencement of the field verification activities. The Lessor may require that the Lessee modify the plan to address any comments the Lessor submits to the Lessee on the contents of the plan in a manner deemed satisfactory to the Lessor prior to the commencement of the field verification activities.

5) Report of Activities and Observations. The lessee must provide the Lessor and the NMFS with a report within ninety (90) calendar days following the commencement of HRG and/or geotechnical sampling activities that includes a summary of the survey activities and an estimate of the number of listed marine mammals and sea turtles observed or Taken during these survey activities.

6) Final Technical Report for Meteorological Tower Construction and Meteorological Buoy Installation Observations. The lessee must provide the Lessor and NMFS a report within 120 days after completion of the pile-driving and construction activities. The report must include full documentation of methods and monitoring protocols, summarizes the data recorded during monitoring, estimates the number of listed marine mammals and sea turtles that may have been taken during construction activities, and provides an interpretation of the results and effectiveness of all monitoring tasks. The report must also include acoustic monitoring results from any pile-driving activity conducted during the installation of a meteorological tower.

    Reports must be sent to:
    Bureau of Ocean Energy Management
    Environment Branch for Renewable Energy
    Phone: 703-787-1340
    Email: renewable_reporting@boem.gov

    National Marine Fisheries Service
    Northeast Regional Office, Protected Resources Division
    Section 7 Coordinator
    Phone: 978-281-9328
    Email: incidental.take@noaa.gov

ATTACHMENT B-1

NMFS Incident Report

Incident Report: Protected Species Injury or Mortality

Photographs should be taken of all injured or dead animals.

Observer's full name:____
Reporter's full name:____

Species Identification:____

Name of platform and activity ongoing at time of observation (e.g., transit, survey, pile driving, etc:
____
____

Date animal observed:________________ Time animal observed: ________________________
Date animal collected:________________ Time animal collected:_________________________

Environmental conditions at time of observation (i.e., tidal stage, sea state, weather):
____
____

Water temperature (°C) at site and time of observation:_________________________
Describe location of animal and events leading up to, including and after, the incident:
____

Sturgeon Information:
Species ___________________________________

Fork length (or total length) _____________________ Weight ______________________

Condition of specimen/description of animal
____
____
____
____

Fish Decomposed: NO SLIGHTLY MODERATELY SEVERELY
Fish tagged: YES / NO *Please record all tag numbers.* Tag # ________________

Photograph taken: YES / NO
(please label *species, date, geographic site* and *vessel name* when transmitting photo)

Genetics Sample taken: YES / NO
Genetics sample transmitted to: ____________________ on ____/_____/2012

Sea Turtle Species Information: *(please designate cm/m or inches.)*
Species ______________________________ Weight (kg or lbs)______________________________

Sex (circle): Male Female Unknown How was sex determined? ____________________

Straight carapace length ________________ Straight carapace width ______________________

Curved carapace length _________________ Curved carapace width _______________________

Plastron length _______________________ Plastron width ______________________________

Tail length ____________________________ Head width ________________________________

Condition of specimen/description of animal____
____

Existing Flipper Tag Information
Left _______________________________ Right ____________________________________
PIT Tag # ___________________________________
Miscellaneous:
Genetic biopsy taken: YES NO
Photos Taken: YES NO

Turtle Release Information:
Date _____________________________ Time __________________________________
Lat ______________________________ Long __________________________________
State ____________________________ County _______________________________

Remarks: (note if turtle was involved with tar or oil, gear or debris entanglement, wounds or mutilations, propeller damage, papillomas, old tag locations, etc.)
____
____

Marine Mammal information:
Species ____

Injuries Observed ____

Condition/Description of Animal ____
____

Other Remarks ____

Date and Time Reported to NMFS Stranding Hotline: __________________________________

APPENDIX C
Additional Resource Information: Geology and Physical Oceanography

APPENDIX C

ADDITIONAL RESOURCE INFORMATION: GEOLOGY AND PHYSICAL OCEANOGRAPHY

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
AMO	Atlantic multidecadal oscillation
Bbbls	billion barrels
BIS	Block Island Sound
BOEM	Bureau of Ocean Energy Management
cm sec^{-1}	centimeters per second
CRMC	(Rhode Island) Coastal Resources Management Council
EA	Environmental Assessment
km	kilometer(s)
m^3 sec^{-1}	cubic meters per second
NM	nautical mile(s)
Ocean SAMP	Rhode Island Ocean Special Area Management Plan; *also* Rhode Island Ocean SAMP
OCS	Outer Continental Shelf
RIS	Rhode Island Sound
Tcf	trillion cubic feet
USGS	United States Geological Survey
WEA	Wind Energy Area

C.1 Geology

C.1.1 Description of the Affected Environment

C.1.1.1 Bedrock Geology

The geologic formations underlying Rhode Island Sound and Block Island Sound are composed of basement rocks consisting of gneiss and schist with pegmatite and granitic intrusions overlain by coastal plain and continental shelf sediments, Wisconsin glacial deposits, and more recent estuarine[1] and marine sediments.

Basement structural features in the study area have a predominantly northwest and northeast trend. A transverse fault, the New Shoreham Fault, has been identified between Block Island and Montauk Point on Long Island and can be traced approximately 35 nautical miles (NM; 65 kilometers [km]) seaward across the shelf. Vertical displacements on the fault vary from 65 to 130 feet (20 to 40 meters) (Needell and Lewis 1984).

C.1.1.2 Sea Floor Sediments and Bathymetry

The present-day surface of the sea floor of Rhode Island Sound, Block Island Sound and the offshore ocean Special Area Management Plan (SAMP) area, is largely the result of the reworking of the sediments deposited by the last glacial event (i.e., Pleistocene glaciation activities of the Wisconsinan Laurentide ice sheet that reached its maximum extent about 24,000 years ago) (Stone and Borns 1986 and Boothroyd and Sirkin 2002 *as cited in* Rhode Island CRMC 2010). These glacial sediments are represented by two end moraines (sedimentary material deposited at the terminus of a glacier) that cross the seafloor. The glacial moraines in the Rhode Island Sound, Block Island Sound and Ocean SAMP area consist of bands of gravelly sediment and submarine ridges (Figure C-1). These glacial moraines are capped by a lag deposit of sand, gravel, and boulders resulting from the reworking of the moraine deposits by marine processes.

A seaward-dipping, erosional remnant of the Cretaceous coastal-plain strata unconformably overlies the bedrock in the southern portion of Block Island Sound (i.e., there is a missing depositional interval). Coastal-plain sediments of unconsolidated and semi-consolidated gravels, sands, silts, and clays have been reported on Block Island and along the north shore of Long Island (Needell and Lewis 1984).

The bedrock and coastal-plain strata are again unconformably overlain by the glacial drift (sediments deposited by a glacier). Block Island, Fishers Island, and Long Island are all capped by two glacial drift sheets representing the two ice advances, one of late Wisconsinan age and one that predates the late Wisconsinan, which make up the two series of end moraines mentioned above. The outermost moraine delineates the maximum seaward extent of Pleistocene glaciation.

The end moraine deposits that overlie central and southeastern Long Island are submerged across Block Island Sound and overlie Block Island. The inner end-moraine deposits stretch

[1] i.e., the mouth of a river where it meets the sea

across northern Long Island, Plum Island, and Fishers Island and extend across southern Rhode Island from Watch Hill to Point Judith (Needell and Lewis 1984).

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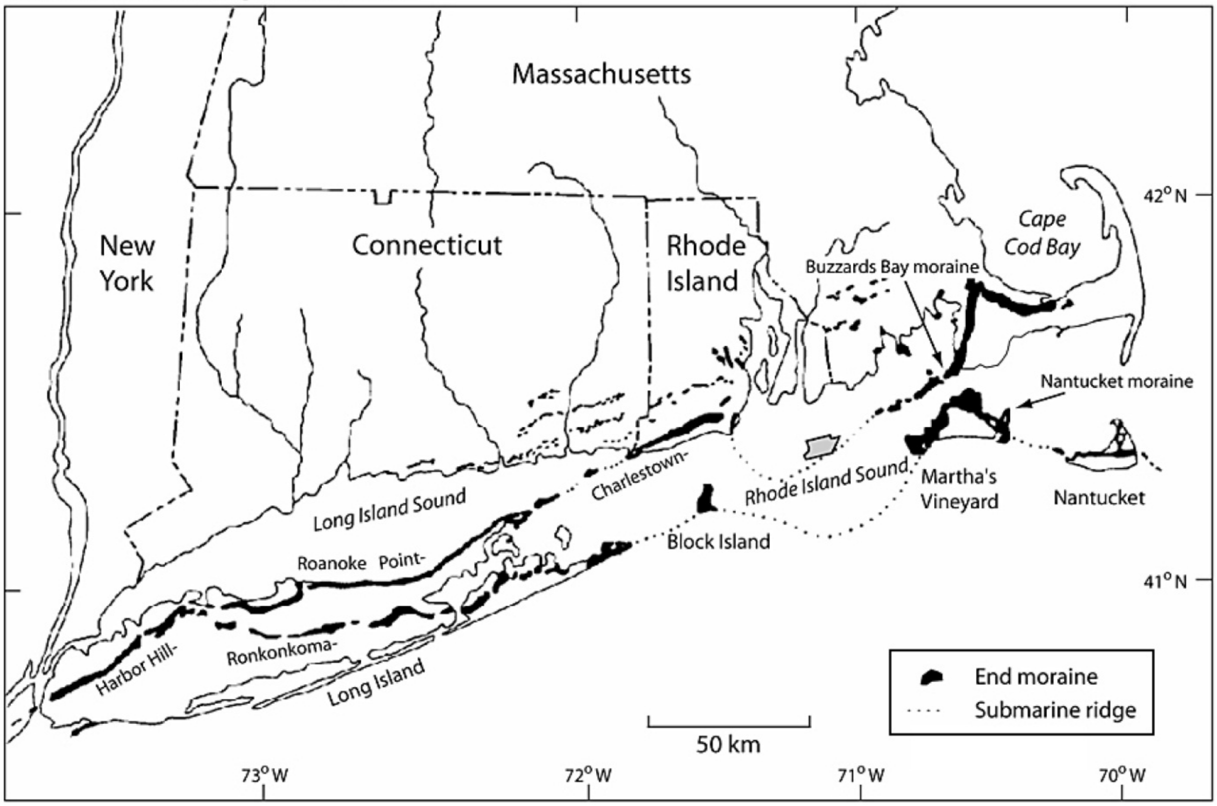


SOURCE: McMullen et.al. 2007

Figure C-1. Location of End Moraines in Southern New England and New York.

In summary, the bottom sediments of the Rhode Island and Block Island Sounds are predominantly composed of sand derived from reworked submerged glacial deposits and glacial deposits derived from the mainland of Rhode Island. The northern Block Island Sound also contains clay concretions in localized areas, indicating the presence of Pleistocene freshwater lakes (Needell and Lewis 1984).

The bathymetry in portions of the Rhode Island Ocean SAMP study area consists of basins and ridges with an overall southerly slope. The basins are surrounded by ridges that coincide with exposures of glacial drift, including glaciolacustrine sediments (glacial lake deposits) and moraine deposits. Ridges tend to be covered with sand waves, exhibit channel erosion, and contain small plateaus, while the basins tend to exhibit a smooth sea floor with boulders (McMullen *et al.* 2007).

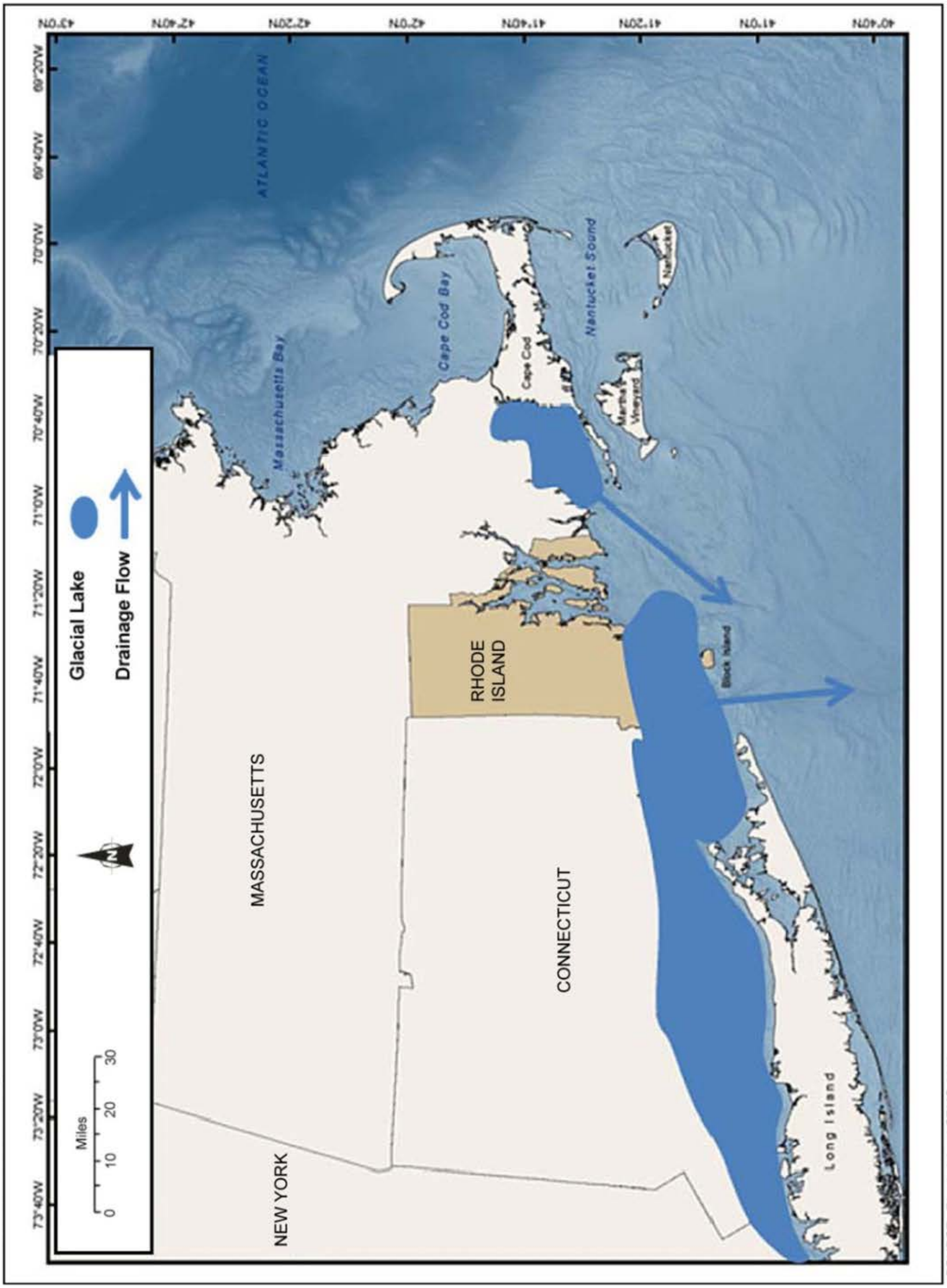
C.1.1.3 Depositional Environment

Upon retreat of the glaciers, sea level began to rise and entered the Rhode Island Sound and Block Island Sound area about 9,500 years ago. At that time, sea level was approximately 115 feet (35 meters) lower than present. Prior to that time, ancient glacial lakes existed in this area, and drainage from the lakes helped create some of the present-day sea bottom features on the Outer Continental Shelf (OCS) (Figure C-2) (Rhode Island Coastal Resources Management Council [CRMC] 2010). As described in the Ocean SAMP, the seafloor bottom in the study area is characterized by four major depositional environments:

1. Depositional Platform Sand Sheets: These features parallel the Rhode Island shore and consist of medium-grained sand containing small ripples. They act as short-term sand-storage areas that supply alongshore transport of sand to the east or onshore transport to shoreline environments.
2. Cross-shore Swaths: These features are medium- to coarse-grained sand with small dunes that act as a conduit for sand transport during storms.
3. Depositional Gravel Pavement: These features are cobble-sized gravel deposits that are often rearranged during storms but, on a whole, do not increase or decrease in area.
4. Glacial Outcrops: These features contain a concentration of boulders and gravel derived from the nearby moraines. Due to their size, they are relatively fixed in place.

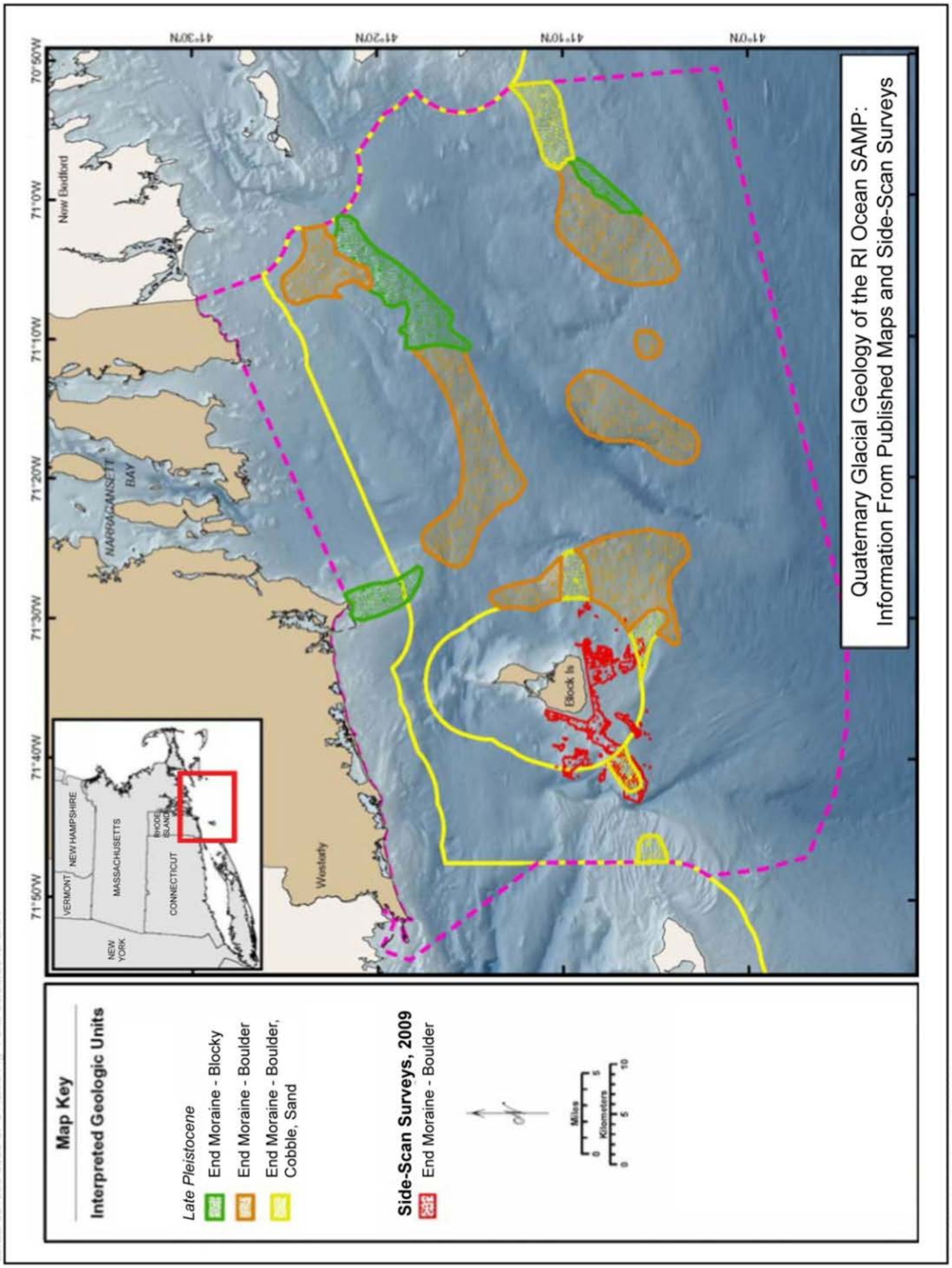
These sea bottom features of the Rhode Island and Block Island Sounds have a strong influence on the physical oceanographic characteristics, which in turn have a significant influence upon erosional and depositional processes. These processes are governed by upwelling currents, orbital motion waves, and unidirectional lateral flows. Glacial moraines, for instance, create a unique bottom topography that influences the patterns of currents, which in turn influence erosion and deposition (Figure C-3). Other bathometric features in the Rhode Island Ocean SAMP study area also influence these flows and currents. The flows and currents transport sand-sized and smaller materials and cause the migration of large bedforms such as dunes, sand ripples, and sand waves across the bottom (Rhode Island CRMC 2010).

Recent sidescan sonar surveys show a mosaic of sedimentary environments that are the result of erosion and sediment transport, deposition and sorting, and reworking (Rhode Island CRMC 2010; *see* Figure C-4). Scattered boulders and clusters of boulders were found throughout the SAMP study area. Depositional areas containing sorted and reworked sediments tended to be found along channels and bathymetric high points. Sand waves were also a predominant feature. Other earlier surveys of Block Island Sound noted smooth plains in the east–central portion with an average depth of 112 feet (34 meters), with the rest of the section being dissected by holes, ledges, and submerged valleys and ridges. The area north of Block Island was noted to contain a northerly running ridge flanked by deep holes and submerged hills and valleys. The deepest hole in Block Island Sound is an area 328 feet (100 meters) deep located 3.5 NM (6.4 km) south of East Point on Fishers Island (Rhode Island CRMC 2010).



SOURCE: Rhode Island CRMC 2010

Figure C-2. Approximate Location of Major Glacial Lakes 19,000 Years Ago.



SOURCE: Rhode Island CRMC 2010

Figure C-3. Location of Glacial Moraines in the Rhode Island SAMP Study Area.

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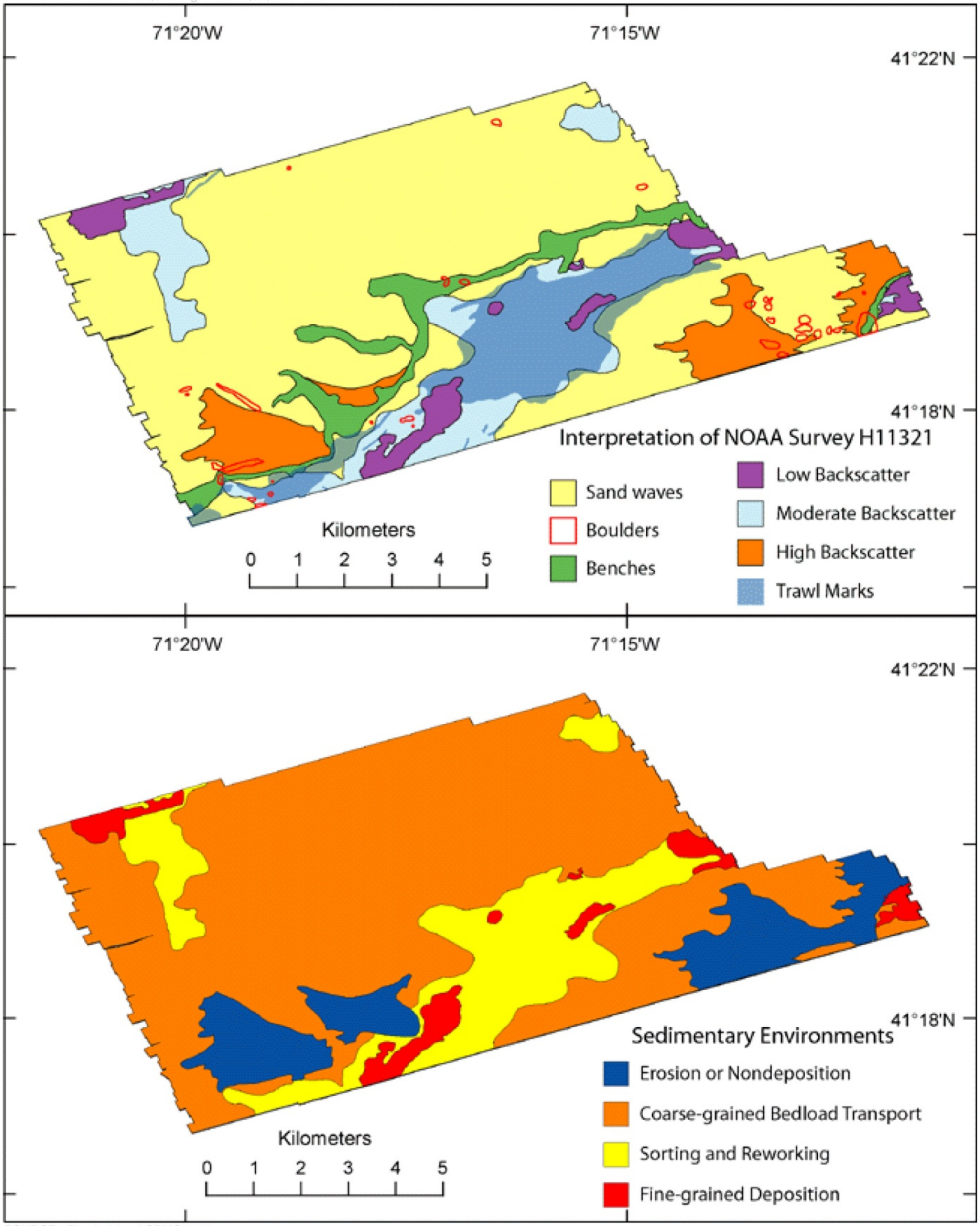

SOURCE: Rhode Island CRMC 2010

Figure C-4. Bottom Characteristics in a Section of Rhode Island Sound as Interpreted from Side-Scan Sonar Images

C.1.1.4 Mineral Resources

There are two types of offshore mineral resources—energy-related (oil and gas) and non-energy-related (sand and gravel). The Bureau of Ocean Energy Management (BOEM) manages the extraction of offshore mineral resources from the OCS. While the largest component of this is the exploration for and development of oil and gas resources, BOEM is also responsible for non-energy minerals obtained from the ocean floor (USDOI, BOEM n.d.[a]).[2]

C.1.1.5 Energy-Related Minerals

BOEM periodically assesses the undiscovered technically recoverable minerals resources underlying offshore waters on the OCS. Resource estimates are based on Mineral Management Service (now BOEM) assessment data of 2006 and on information available as of January 1, 2003, including information obtained from new explorations.[3] Based on this assessment, resource estimates in the 0 to 656-foot (200-meter) water depth range include 4.20 to 17.28 trillion cubic feet (Tcf) of natural gas and 0.33 to 2.17 billion barrels (Bbbls) of oil (Figure C-5). These resource estimates are based on 1970 to 1980 seismic data and a limited number of exploratory wells and, while they are based on best available data, they are highly speculative.

C.1.1.6 Non-Energy-Related Minerals

Sand and gravel deposits consisting of heavy minerals are found in significant concentrations in Rhode Island Sound and Block Island Sound that can serve as potential non-energy-related mineral resource areas. However, several constraints are associated with these potential resource areas: water depth restrictions that protect shellfish beds and public beaches; fishing activities: military, commercial, and fishing vessel traffic; seafloor cable routes; and dump sites (Neff and Lewis 1989).

In Block Island Sound, the area with the fewest user constraints is southwest of Block Island (in the northern portion of the sound). This area (BIS-1) consists of glacial moraine, glacial outwash, and Holocene marine deposits. Seismic data indicate that this deposit is approximately 7,060 cubic feet (200 million cubic meters) in volume. Side-scan observations of this area suggest that the surface of the deposit is composed of gravel. Fishing activities constitute the primary constraint on exploitation in area BIS-1 (Figure C-6). In the southern Block Island Sound (area BIS-2) approximately 3.3 billion cubic yards (2.5 billion cubic meters) of coarse-grained Holocene sediments were identified as potential resource areas. Side-scan observations suggest that these sediments consist of patchy sand and gravel, but core data indicate they offer a limited potential as a source of heavy minerals. Fishing activities and potentially inhospitable tidal current velocities (2 knots) constitute constraints in area BIS-2 (Figure C-7) (United States Geological Survey [USGS] 2002).

[2] *see* http://www.boem.gov/Non-Energy-Minerals/Non-Energy-Minerals.aspx
[3] *see* http://www.boemre.gov/revaldiv/NatAssessmentMap.htm.

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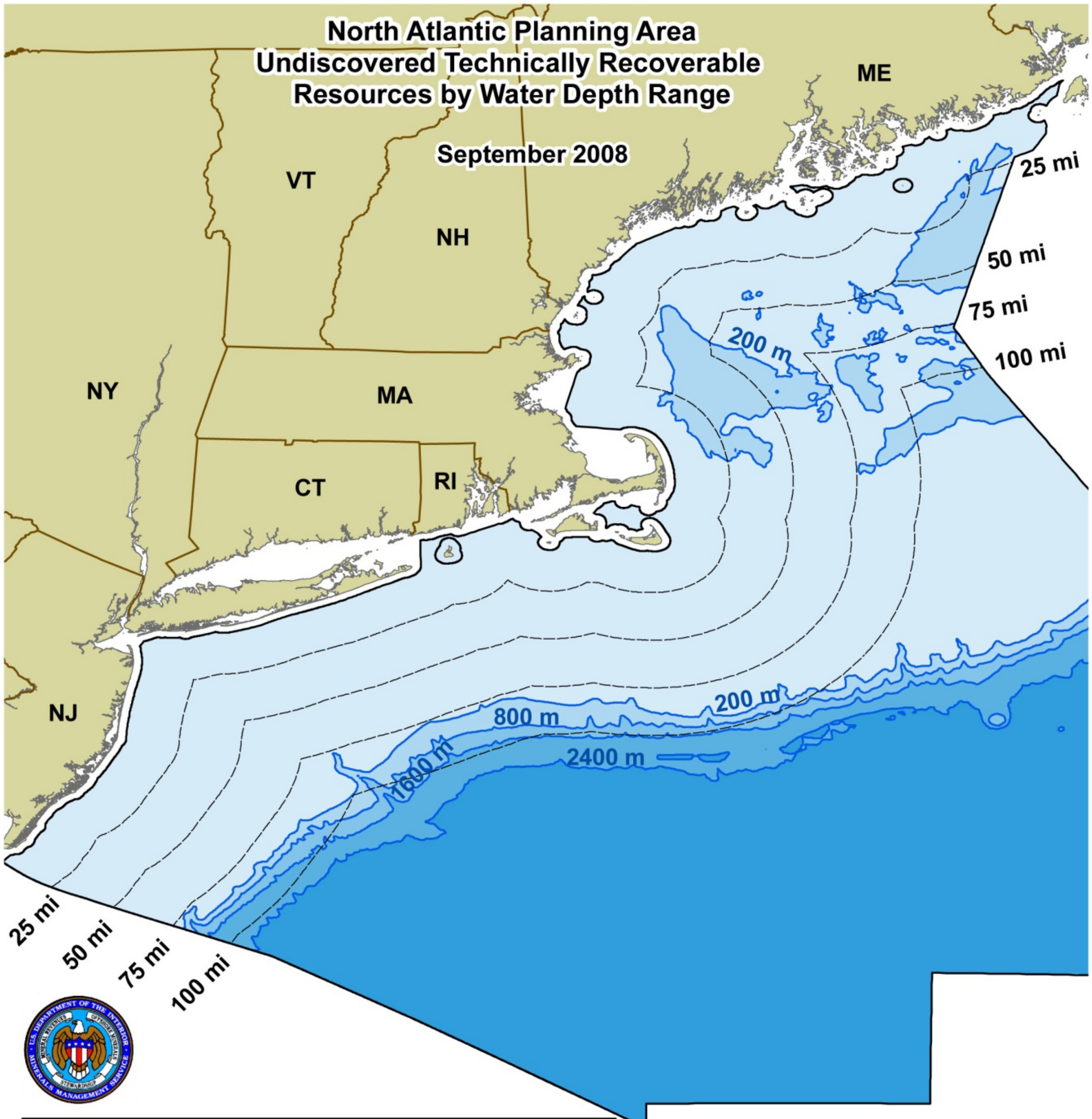

Resource Estimates Based on MMS 2006 Assessment Data

	Water Depth	Gas (Tcf) UTRR	Oil (Bbbl) UTRR
	0-200 meters	4.20 - 17.28	0.33 - 2.17
	200-800 meters	0.51 - 2.27	0.05 - 0.32
	800-1600 meters	0.42 - 1.84	0.04 - 0.25
	1600-2400 meters	0.73 - 4.12	0.06 - 0.42
	>2400 meters	1.32 - 6.66	0.10 - 0.64

Resource values are in trillion cubic feet of gas (Tcf) and billion barrels of oil (Bbbl).

Note:
Resource numbers in the Atlantic area are estimates based on1970s-1980s seismic data and limited exploratory wells. The numbers for these bands in the Atlantic area, while based on the best available data, are highly speculative.

SOURCE: BOEM web site: http://www.boemre.gov/revaldiv/NatAssessmentMap.htm

Figure C-5. North Atlantic Planning Area: Undiscovered Technically Recoverable Resources by Water Depth Range.

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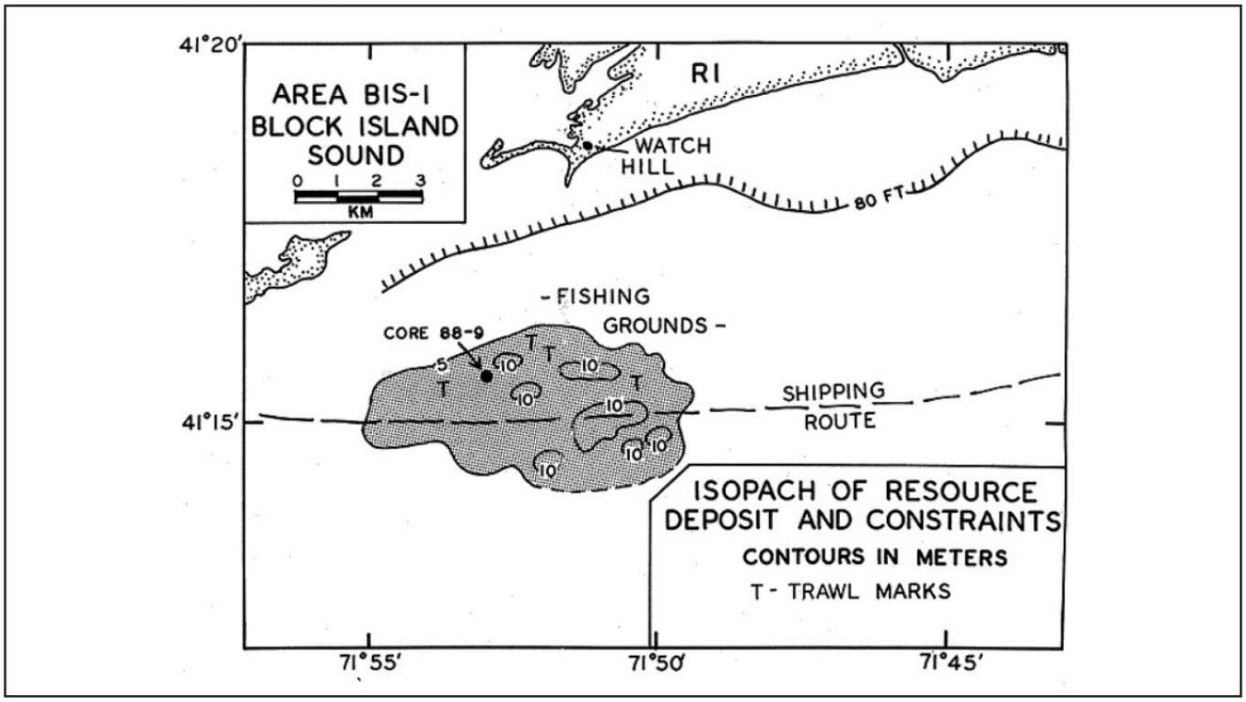

SOURCE: U.S. Geological Survey Open-File Report 02-002, 1988

Figure C-6. Potential Non-energy Resources in Block Island Sound (Area BIS-1)

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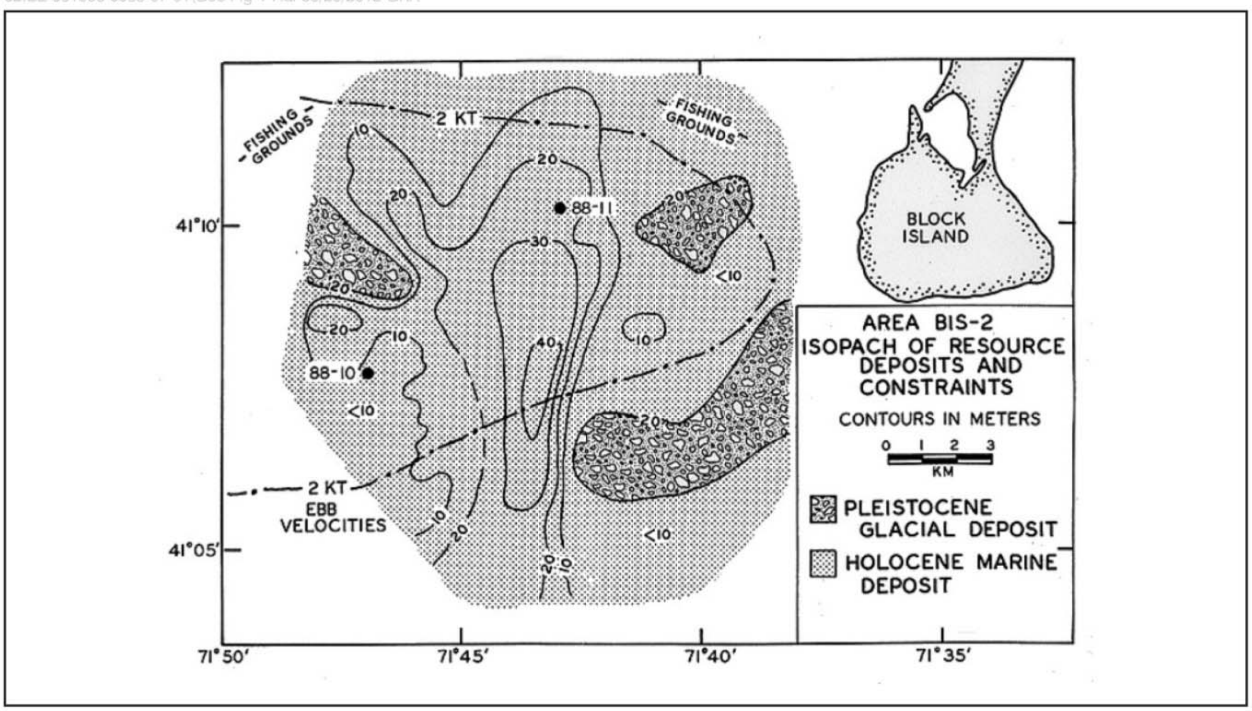

SOURCE: U.S. Geological Survey Open-File Report 02-002, 1988

Figure C-7. Potential Non-energy Resources in Block Island Sound (Area BIS-2)

In Rhode Island Sound the larger areas of potential resources, consisting of reworked moraine and out-wash deposits, occur mostly in areas where there is significant user conflict. However, smaller areas of medium to gravelly sand were also identified (Neff and Lewis 1989). The constraints on these smaller areas are fewer than in the larger areas. Neff and Lewis estimated about over 104 million cubic yards (80 million cubic meters) of glacial drift could be a potential resource in area RIS-1 (Figure C-8). In resource area RIS-2, Neff and Lewis estimated that coarse-grained glacial drift was an average 98 feet (30 meters) thick over 52 square miles (135 square kilometers), yielding over 5.2 billion cubic yards (4 billion cubic meters) of potential resource material (Figure C-9). However, in later studies, the thickness estimate of approximately 98 feet (30 meters) was not confirmed and the volumetric assessment of this potential resource was reduced to just over 523 million cubic yards (400 million cubic meters). Lastly, the resources mapped in Rhode Island Sound coincide with established shipping lanes (Figure C-9). Documented fishing grounds and a cable route are also found along the margins of this area. Of these constraints, fishing activities, which are not limited to the documented regions, pose the greatest conflict with resource exploitation (USGS 2002).

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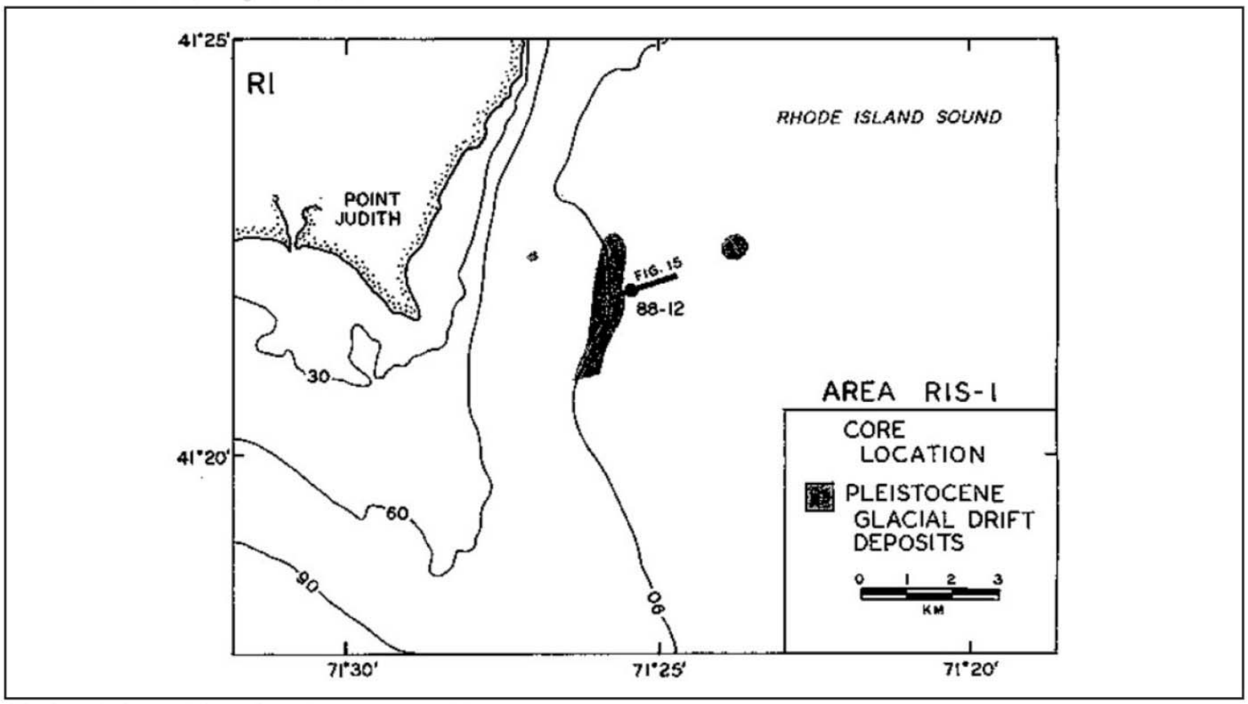

SOURCE: U.S. Geological Survey Open-File Report 02-002, 1988

Figure C-8. Glacial Drift Deposits (Area RIS-1)

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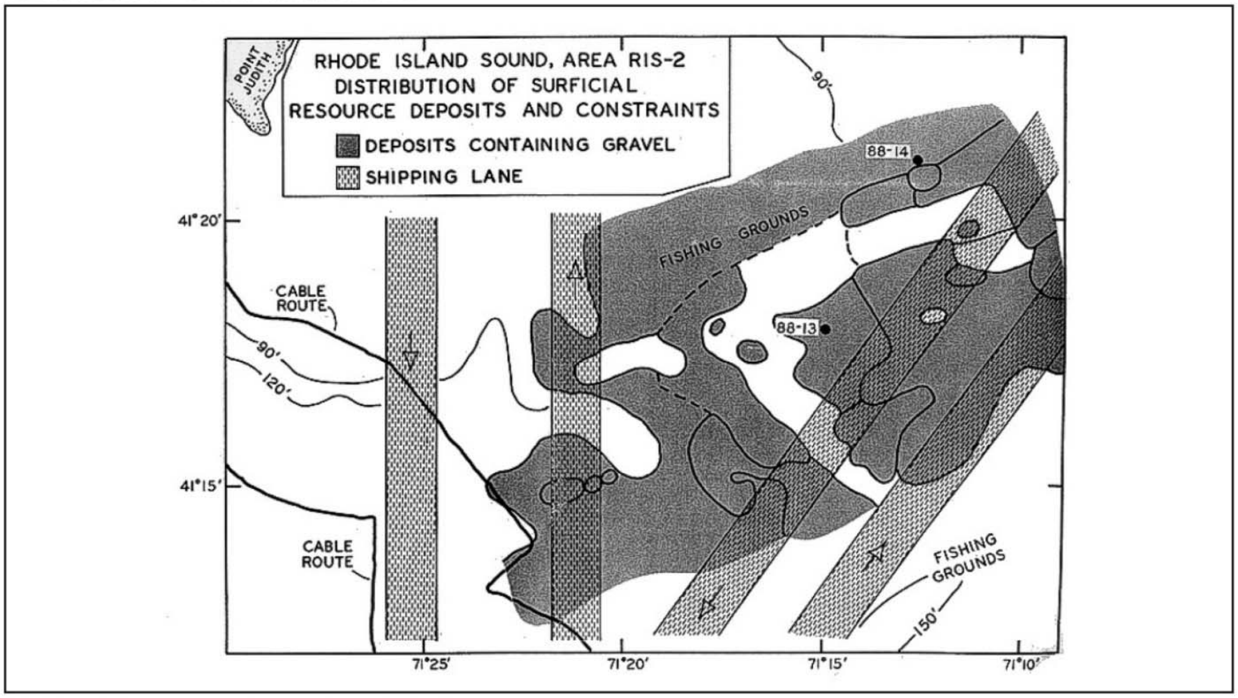

SOURCE: U.S. Geological Survey Open-File Report 02-002, 1988

Figure C-9. Potential Non-energy Resources in Rhode Island Sound (Area RIS-2)

C.1.1.7 Seismicity

Rhode Island is not known for significant earthquakes; however, shock waves from nearby earthquakes have been recorded in Rhode Island as far back as the 1600s. Most of these earthquake epicenters occurred outside the state and the Rhode Island Sound/Block Island Sound area in the neighboring New England states. Massachusetts, on the other hand, has extensive historical accounts of earthquake activity dating back to the early settlers. Nineteen earthquakes, intensity V or greater, have been centered in Massachusetts. A number of other earthquakes were centered off the coast of Massachusetts and affected the eastern portion of the state. A shock in 1755 reached intensity VIII at Boston and was felt across the state. In addition, Massachusetts was affected by some of the more severe Canadian shocks, in addition to the earthquake in 1929 that centered on Grand Banks of Newfoundland.

Figure C-10 illustrates the pattern of earthquake activity in New England and surrounding areas. The figure shows that two earthquakes occurred in the vicinity of Rhode Island Sound, and several occurred within the state of Rhode Island and southern Massachusetts between 1924 and 1974. Although there have been no earthquakes in Rhode Island or in Rhode Island Sound since 1974, southern Massachusetts experienced a similar number of earthquakes as the earlier period (Kafka 2011).

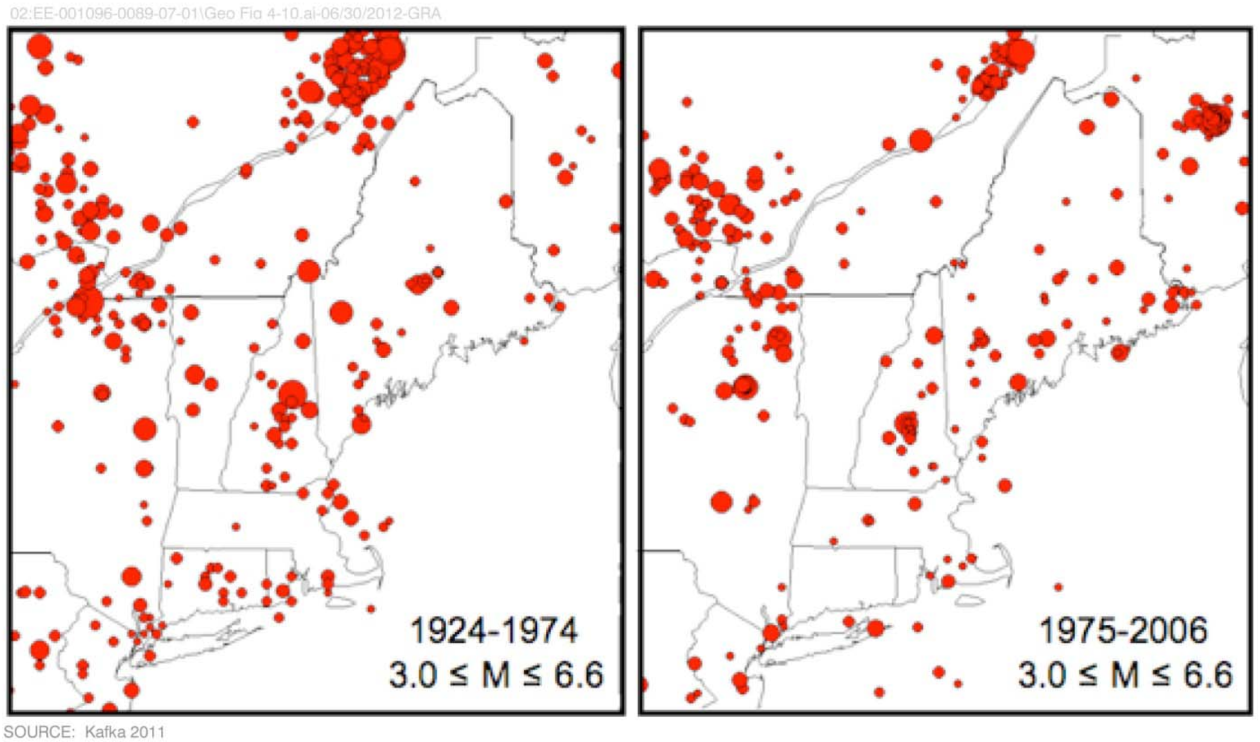

Figure C-10. Earthquakes in New England and Surrounding Areas

Historic data indicate that earthquake epicenters in Rhode Island are very rare but have occurred in Massachusetts on several occasions. However, predicting earthquakes is essentially impossible (Kafka 2011). According to the USGS seismic hazards map of Rhode Island and Massachusetts, the Rhode Island/Block Island Sounds area and waters south of Massachusetts have a very low ground-shaking hazard (Figure C-11]). Ground shaking is expressed as a percentage of the force of gravity (%g). Figure C-11 shows contours of the percentage of the force of gravity that has a 2 percent probability of exceedence in any given 50-year period. Since the project area is in the 6%g to 8%g range, there is a one in ten chance that ground shaking would occur with 6% to 8% of the force of gravity (which is very low) at some point in time within a given 50-year period. It requires more than 100%g to throw objects up in the air; therefore, 2%g equates to an earthquake intensity of about IV (capable of breaking dishes and windows). A 10%g to 20%g earthquake equates to an intensity of about VII (capable of breaking chimneys, etc.) (Kafka 2011). Therefore, based on this information, the likelihood of a damaging earthquake to occur in the project area over the life of the project is very low.

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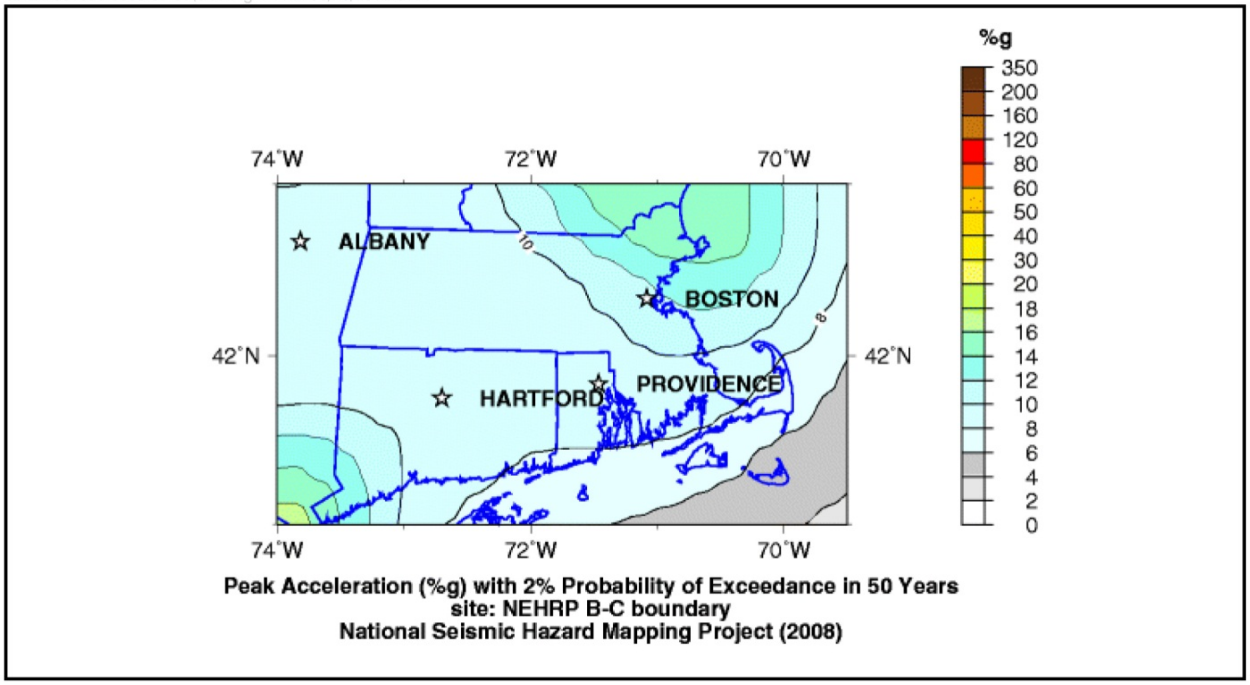

SOURCE: USGS Earthquakes Hazards Program, Online at:
http://earthquake.usgs.gov/earthquakes/states/rhode_island/hazards.php

Figure C-11. Rhode Island and Massachusetts Seismic Hazards Map.

C.1.1.8 Summary of Geological Hazards

Potential geohazards in any given offshore area generally include the following:

- Ground failure caused by unstable soils (liquefaction);
- Karst terrain (unexpected formation of sinkholes);
- Irregular sea floor with hummocky relief (areas where bedrock is exposed or thinly covered and undergoing erosion);
- Gas-charged sediments (unstable soils [organic-rich muds] charged with biogenic gas);
- Boulder areas;
- Area of intense bottom sediment movement (e.g., sand waves);
- Seismicity (earthquakes);
- Volcanism; and
- Human activities (mining, blasting/construction, etc.).

C.1.2 Impact Analysis of Alternative A

C.1.2.1 Impacts of Routine Activities and Events

Routine activities (*see* Section 3.1 of the Environmental Assessment [EA]), which include site characterization surveys and the construction, operation, and decommissioning of meteorological and oceanographic data collection facilities, have the potential to affect geologic features as described below.

Site Characterization Surveys

Site characterization surveys (*see* Section 3.1.2 of the EA) include shallow hazards surveys, geological surveys, biological surveys, geotechnical surveys, and archaeological resource surveys. Shallow hazards surveys and archaeological resource surveys use remote sensing technology, which would not affect the geology present in the Wind Energy Area (WEA). However, geological surveys (sediment coring), biological surveys (benthic grab sampling), and geotechnical surveys (cone penetrometer and sediment coring) may be impeded by the presence of bedrock and boulders on the seafloor, but impacts on geology from these surveys are expected to be short-term and negligible.

Construction and Decommissioning

Construction of meteorological and oceanographic data collection facilities may also be impeded by the presence of bedrock and boulders, and impacts on bottom sediments/seafloor features may result from scouring. If required, a scour-control system could be installed, and it is estimated that it would occupy up to 2 acres (almost 1 hectare) based on the potential seabed scour anticipated at the site. Although movement and anchoring of support vessels when installing foundations could impact areas up to 1,500 radial feet (162 acres, over 65 hectares), these potential impacts are expected to be short-term and no significant impacts on the geology of the site are expected.

As required by BOEM, the lessee would sever bottom-founded structures and their related components at least 15 feet (5 meters) below the mud line. In addition, any scour-control systems would be removed during the decommissioning process. Therefore, other than a short-term disturbance of bottom sediments, decommissioning activities would have a negligible effect on geology.

Operations

Meteorological towers and buoys may be in place for up to five years. While the meteorological tower is in place, data would be collected and processed remotely; data cables to shore would not be necessary. There would be no impact to geology. In addition, impacts from geohazards are not anticipated other than potential scour or impacts from migrating sand waves, which are expected to be negligible.

C.1.2.2 Impacts of Non-Routine Events

Non-routine events (*see* Section 3.2 of the EA) include severe storms such as hurricanes and extratropical cyclones; collisions between the structure or associated vessels with other marine vessels or marine life, and spills from collisions or during generator refueling. None of these activities or events would affect the geology of the WEA.

C.1.3 Conclusions

Impacts or the risks of liquefaction, karst terrain, volcanism, and human activities are not associated with Alternative A due to the minimal physical scale of any structures that would be deployed or constructed. In addition, the likelihood of a damaging earthquake occurring in the WEA area over the life of the project is very low. However, the irregular seafloor, sand waves, boulder areas and, to a lesser extent, gas-charged areas can impact facility siting in a leasehold and data from detailed geohazard surveys would be used to evaluate vulnerability. Therefore impacts to geology are expected to be negligible.

C.2 Physical Oceanography

C.2.1 Description of the Affected Environment

The offshore waters of Rhode Island in the Ocean SAMP study area consist of Rhode Island Sound and Block Island Sound. Rhode Island Sound is located in the eastern section of the Ocean SAMP study area (Figure C-12) and encompasses an area of approximately 591 square miles (1,530 square kilometers). It is bounded to the west by the eastern side of Block Island, to the north by the Rhode Island coast, and to the east by Martha's Vineyard and Nantucket Shoals. Rhode Island Sound is open to the Atlantic Ocean to the south and has an average depth of 100 feet (31 meters) and reaches depths of about 200 feet (60 meters). It exchanges water with Narragansett Bay through the East and West Passages, with the Sakonnet River, Buzzards Bay, Vineyard Sound, Block Island Sound, and the Atlantic Ocean.

Block Island Sound, located in the western section of the Rhode Island Ocean SAMP study area (Figure C-12), encompasses an area of approximately 521 square miles (1,350 square km) and is bounded to the east by the western shore of Block Island, to the north by the Rhode Island coast, and to the west by Long Island, Fishers Island, and Long Island Sound. Block Island Sound is also open to the Atlantic Ocean to its south, has an average depth of 130 feet (40 meters) and reaches depths of approximately 330 feet (100 meters). One of the end moraines forms a shallow shelf-like feature (*see* Figure C-1) between Montauk Point and Block Island at a depth of 50 to 60 feet (15 to 25 meters) and partially isolates Block Island Sound from the OCS. A canyon—Block Channel—extends several tens of kilometers from the deepest point of the moraine, forming a deep connection between Block Island Sound and the Atlantic Ocean. The region immediately south of Rhode Island Sound and Block Island Sound is considered the inner continental shelf. The inner continental shelf area has a strong overall current flow to the west. Winds over this area are highly variable and seasonal (i.e., generally light in summer, strong in winter, and variable in both fall and spring). The waters in the inner shelf area become strongly stratified on an annual cycle, being generally well mixed throughout the winter and strongly stratified in summer due to a combination of heating, freshwater influence, and reduced wind strength. The breakdown of stratification on the inner shelf area results mainly from the west winds. A prominent hydrographic feature or front (the Race) separates fresher, nearshore shelf water from salty continental slope water between the 230-foot (70-meter) and 330-foot (100-meter) isobaths (*see* "Rhode Island Sound Circulation" below for further details).

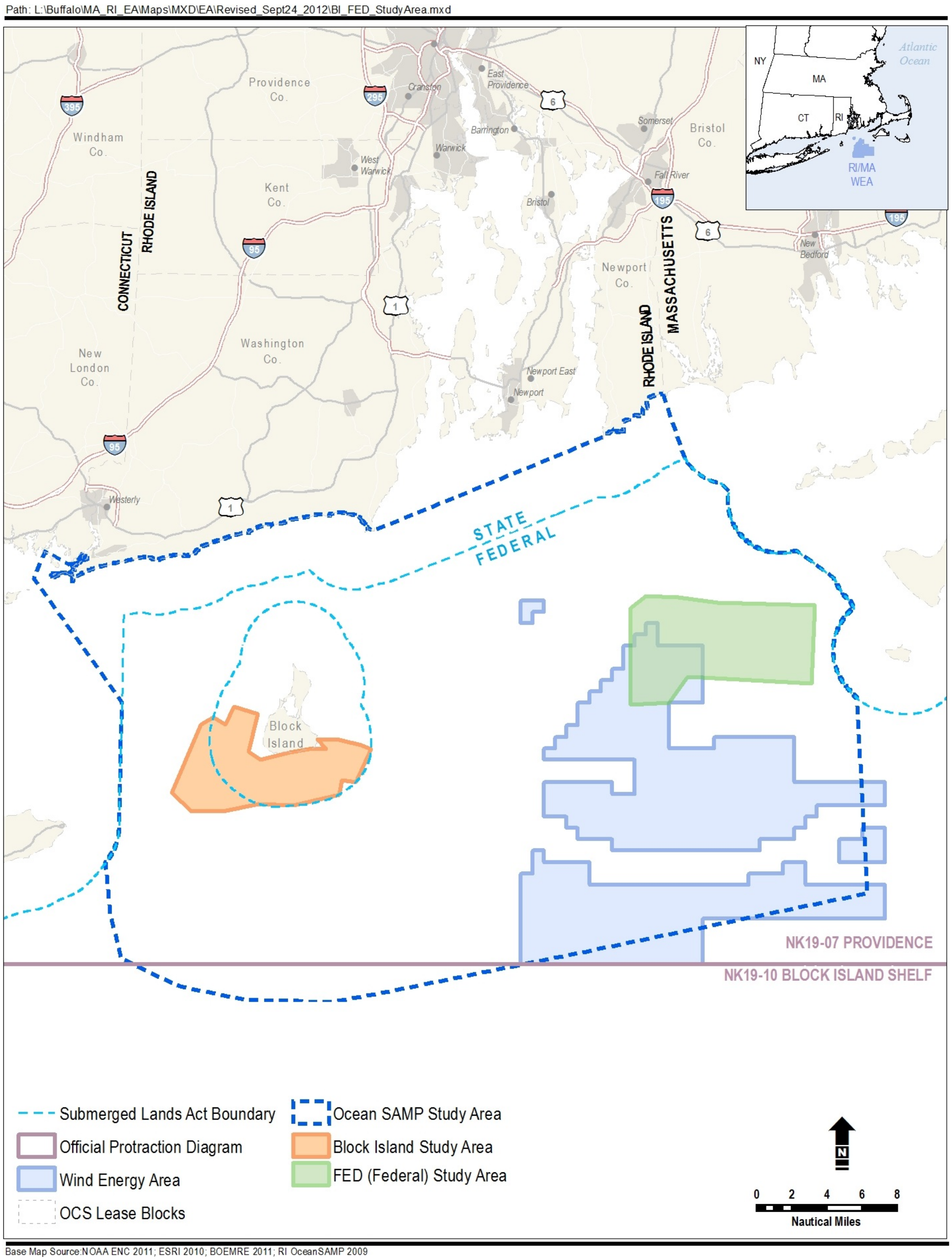

Figure C-12. Block Island, Federal and Ocean SAMP Study Areas.

Currents and circulation are highly influenced by winds, tides, water temperature, and salinity. Freshwater input, for example, mainly from Long Island Sound, can set up and strongly influence water circulation in Block Island Sound, while Rhode Island Sound is more influenced by the circulation patterns of Block Island Sound and by water moving in the inner continental shelf area and from the east across Nantucket Shoals. In general, the Gulf Stream moves warm water northward, with a return flow of cold water moving southward from the Gulf of Maine. This warm water interacts with the water in the inner continental shelf to form a lobe of warm water extending toward the Rhode Island Ocean SAMP study area (Figure C-13). Sometimes this lobe breaks free and is referred to as a "warm core ring" that brings distinctive pockets of tropical water, including the biota entrained in it, onto the OCS, where interaction with the Rhode Island Ocean SAMP study area is possible. There are also distinct current flows that move from north to south, originating in the Gulf of Maine, moving around Cape Cod and then into and influencing the waters in the Ocean SAMP study area. It should be noted, however, that in the Ocean SAMP study area there is a general flow to the southwest outside the Ocean SAMP study area with inflow into the area from the northeast. Because of this, the study area has a higher probability of cold water species from the north entering the area and it contributes to unusual events such as storms from the south or the inflow of warm core rings.

C.2.1.1 Wave Action

Wave analyses performed by Spaulding (2007 *as cited in* Rhode Island CRMC 2010) indicate that approximately 53 percent of the ocean waves in the Ocean SAMP study area come from three predominant directions: 22 percent from the south, 19 percent from the south/southwest, and 12 percent from the south/southeast, with average annual wave heights for each direction at 3.5 feet (1.09 meters) (SSE), 3.75 feet (1.15 meters) (S), and 4.2 feet (1.29 meters) (SSW). Asher *et al.* (2009 *as cited in* Rhode Island CRMC 2010) believed that the greatest frequency of waves, regardless of size, come from a southerly direction, with a mean wave height of 3.9 feet (1.2 meters) and an extreme height of 27.5 feet (8.4 meters). Wave height extremes over a ten-year period were estimated at 20 to 23 feet (6.5 to 7.0 meters); over a 25-year period at 24.6 to 25.4 feet (7 to 7.5 meters); over a 50-year period at 26.9 to 27.4 feet (8.2 to 8.35 meters); and over a 100-year period at 28.9 to 29.5 feet (8.8 to 9.0 meters) (Spaulding 2007 *as cited in* Rhode Island CRMC 2010). The wave analysis also noted that the probability of a 29.5-foot (9.0-meter) wave was not applicable to the entire Ocean SAMP study area. Geography influences wave height, with waves from the south and the southeast having the greatest potential for larger size, with 32.8-foot (10+ meters) extreme waves possible. The Ocean SAMP also reported studies from Ullman and Codiga (2010 *as cited in* Rhode Island CRMC 2010) depicting average wave heights ranging from 1.6 to 8.2 feet (0.5 to 2.5 meters), with waves of less than 1.6 feet (0.5 meters) occurring for less than a day during winter and up to several days during summer. The moraine stretching between Block Island and Montauk dampens wave action, resulting in extreme wave heights that would be 6.6 to 9.8 feet (2 to 3 meters) less to the west of Block Island (rather than to the south or southeast) (Asher *et al.* 2009 *as cited in* Rhode Island CRMC 2010).Normal wave action in the Ocean SAMP study area results in thorough mixing of surface waters, and little impact on bottom waters is expected. However, high-intensity winds have the potential to create waves large enough to mobilize sediment at the surface of the seafloor throughout much of the Ocean SAMP study area, causing a reworking and re-sorting of sediments.

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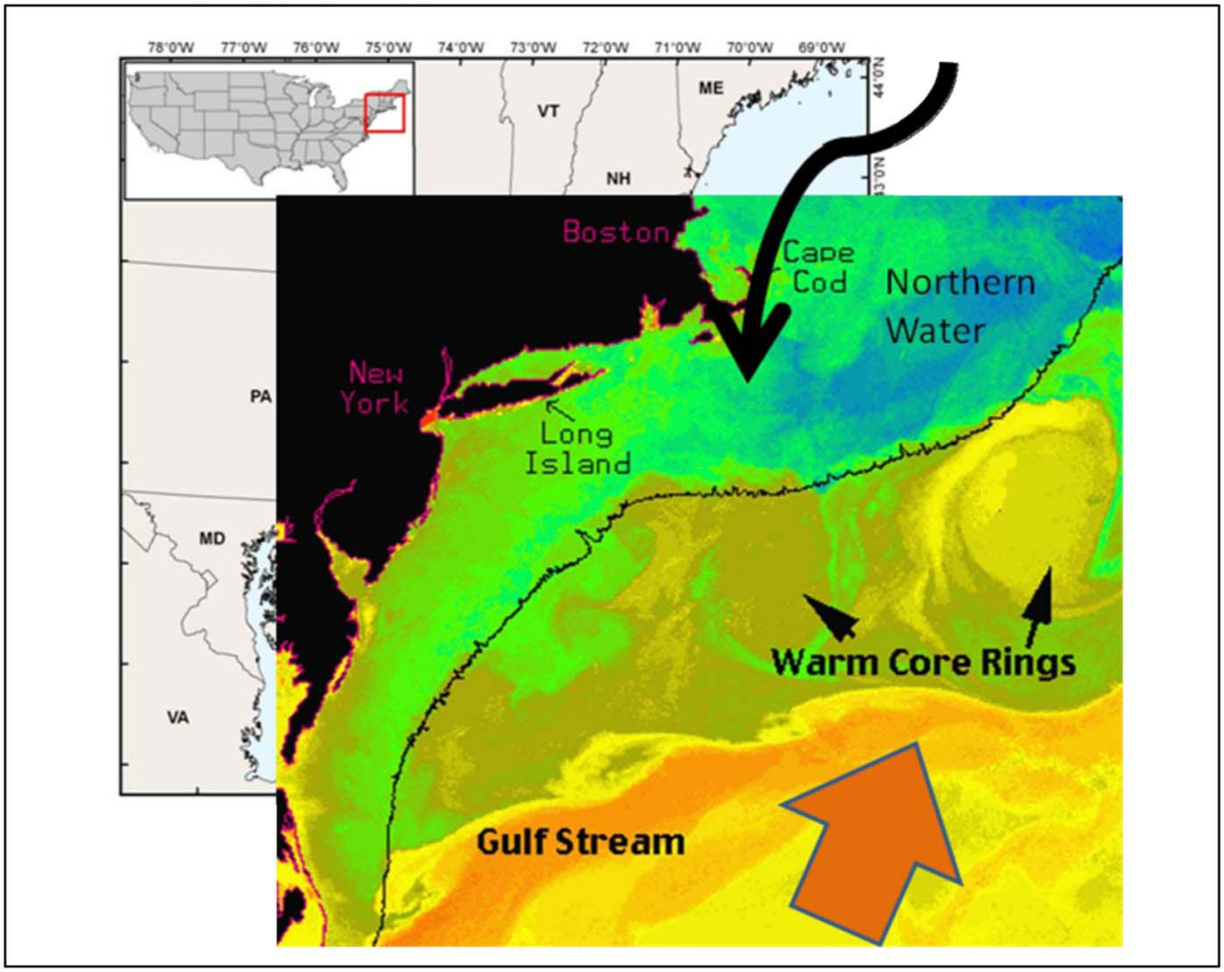

SOURCE: Rhode Island CRMC 2010

Figure C-13. Schematic Representation of Water Currents.

C.2.1.2 Tidal Processes

Tides and tidal processes are a major influence on circulation in the region. The Ocean SAMP study area tides are semi-diurnal tide (twice daily) with a mean tidal range of about 3.2 feet (1.0 meter [Shonting and Cook 1970 *as cited in* Rhode Island CRMC 2010]). The intensity of tidal interchange is much stronger in Block Island Sound than in Rhode Island Sound due to stronger tidal velocities. These tides also interact with connected bodies of water such as Nantucket Shoals, Buzzards Bay, Narragansett Bay, and Long Island Sound.

Block Island Sound is highly influenced by Long Island Sound, mainly because of the large volume of freshwater that Long Island Sound receives and the narrowness of the connection to Block Island Sound (i.e., The Race). Tidal current velocities in The Race are strong (>5 knots [*see* Figure C-14]), and water moving out of Long Island Sound moves a considerable distance into Block Island Sound and even into Rhode Island Sound (Rhode Island CRMC 2010).

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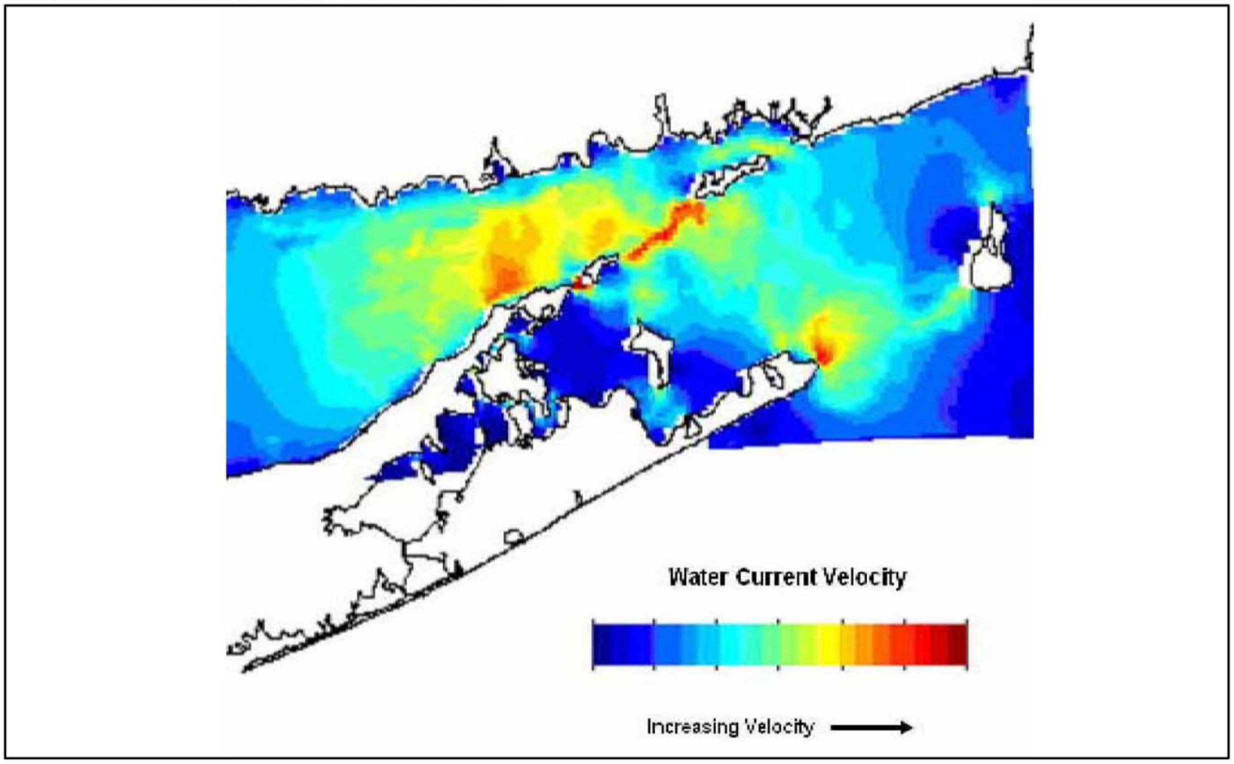

SOURCE: Rhode Island CRMC 2010

Figure C-14. Water Current Velocities.

The subsea topography of Block Island Sound is a major force on tidal flows due to the presence of slopes and troughs creating drag, turbulence, upwelling, and possibly downwelling currents, all of which influence sediment transport and sorting (Riley 1952 *as cited din* Rhode Island CRMC 2010).

In Rhode Island Sound, tidal currents flow predominantly northwest to southeast, but are variable due to the influence of wind stress and turbulent flow around shoals and islands (Shonting and Cook 1970 *as cited in* Rhode Island CRMC 2010). The major tidal flow in the Ocean SAMP study area is via bottom water moving through Block Island Sound from offshore and into Long Island Sound via The Race (Edwards et al. 2004 *as cited in* Rhode Island CRMC 2010) and out again on the opposing tide.

Tidal flow from Long Island Sound affects Rhode Island Sound much less than Block Island Sound. Receding tides from Long Island Sound run east to the north of Block Island and impact the western edge of Rhode Island Sound. The majority of the receding tidal flow moves out and around Montauk Point, creating high current velocities, and then to the southwest parallel to the coast of Long Island and into the Mid-Atlantic Bight region (Edwards *et al.* 2004 *as cited in* Rhode Island CRMC 2010). Since the waters in Long Island Sound are influenced by freshwater inflow, the flow from Long Island Sound tends to be lower salinity water than that originating in the sounds (Rhode Islando CRMC 2010).

C.2.1.3 Temperature

Water temperature is a major factor in organism distribution, defines the density of water, which in turn influences circulation patterns, and plays an important role in water column stratification. In the Ocean SAMP area, temperature is highly seasonal. During summer months, the warmest waters (51.8 degrees Fahrenheit (°F) to 69.8°F; 11 degrees Celsius (°C) to 21°C) at both the surface and bottom of the Ocean SAMP area tend to be in the central portion of Rhode Island Sound. Block Island Sound and the eastern portions of Rhode Island Sound are typically 34°F to 36°F (1°C to 2°C) cooler because of the stronger vertical mixing in Block Island Sound as a result of its interaction with Long Island Sound. During winter, the warmest waters are offshore of Cox Ledge, with lowest temperatures found along the periphery of the sounds abutting the landmass of the coast. A distinct thermal front is noted south of Block Island at the periphery of the cooler waters, and this front is coincident with a salinity front derived from the lower salinity waters of Long Island Sound (Rhode Island CRMC 2010).

Temperature data were collected by the Northeast Fisheries Center as part of its Marine Resources Monitoring, Assessment, and Prediction Program conducted in the Northeast Continental Shelf ecosystem. Data were collected at a suite of stations located within Ocean SAMP boundaries. Figure C-15 shows the seasonality of water temperature at both surface and bottom. There is a clear difference in temperature of 6°C to 7°C between surface and bottom from early spring through late fall, confirming that this is the most probable time for the water column to stratify (Rhode Island CRMC 2010).

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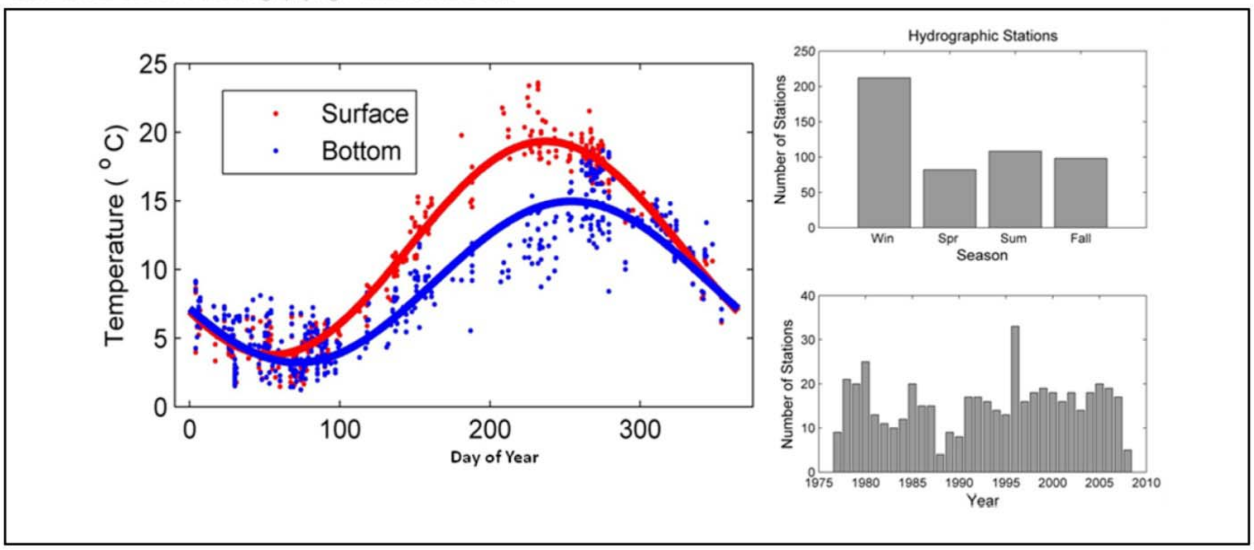

SOURCE: Rhode Island CRMC 2010

Figure C-15. Water Temperature Data.

Figure C-16 shows water temperatures in the Ocean SAMP study area on a seasonal basis and at various depths. During the winter, bottom waters are considerably warmer than at surface or at mid-depth, and during the summer, the opposite is true. Strong storms that mix the water column could influence the occurrence of thermal refuges, although this has not been documented (Rhode Island CRMC 2010).

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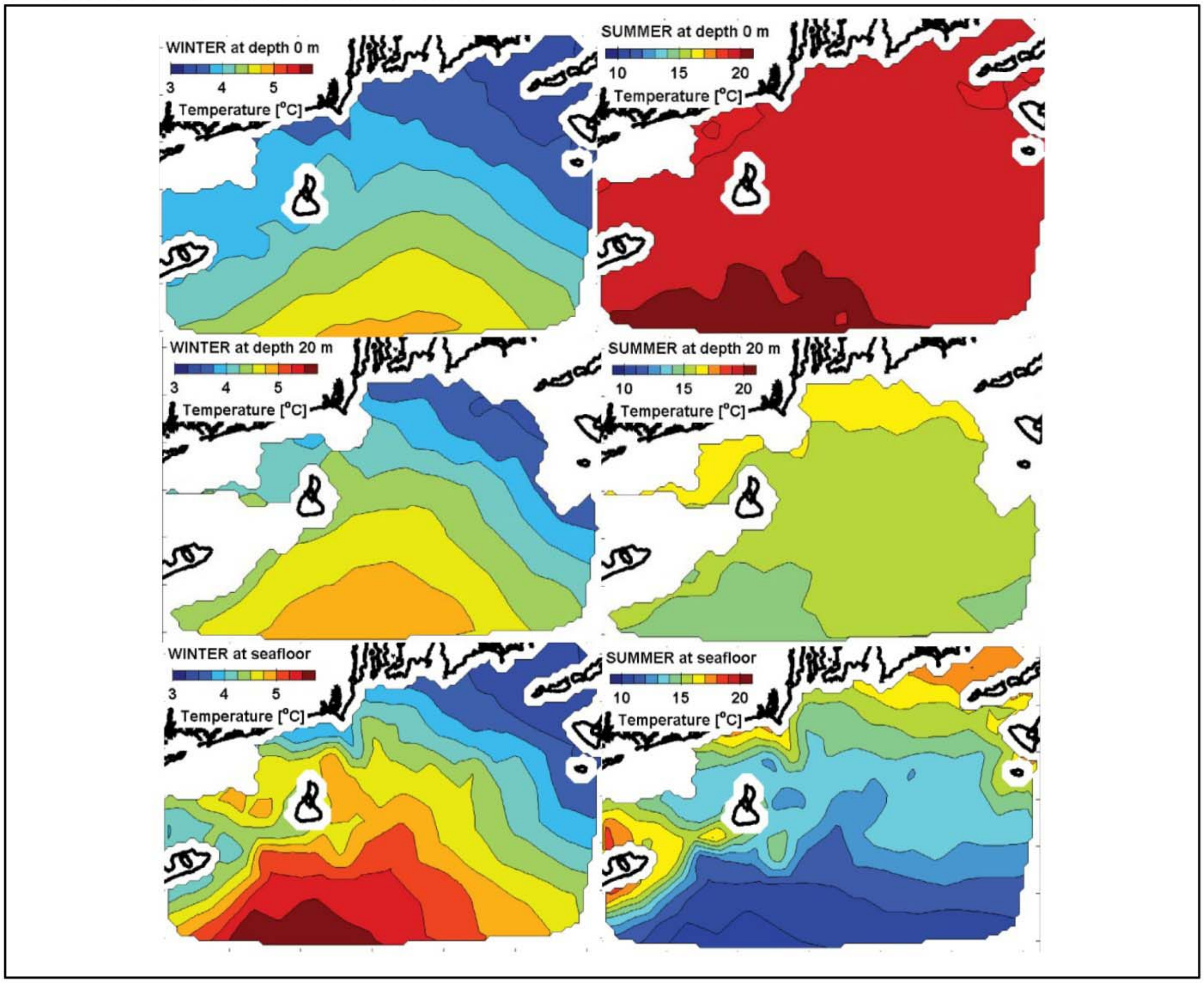

SOURCE: Rhode Island CRMC 2010

Figure C-16. Seasonal Water Temperature Based on Data Collected Between 1980 and 2007.

Figure C-17 shows that the seasonal peak in water temperature consistently occurs in later summer/early fall (August/September), with the seasonal low occurring in late winter/early spring (February/March). During the years where surface and bottom temperatures are nearly identical (e.g., 1996), the water column is most likely well-mixed. Conversely, in years where surface and bottom temperatures are considerably divergent (e.g., 1998), the water column appears not to be well-mixed and water column stratification is likely (Rhode Island CRMC 2010).

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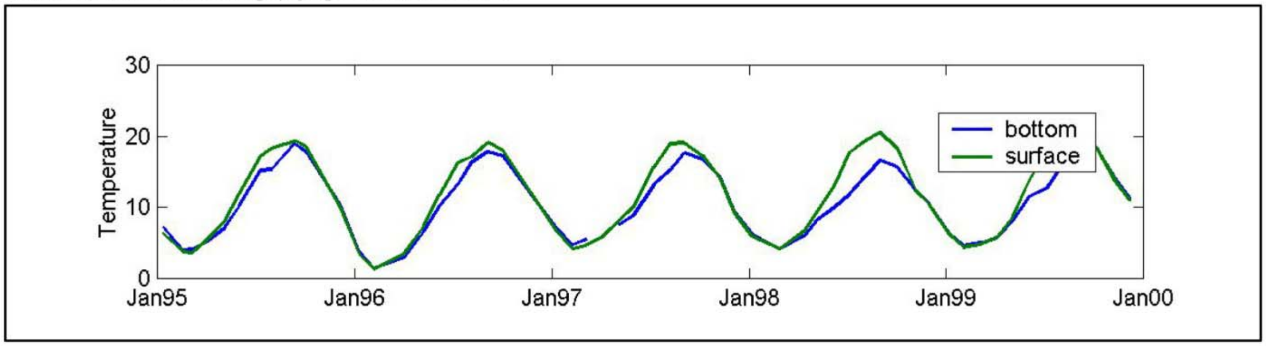


SOURCE: Rhode Island CRMC 2010

Figure C-17. Average Annual Surface and Bottom Temperatures in Block Island Sound (NW of BI, ¾ of the way to The Race).

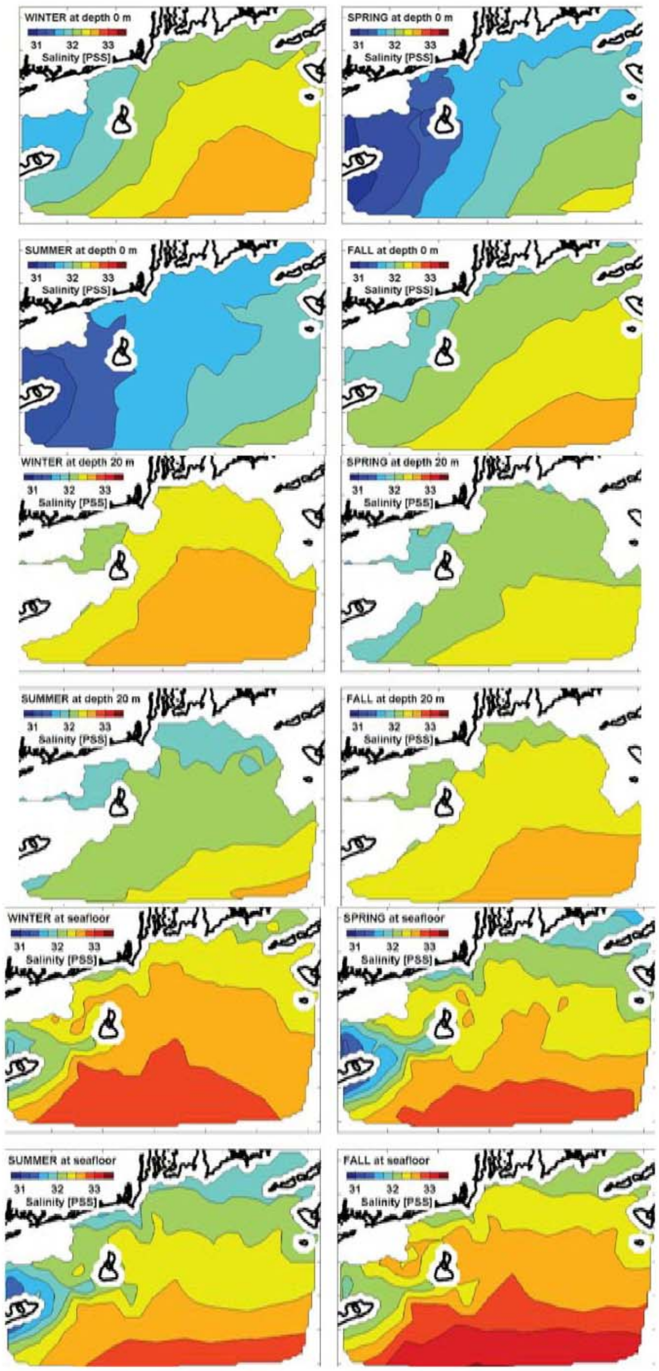
C.2.1.4 Salinity

The salinity of the Ocean SAMP study area waters is affected by seasonal input of freshwater. These changes in salinity promote exchange with offshore bottom waters by fostering a return flow that offsets surface water outflow to offshore areas. It also promotes water column stratification, and water temperatures increase. All of these factors shape the ecological composition of the Ocean SAMP area.

The input of freshwater to Long Island Sound is primarily via the Connecticut and Thames Rivers. No large rivers or streams flow directly into Block Island Sound. Narragansett Bay is not considered to be a major source of fresh water in the Rhode Island Sound ecosystem, but further study is needed to verify or refute these suggested interactions (Rhode Island CRMC 2010).

Salinity is also variable by season (Figure C-18). During winter, salinity is higher at the bottom than at the surface, with higher salinity water occurring with the distance moved offshore. Salinity decreases during spring, particularly at surface and mid-depth due to spring rains and snowmelt runoff into river systems. Summer salinities are very similar to those seen during spring throughout the water column. Fall sees a shift towards increased salinity, particularly at surface and mid-depth, as would be expected during dry late summer and early fall months. Spring and summer see the strongest salinity differences at horizontal and vertical scales, which correspond to the occurrence of the seasonal “front” to the south of Block Island (Rhode Island CRMC 2010).

02:EE-001096-0089-07-01\Oceanography Fig 4-18.ai-06/22/2012-GRA



SOURCE: Rhode Island CRMC 2010

Figure C-18. Seasonal Water Salinities at Various Depths in the Study Area Based on Data Collected Between 1980 and 2007.

Another factor that may influence salinity is the Atlantic multidecadal oscillation (AMO), which is a 65- to 80-year oscillation in sea surface temperatures in the North Atlantic. There has been a distinct warming trend since 1990, and Enfield *et al.* (2001 *as cited in* Rhode Island CRMC 2010) suggested that the AMO is entering a warm phase during which rainfall will be less than normal. The amount of influence this will have on freshwater input to Long Island Sound is not known. Further research is needed to better describe the role of freshwater input and seasonal salinity patterns on the ecology of the Ocean SAMP study area and possible impacts on the ecology from changing precipitation patterns.

C.2.1.5 Stratification

As discussed above, winds, tides, water temperatures, and bottom features all affect circulation, and all promote the transport and mixing of water and their constituents. However, water column stratification (because of differing water density regimes) plays an opposing role to transport by setting up the physical conditions that can limit or preclude vertical mixing. Therefore, a stratified water column could prevent vertical mixing and could entrain hypoxic or anoxic waters in stratified layers that can be detrimental to marine life. Vertical stratification in Rhode Island Sound and Block Island Sound appears to be highly seasonal. As previously stated, it has been suggested that Block Island Sound, because of to its more vigorous circulation and mixing regimes, is less prone to stratification than Rhode Island Sound. However, observations suggest that strong stratification can occur in either sound (Codiga and Ullman 2010 *as cited in* Rhode Island CRMC 2010). Strong winds during the fall tend to break down stratification, but there are no reports of water column anoxia or hypoxia in Ocean SAMP waters. Further work is needed on this topic. Beardsley *et al.* (1985 *as cited in* Rhode Island CRMC 2010) also reported that the outer shelf and continental slope waters (to depths of 200 meters [656 feet]) are stratified on a seasonal basis, i.e., strong stratification during summer months and breakdown of stratification in the fall and winter months.

Freshwater input from Long Island Sound results in stratification just south of Block Island. The area of stratified water expands northward during times of high river discharge but is seasonal and breaks down during summer months and/or times of reduced precipitation/river flow. Figure C-19 shows seasonal averages for surface and bottom salinity in northwestern Block Island Sound. Surface and bottom water salinity that are near equal suggest intense mixing events, possibly from storm events. Wide differences between surface and bottom water salinity suggest large influxes of freshwater from Long Island Sound (Figure C-20). Codiga and Ullman (2010 *as cited in* Rhode Island CRMC 2010) found winter stratification to be stronger in Block Island Sound than in Rhode Island Sound, largely due to the freshwater influence of Long Island Sound outflow. Enhanced stratification in eastern Block Island Sound was also noted during spring months, again because of the influence of Long Island Sound outflow. In general terms, stratification is consistently the strongest in the western Ocean SAMP study area, particularly south of Block Island (Codiga and Ullman 2010 *as cited in* Rhode Island CRMC 2010).

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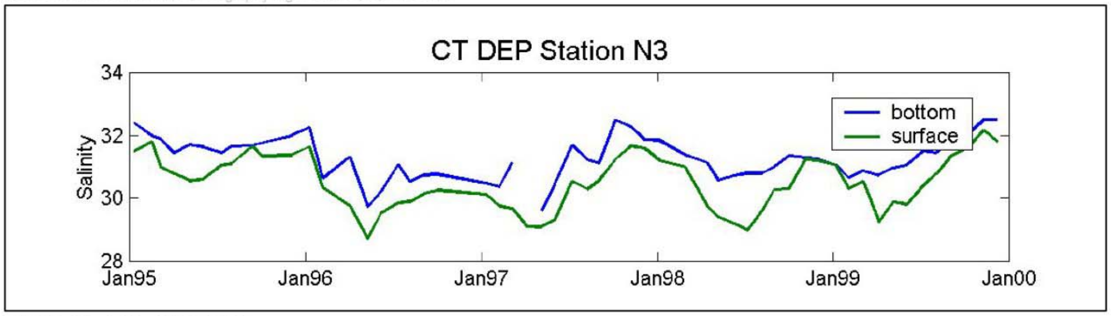
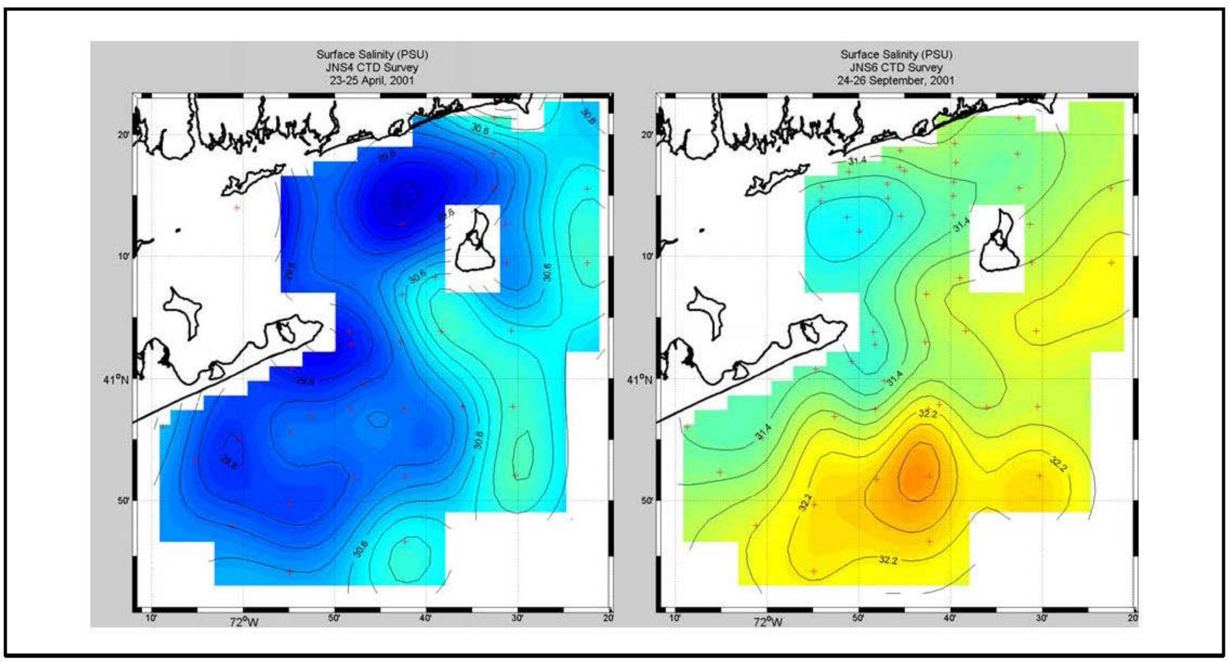


SOURCE: Rhode Island CRMC 2010

Figure C-19. Average Annual Surface and Bottom Salinity in Block Islando Sound (NW of BI, ¾ of the way to The Race.



SOURCE: Rhode Island CRMC 2010

Figure C-20. Surface Water Salinity During Times of High Freshwater Discharge (left panel) and Low Discharge (right panel)

C.2.1.6 Circulation

As previously discussed, circulation patterns in Rhode Island Sound and Block Island Sound are highly influenced by tides, waves, and temperature and salinity differences (which result in density differences). Buoyancy-driven circulation (circulation affected by water density) varies with the season. Tidal influences can generate turbulent flow and mixing of the water column on a daily basis, while wind-driven (storm events) currents play a significant role daily or over the course of several days (Rhode Island CRMC 2010).

Circulation patterns vary considerably between Rhode Island Sound and Block Island Sound because of the high tidal velocities and mixing between Block Island Sound and Long Island Sound. Block Island Sound has a more intensive circulation pattern than Rhode Island Sound (Codiga and Ullman 2010 *as cited in* Rhode Island CRMC 2010). Figure C-21 is a graphic of the results of two separate circulation studies, one in Block Island Sound and the other in Rhode Island Sound. As noted above, current velocity in Block Island Sound is greater, especially in the west where the influence of The Race is strong, while the majority of the area of Rhode Island Sound exhibits mild current speeds, except to the east where it interacts with Vineyard Sound and Nantucket Shoals (Rhode Island CRMC 2010).

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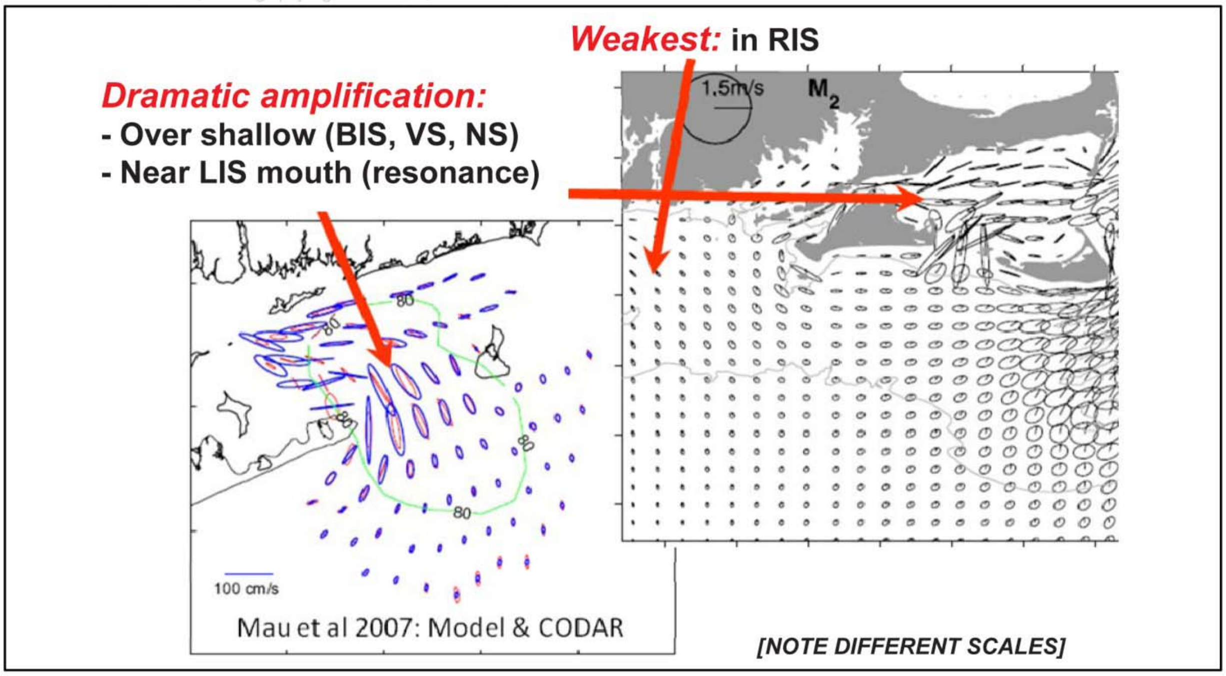

SOURCE: Rhode Island CRMC 2010

Figure C-21. Differences in Tidal Circulation Velocities Between Rhode Island Sound and Block Island Sound

Strong surface flows are observed moving water out of both sounds, generally in a southwestward direction parallel to the south shore of Long Island. Surface water transport out of both sounds and south following the coast of Long Island is a major pathway for water in the Ocean SAMP study area to move into the Mid-Atlantic Bight ecosystem (Rhode Island CRMC 2010).

Figure C-22 shows overall patterns of circulation; Figure C-23 is a summary schematic diagram of surface and bottom flows on a seasonal basis. Fall and winter show dominant offshore flow out of Rhode Island Sound, with a reversal during spring and summer months. Block Island Sound shows continuous interchange with all adjacent waterbodies, although the interchange is most vigorous in spring and summer when Long Island Sound influence is the greatest. Interaction between Block Island Sound and Rhode Island Sound is year-round, but most intense in spring and summer when freshwater input from Long Island Sound intensifies overall circulation in the Ocean SAMP area (Rhode Island CRMC 2010).

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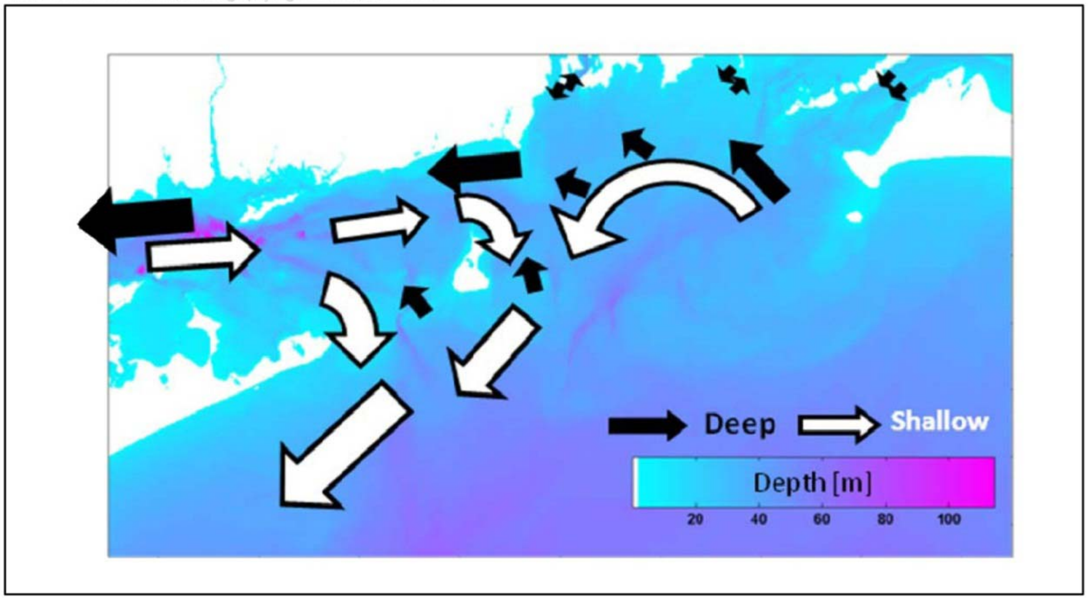

SOURCE: Rhode Island CRMC 2010

Figure C-22. Schematic of Hypothesized Water Flow at Surface and at Depth.

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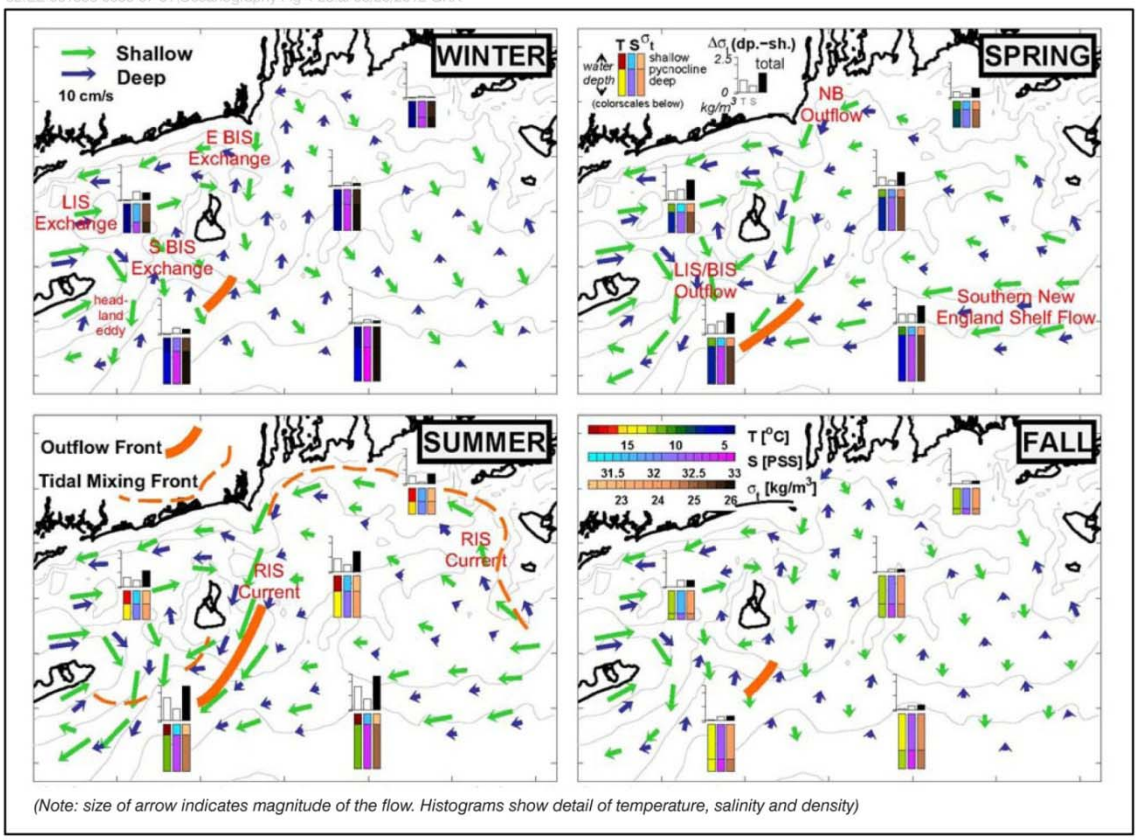


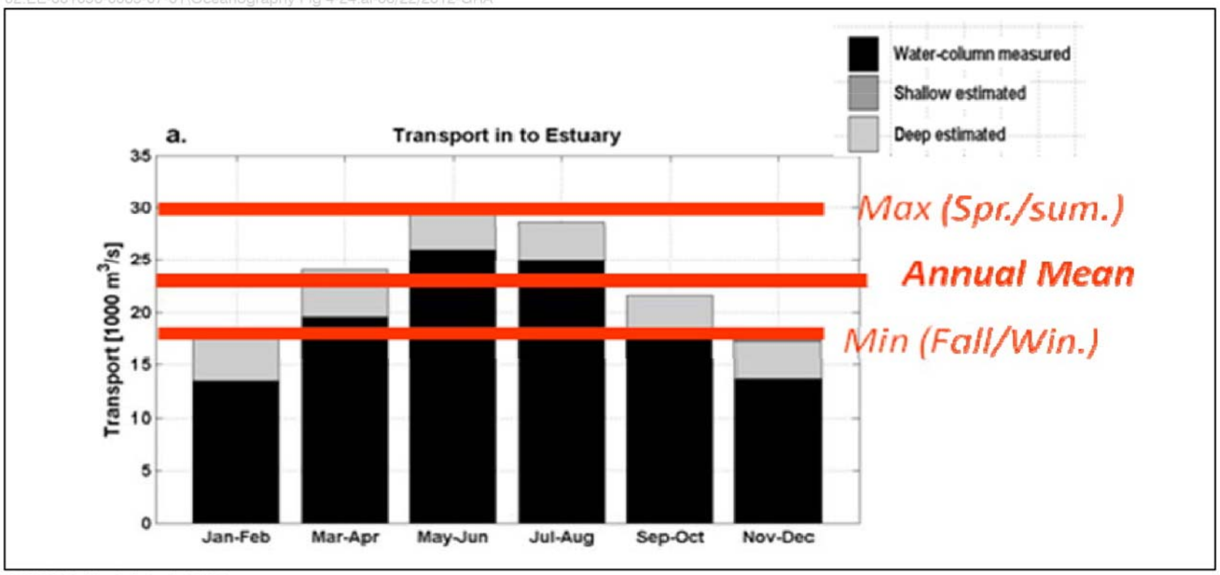
SOURCE: Rhode Island CRMC 2010

Figure C-23. Schematic Summary of Currents and Hydrography.

Block Island Sound Circulation

As stated above, circulation in Block Island Sound is highly influenced by its interaction with Long Island Sound (mainly from the high-velocity tidal current flow through The Race). The Race is an important feature because it allows the exchange of warmer, nutrient-rich, low-salinity water from Long Island Sound with colder, saltier water from the OCS. Codiga and Aurin (2007 *as cited in* Rhode Island CRMC 2010) suggest that the approximate mean annual volume transport between Long Island Sound and Block Island Sound through The Race is 848 cubic feet per second (24,000 cubic meters per second [m^3 sec-1]) (Figure C-24). Because circulation is influenced by storms, water temperature, and density, among other factors, it is logical to assume it is also seasonal in nature, responding to increased freshwater inflow during spring and early summer months. Because of the intense interaction with Long Island Sound, the western portion of Block Island Sound can be considered well-mixed as far out as 2.7 to 5.4 NM (5 to 10 kilometers) into the offshore Ocean SAMP area region and to a depth between 66 to 131 feet (20 and 40 meters) (Edwards *et al.* 2004 *as cited in* Rhode Island CRMC 2010).

02:EE-001096-0089-07-01\Oceanography Fig 4-24.ai-06/22/2012-GRA



SOURCE: Rhode Island CRMC 2010

Figure C-24. Seasonal Volume Transport from Block Island Sound into Long Island Sound.

Upon leaving The Race, shallow flow tends southwestward towards the opening to Block Island Sound between Montauk Point and Block Island, with a peak flow of 10 to 25 centimeters per second (cm sec^{-1}) (Figures C-21 and C-22; Ullman and Codiga 2004 *as cited in* Rhode Island CRMC 2010). This flow is deflected westward along the south shore of Long Island by the Coriolis force, where it moves southward to mingle with southern waters of the Mid-Atlantic Bight ecosystem. During the spring snow melt this flow is significant and is referred to as a “jet” that can be detected 2.7 NM (5 km) south of Montauk Point (Ullman and Codiga 2004 *as cited in* Rhode Island CRMC 2010). A sharp gradient (front) is observed south of Block Island, where lower salinity estuarine waters meet saltier continental shelf waters Edwards *et al.* 2004 and Ullman and Cornillon 2001 *as cited in* Rhode Island CRMC 2010). The front is seasonal and is readily noted by a temperature discontinuity. Figure C-24 shows the seasonality of the front—offshore in winter then moving north and intensifying in spring with a strong presence off Block Island during the summer months. During summer, the front is strongly set and is often observed to extend from the region northeast of Block Island southwestward, 5.4 to 8.0 NM (15 to 20 km) southeast of Montauk Point (Figure C-25) (Edwards *et al.* 2004, Kirincich and Hebert 2005, and Codiga 2005 *as cited in* Rhode Island CRMC 2010).

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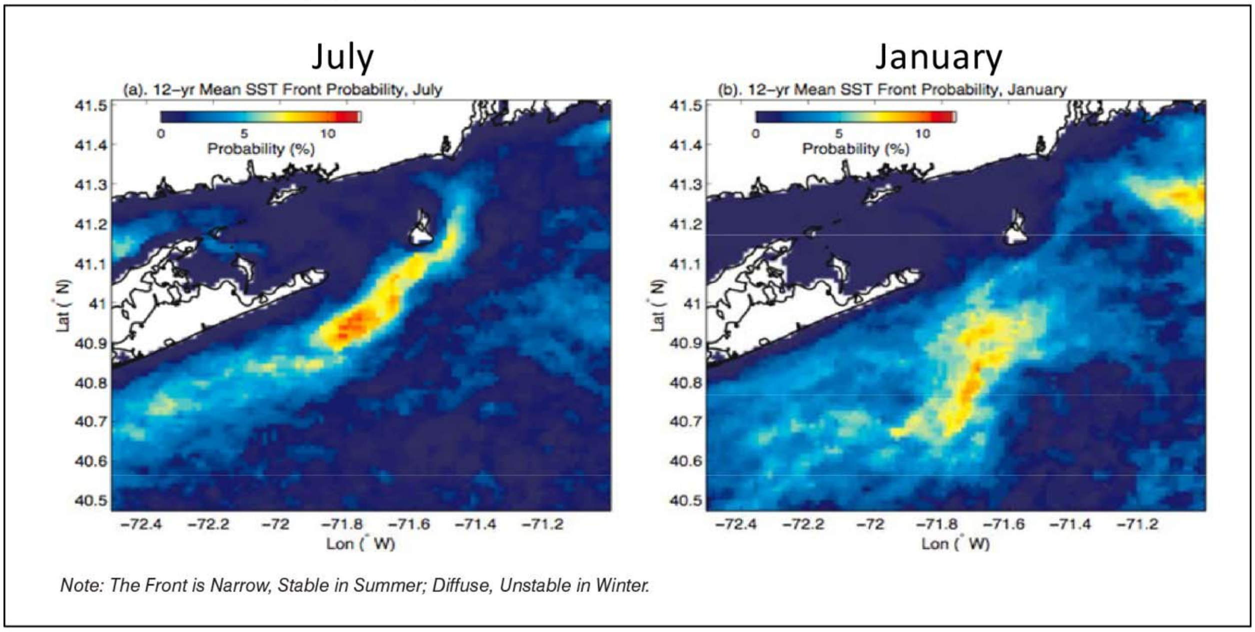


SOURCE: Rhode Island CRMC 2010

Figure C-25. Probability of Sea Surface Temperatures Occurring Along the "Front." Averaged 1985-1996.

Rhode Island Sound Circulation

Circulation in Rhode Island Sound is influenced by interaction with Narragansett Bay through the East and West Passages, Buzzards Bay and Vineyard Sound, Nantucket Shoals, Block Island Sound, and the offshore Ocean SAMP area. The East Passage, which has an average depth of 59 feet (18 meters) and a maximum depth of 131 feet (40 meters), is the deeper of the two connections to Narragansett Bay and experiences current flows of 20,000 m^3 sec^{-1} on the flood tide and 30,000 m^3 sec^{-1} on the ebb (Kincaid *et al.* 2003 *as cited in* Rhode Island CRMC 2010). The West Passage sees current speeds about 60 percent less than those in the East Passage, on either tide (Rhode Island CRMC 2010).

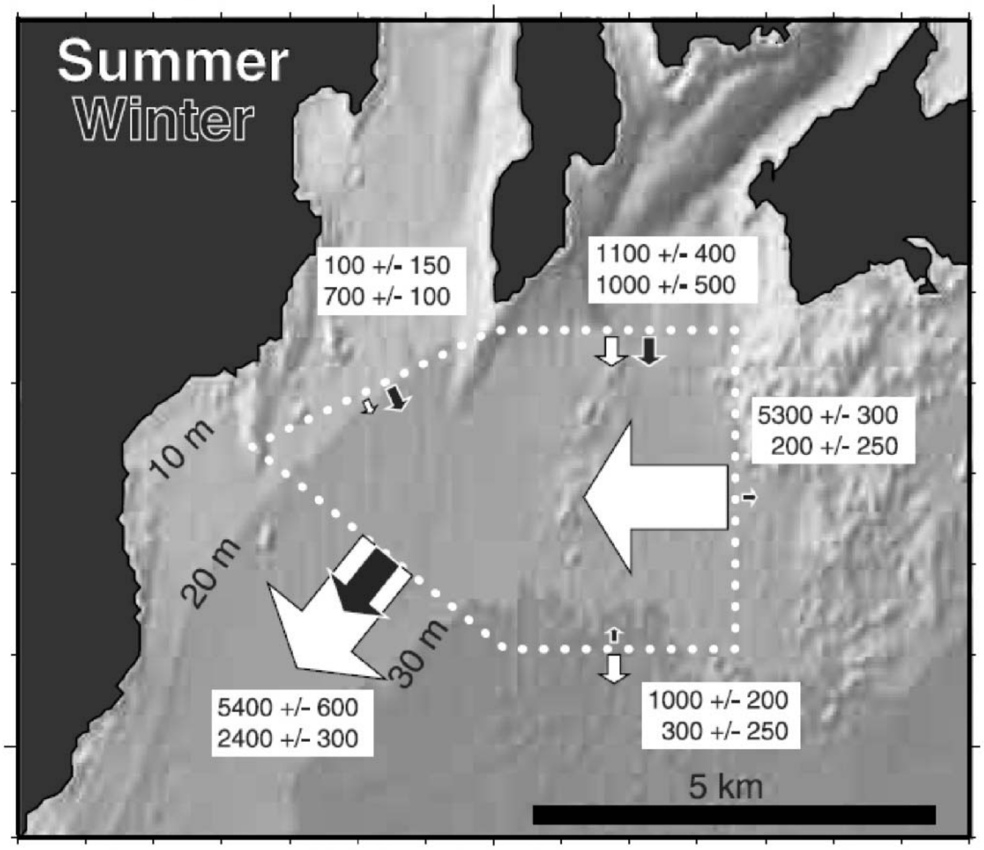
Bottom currents in Rhode Island Sound were measured between 8 to 12 cm sec^{-1} and up to 20 cm sec^{-1}, with averages around 5 cm sec^{-1} (Shonting 1969 *as cited in* Rhode Island CRMC 2010). These currents showed little overall variability. Surface currents were found to flow at rates of 15 to 35 cm sec^{-1}, with an average speed of 22 cm sec^{-1} and with great variability. Although some anti-cyclonic flow was initially reported, it was thought to be not representative of seasonal conditions. However, cyclonic flow in Rhode Island Sound was reported in two other studies and determined to be seasonal in nature (Kincaid *et al.* 2003 and Hyde 2009 *as cited in* Rhode Island CRMC 2010). Such a circulation pattern could have significant influence on the ecology of that area of the Rhode Island Sound, although further study to verify and describe this phenomenon in greater detail would be needed. Bottom currents at a station located on Cox Ledge in the Rhode Island Sound at the 177-feet (54-meter) water depth were found to generally be to the northeast or to the southwest and tended to flow according to bottom topography (First (1972 *as cited in* Rhode Island CRMC 2010).

During the spring, a non-tidal surface drift was noted to the east and the northwest in Rhode Island Sound, with a northwesterly tending bottom non-tidal drift (Cook 1966 *as cited in* Rhode Island CRMC 2010). Strong westerly flow was also found between Block Island and Point Judith (*see* Figure C-22). During summer, a north-tending non-tidal drift at the surface and a northwest bottom drift was noted. During autumn there was southerly drift at surface but to the north on the bottom. Annual average drift rates at the surface were observed to be 2 to16 cm sec^{-1}, while on the bottom they tended to be between 0.1 and 3 km day^{-1} (0.1 to 3.0 cm sec^{-1}) (Cook 1966 *as cited in* Rhode Island CRMC 2010).

Kincaid *et al.* (2003 *as cited in* Rhode Island CRMC 2010) hypothesized that upwelling occurred in the Rhode Island Sound in the area of Brenton Reef and that this water was then advected (movement in a horizontal direction) into the East Passage of Narragansett Bay. Such an exchange could be an important source of nutrients to lower Narragansett Bay but needs to be further quantified to determine if and how it influences the ecology of Narragansett Bay (Rhode Island CRMC 2010).

Kincaid *et al.* (2003 *as cited in* Rhode Island CRMC 2010) also observed a distinct, significant flow during summer in the eastern portion of Rhode Island Sound that moved to the west, and then southwest, following the coast of Rhode Island (Figure C-26). Riley (1952 *as cited in* Rhode Island CRMC 2010) noted a similar westward flow into Block Island Sound between Point Judith and Block Island. During winter months, this flow continued but at a much diminished rate. Kincaid *et al.* (2003 *as cited in* Rhode Island CRMC 2010) suggested that seasonal cyclonic swirling exists in Rhode Island Sound and that this swirling has significant influence upon dynamic exchange with Narragansett Bay. While a cyclonic swirling the size of Rhode Island Sound is consistent with flow counterclockwise around its periphery, the analysis of model output and of current observations have demonstrated that along the southern edge of Rhode Island Sound the flow is westward (Codiga and Ullman 2010 and Ullman and Codiga 2010, respectively, *as cited in* Rhode Island CRMC 2010), which contradicts the idea that flow closes in a distinct swirl as originally suggested by Cook (1966 *as cited in* Rhode Island CRMC 2010).

02:EE-001096-0089-07-01\Oceanography Fig 4-26.ai-06/22/2012-GRA



Note: White Arrows are for Summer Flows and Black for Winter; Size of Arrow is Relative to Volume of Flow; Units are M3 Sec-1

SOURCE: Rhode Island CRMC 2010

Figure C-26. Seasonal, Tidally Averaged Volume Transport Between Narragansett Bay and Rhode Island Sound.

C.2.2 Impact Analysis of Alternative A

C.2.2.1 Impacts of Routine Activities and Events

Routine activities (*see* Section 3.1 of the EA), which include site characterization surveys and the construction, operation, and decommissioning of meteorological and oceanographic data collection facilities, would not have measureable effects on the physical oceanography of the WEA; however, the physical oceanography could affect the implementation of these activities as described below.

Site Characterization Surveys

Site characterization surveys (*see* Section 3.1.2 of the EA) include shallow hazards surveys, geological surveys, biological surveys, geotechnical surveys, and archaeological resource surveys. All of these surveys would require vessels traveling through the WEA and the deployment of equipment into the sea. While the implementation of these surveys would not affect physical oceanography, tides, winds, waves, and resulting circulation patterns could have short-term minor effects on the implementation of the surveys. These effects, along with enhancement from adverse weather, would be taken into account during the planning phases but may result in short-term delays (a few days) during the implementation of these surveys.

Construction and Decommissioning

Construction of meteorological and oceanographic data collection facilities may also be impeded by adverse weather conditions. As with the site characterization described above, construction and decommissioning may be delayed a few days by changes in physical oceanographic conditions (tides, waves, and circulation patterns)

Operations

Meteorological and oceanographic data collection facilities may be in place for up to five years. Physical oceanographic conditions would not be impeded by operations, and operations should not be affected by adverse physical oceanographic conditions. Adverse conditions may delay any scheduled maintenance of the equipment, but this would be short-term and negligible.

C.2.2.2 Impacts of Non-Routine Events

Non-routine events (*see* Section 3.2 of the EA) include severe storms such as hurricanes and extratropical cyclones; collisions between structures and vessels or with other marine vessels or marine life; and spills from collisions or during generator refueling. Adverse physical oceanographic conditions would be enhanced by severe storms, but these effects would be short-term.

C.2.3 Conclusions

The proposed action is not expected to affect the physical oceanography in the WEA including wave action, tidal processes, temperature, salinity, stratification, and circulation, due to the minimal physical scale of any structures that would be deployed or constructed.

C.3 References

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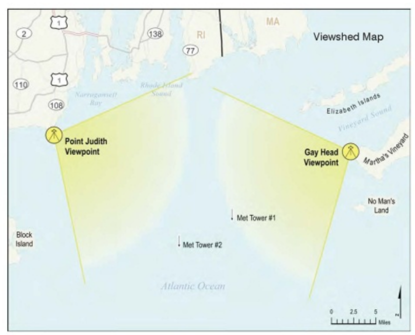
APPENDIX D
Visual Simulations

Longitude (W): 71° 28' 50.608" W
Latitude (N): 41° 21' 43.865" N
Elevation: 0 M AMSL (0 feet)
Distance from Met Tower #1: 35.5 KM (19.1 NM)
Distance from Met Tower #2: 29.9 KM (16.2 NM)
Weather Conditions: Clear, Windy
Visibility Conditions: 10+ Statute Miles
Tidal: 0.30 m (1.00 feet)
Reference Cone 1: 41° 21' 43.833" N
71° 28' 50.186" W
Reference Cone 2: 41° 21' 43.391" N
71° 28' 50.011" W
Reference (bench): 41° 21' 43.700" N
71° 28' 50.315" W
Camera Model and Lens: Canon EOS 50D
Digital Focal Length: 56.00 mm
35mm Equivalent Focal Length: 88.73 mm
Camera Bearing: 66 degrees to 168 degrees
Total Viewable Area: 102 degrees

Towers are represented by yellow rectangles, 100 meters = height of tower, 6 meters = width of base. The red line indicates the location of the horizon. Due to elevation of viewpoint (0 ft. above sea level), tower bases would be blocked from view, because the curve of the earth results in location behind the horizon, not in front. Actual width of tower will be 3 meters, which will not be discernible with the human eye at this distance.

The orange cones shown in the photomontages were used in Windpro software environment as reference points to calibrate wireframes. The photomontages (existing and simulated views) were created from up to 8 separate photos each using Adobe Photoshop to provide a panoramic view.

Figure 1a Point Judith Lighthouse
Narragansett, RI
Date: March 27, 2012
Time: 8 a.m.

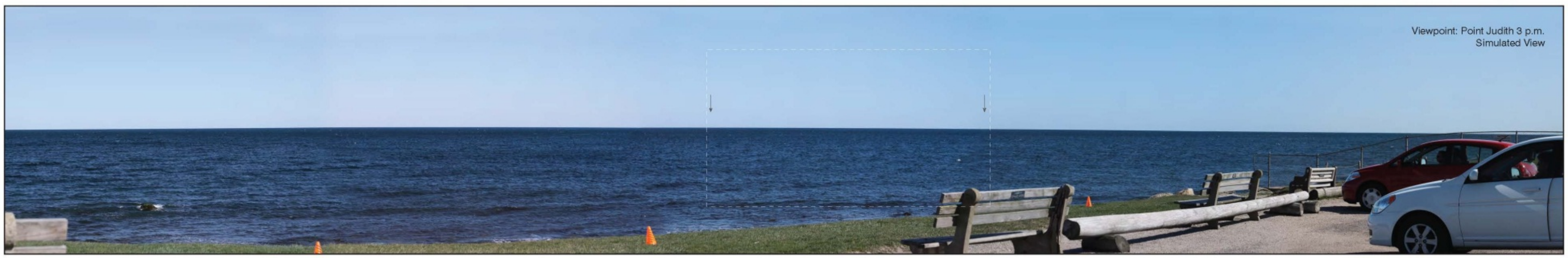


Longitude (W): 71° 28' 50.608" W
Latitude (N): 41° 21' 43.865" N
Elevation: 0 M AMSL (0 feet)
Distance from Met Tower #1: 35.5 KM (19.1 NM)
Distance from Met Tower #2: 29.9 KM (16.2 NM)
Weather Conditions: Clear, Windy
Visibility Conditions: 10+ Statute Miles
Tidal: .75 m (2.45 feet)
Reference Cone 1: 41° 21' 43.920" N
71° 28' 50.187" W
Reference Cone 2: 41° 21' 43.390" N
71° 28' 50.036" W
Reference (bench): 41° 21' 43.700" N
71° 28' 50.315" W
Camera Model and Lens: Canon EOS 50D
Digital Focal Length: 56.00 mm
35mm Equivalent Focal Length: 88.73 mm
Camera Bearing: 66 degrees to 168 degrees
Total Viewable Area: 102 degrees

Towers are represented by yellow rectangles, 100 meters = height of tower, 6 meters = width of base. The red line indicates the location of the horizon. Due to elevation of viewpoint (0 ft. above sea level), tower bases would be blocked from view, because the curve of the earth results in location behind the horizon, not in front. Actual width of tower will be 3 meters, which will not be discernible with the human eye at this distance.

The orange cones shown in the photomontages were used in Windpro software environment as reference points to calibrate wireframes. The photomontages (existing and simulated views) were created from up to 8 separate photos each using Adobe Photoshop to provide a panoramic view.

Figure 1b Point Judith Lighthouse
Narragansett, RI
Date: March 27, 2012
Time: 12 p.m.

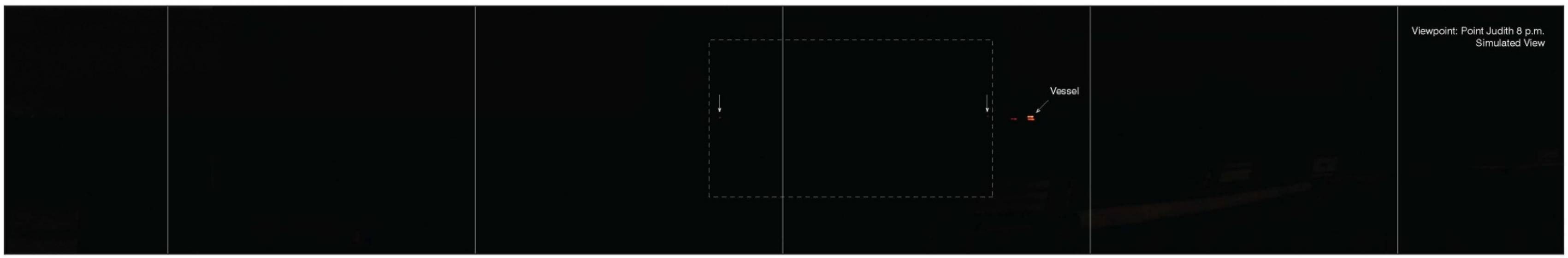


Longitude (W): 71° 28' 50.608" W
Latitude (N): 41° 21' 43.865" N
Elevation: 0 M AMSL (0 feet)
Distance from Met Tower #1: 35.5 KM (19.1 NM)
Distance from Met Tower #2: 29.9 KM (16.2 NM)
Weather Conditions: Clear, Windy
Visibility Conditions: 10+ Statute Miles
Tidal: .21 m (.70 feet)
Reference Cone 1: 41° 21' 43.876" N
71° 28' 50.150" W
Reference Cone 2: 41° 21' 43.748" N
71° 28' 50.131" W
Reference Cone 3: 41° 21' 43.396" N
71° 28' 49.959" W
Reference (bench): 41° 21' 43.700" N
71° 28' 50.315" W
Camera Model and Lens: Canon EOS 50D
Digital Focal Length: 56.00 mm
35mm Equivalent Focal Length: 88.73 mm
Camera Bearing: 66 degrees to 168 degrees
Total Viewable Area: 102 degrees

Towers are represented by yellow rectangles, 100 meters = height of tower, 6 meters = width of base. The red line indicates the location of the horizon. Due to elevation of viewpoint (0 ft. above sea level), tower bases would be blocked from view, because the curve of the earth results in location behind the horizon, not in front. Actual width of tower will be 3 meters, which will not be discernible with the human eye at this distance.

The orange cones shown in the photomontages were used in Windpro software environment as reference points to calibrate wireframes. The photomontages (existing and simulated views) were created from up to 8 separate photos each using Adobe Photoshop to provide a panoramic view.

Figure 1c Point Judith Lighthouse
Narragansett, RI
Date: March 27, 2012
Time: 3 p.m.

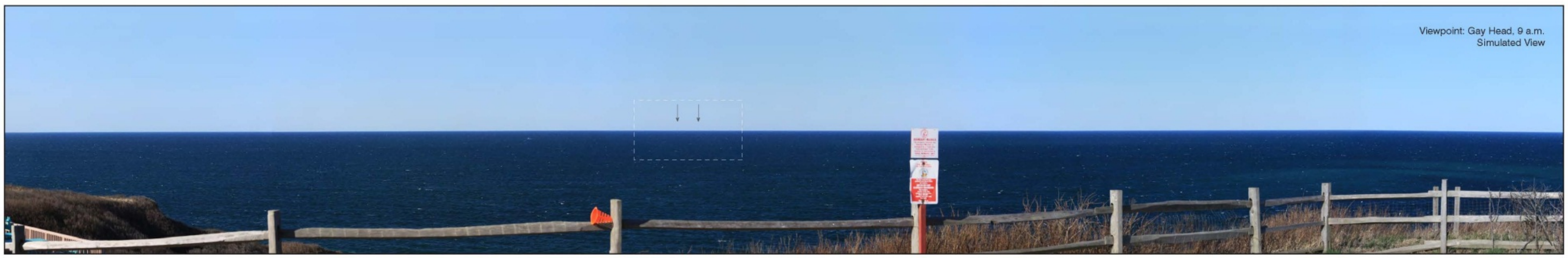


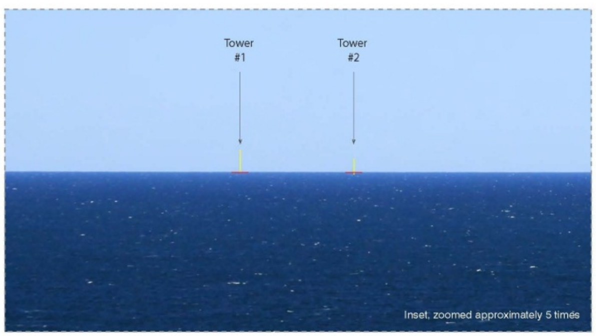
Longitude (W): 71° 28' 50.608" W
Latitude (N): 41° 21' 43.865" N
Elevation: 0 M AMSL (0 feet)
Distance from Met Tower #1: 35.5 KM (19.1 NM)
Distance from Met Tower #2: 29.9 KM (16.2 NM)
Weather Conditions: Clear, Windy
Visibility Conditions: 10+ Statute Miles
Tidal: .45 m (1.46 feet)
Reference Cone 1: 41° 21' 43.868" N
71° 28' 50.163" W
Reference Cone 2: 41° 21' 43.414" N
71° 28' 50.050" W
Reference (bench): 41° 21' 43.700" N
71° 28' 50.315" W
Camera Model and Lens: Canon EOS 50D
Digital Focal Length: 56.00 mm
35mm Equivalent Focal Length: 88.73 mm
Camera Bearing: 66 degrees to 168 degrees
Total Viewable Area: 102 degrees

Towers are represented by yellow rectangles, 100 meters = height of tower, 6 meters = width of base. The red line indicates the location of the horizon. Due to elevation of viewpoint (0 ft. above sea level), tower bases would be blocked from view, because the curve of the earth results in location behind the horizon, not in front. Actual width of tower will be 3 meters, which will not be discernible with the human eye at this distance.

The orange cones shown in the photomontages were used in Windpro software environment as reference points to calibrate wireframes. The photomontages (existing and simulated views) were created from up to 8 separate photos each using Adobe Photoshop to provide a panoramic view.

Figure 1d Point Judith Lighthouse
Narragansett, RI
Date: March 26, 2012
Time: 8 p.m.



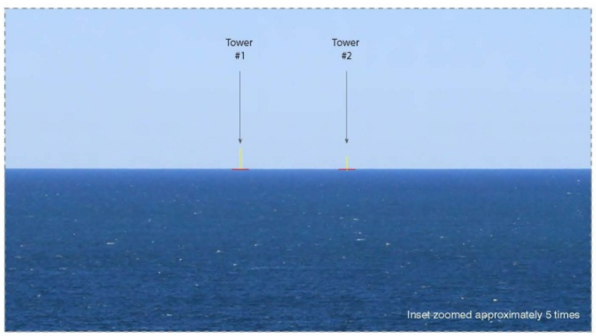


Longitude (W): 70° 50' 13.194" W
Latitude (N): 41° 20' 50.277" N
Elevation: 42 M AMSL (138 feet)
Distance from Met Tower #1: 24.5 KM (13.2 NM)
Distance from Met Tower #2: 35.2 KM (19.0 NM)
Weather Conditions: Clear
Visibility Conditions: 10+ Statute Miles
Tidal: 0.21 m (0.68 feet)
Reference Cone: 41° 20' 50.106" N
70° 50' 13.501" W
Camera Model and Lens: Canon EOS 50D
Digital Focal Length: 60.00 mm
35mm Equivalent Focal Length: 95.07 mm
Camera Bearing: 294 degrees to 195 degrees
Total Viewable Area: 99 degrees

Towers are represented by yellow rectangles, 100 meters = height of tower, 6 meters = width of base. The red line indicates the location of the horizon. Due to elevation of viewpoint (138 ft. above sea level), tower bases would be blocked from view, because the curve of the earth results in location behind the horizon, not in front. Actual width of tower will be 3 meters, which will not be discernible with the human eye at this distance.

The orange cones shown in the photomontages were used in Windpro software environment as reference points to calibrate wireframes. The photomontages (existing and simulated views) were created from up to 8 separate photos each using Adobe Photoshop to provide a panoramic view.

Figure 2a Gay Head Lighthouse
Aquinnah, MA
Date: March 30, 2012
Time: 9 a.m.

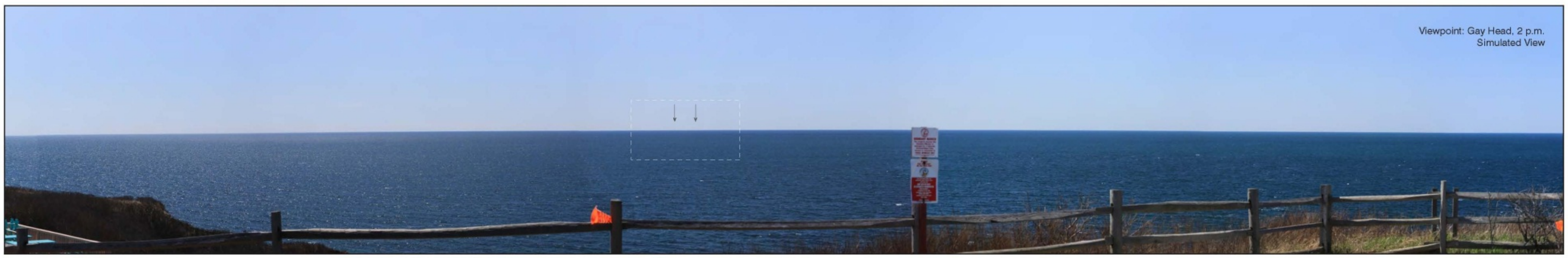


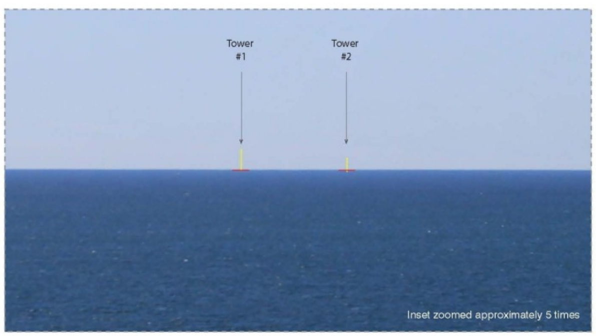
Longitude (W): 70° 50' 13.194" W
Latitude (N): 41° 20' 50.277" N
Elevation: 42 M AMSL (138 feet)
Distance from Met Tower #1: 24.5 KM (13.2 NM)
Distance from Met Tower #2: 35.2 KM (19.0 NM)
Weather Conditions: Clear
Visibility Conditions: 10+ Statute Miles
Tidal: 0.46 m (1.5 feet)
Reference Cone: 41° 20' 50.106" N
70° 50' 13.501" W
Camera Model and Lens: Canon EOS 50D
Digital Focal Length: 56.00 mm
35mm Equivalent Focal Length: 88.73 mm
Camera Bearing: 294 degrees to 195 degrees
Total Viewable Area: 99 degrees

Towers are represented by yellow rectangles, 100 meters = height of tower, 6 meters = width of base. The red line indicates the location of the horizon. Due to elevation of viewpoint (138 ft. above sea level), tower bases would be blocked from view, because the curve of the earth results in location behind the horizon, not in front. Actual width of tower will be 3 meters, which will not be discernible with the human eye at this distance.

The orange cones shown in the photomontages were used in Windpro software environment as reference points to calibrate wireframes. The photomontages (existing and simulated views) were created from up to 8 separate photos each using Adobe Photoshop to provide a panoramic view.

Figure 2b Gay Head Lighthouse
Aquinnah, MA
Date: March 30, 2012
Time: 12 p.m.





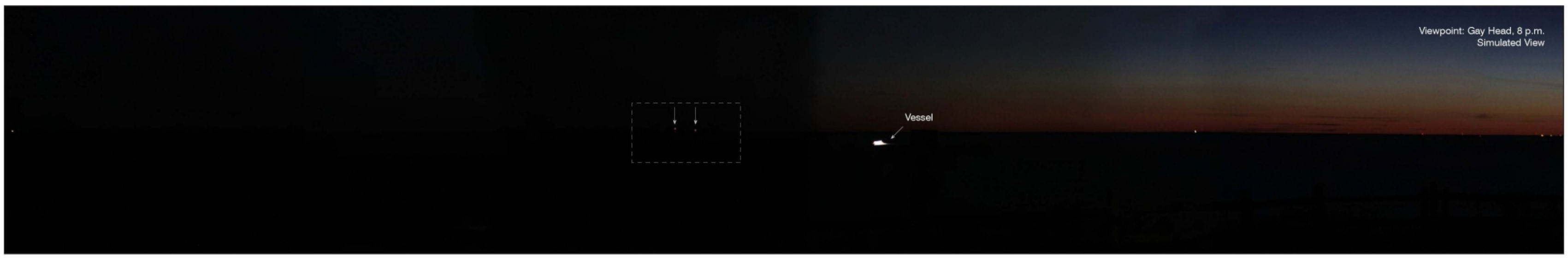
Longitude (W): 70° 50' 13.194" W
Latitude (N): 41° 20' 50.277" N
Elevation: 42 M AMSL (138 feet)
Distance from Met Tower #1: 24.5 KM (13.2 NM)
Distance from Met Tower #2: 35.2 KM (19.0 NM)
Weather Conditions: Clear
Visibility Conditions: 10+ Statute Miles
Tidal: 0.63 m (2.06 feet)
Reference Cone: 41° 20' 50.106" N
70° 50' 13.501" W
Camera Model and Lens: Canon EOS 50D
Digital Focal Length: 56.00 mm
35mm Equivalent Focal Length: 88.73 mm
Camera Bearing: 294 degrees to 195 degrees
Total Viewable Area: 99 degrees

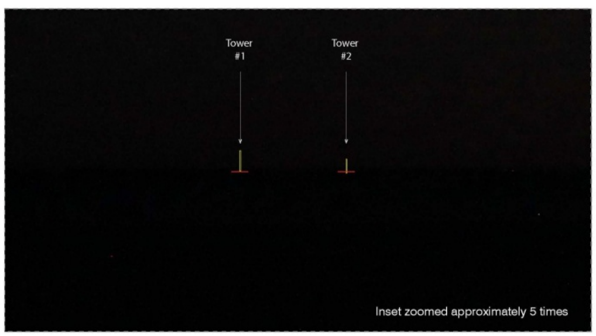
Towers are represented by yellow rectangles, 100 meters = height of tower, 6 meters = width of base. The red line indicates the location of the horizon. Due to elevation of viewpoint (138 ft. above sea level), tower bases would be blocked from view, because the curve of the earth results in location behind the horizon, not in front. Actual width of tower will be 3 meters, which will not be discernible with the human eye at this distance.

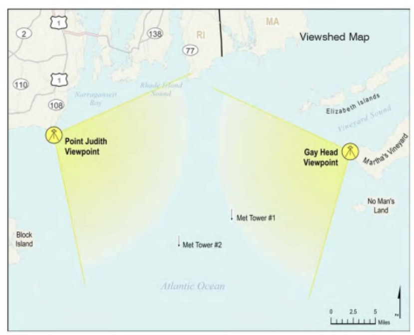
The orange cones shown in the photomontages were used in Windpro software environment as reference points to calibrate wireframes. The photomontages (existing and simulated views) were created from up to 8 separate photos each using Adobe Photoshop to provide a panoramic view.

Figure 2c Gay Head Lighthouse
Aquinnah, MA
Date: March 30, 2012
Time: 2 p.m.

02:001096-0089-13\Gay Head\Gay Head_8PM_Simulation.ai-05/18/2012-GRA







Longitude (W): 70° 50' 13.194" W
Latitude (N): 41° 20' 50.277" N
Elevation: 42 M AMSL (138 feet)
Distance from Met Tower #1: 24.5 KM (13.2 NM)
Distance from Met Tower #2: 35.2 KM (19.0 NM)
Weather Conditions: Clear, Windy
Visibility Conditions: 10+ Statute Miles
Tidal: 0.28 m (0.93 feet)
Reference Cone: 41° 20' 50.106" N
70° 50' 13.501" W
Camera Model and Lens: Canon EOS 50D
Digital Focal Length: 56.00 mm
35mm Equivalent Focal Length: 88.73 mm
Camera Bearing: 294 degrees to 195 degrees
Total Viewable Area: 99 degrees

Towers are represented by yellow rectangles, 100 meters = height of tower, 6 meters = width of base. The red line indicates the location of the horizon. Due to elevation of viewpoint (138 ft. above sea level), tower bases would be blocked from view, because the curve of the earth results in location behind the horizon, not in front. Actual width of tower will be 3 meters, which will not be discernible with the human eye at this distance.

The orange cones shown in the photomontages were used in Windpro software environment as reference points to calibrate wireframes. The photomontages (existing and simulated views) were created from up to 8 separate photos each using Adobe Photoshop to provide a panoramic view.

Figure 2d Gay Head Lighthouse
Aquinnah, MA
Date: March 27, 2012
Time: 8 p.m.

APPENDIX E
Programmatic Agreement

MAY 23 2012

PROGRAMMATIC AGREEMENT
Among
The U.S. Department of the Interior, Bureau of Ocean Energy Management;
the State Historic Preservation Officers of Massachusetts and Rhode Island;
The Mashpee Wampanoag Tribe;
The Narragansett Indian Tribe;
The Wampanoag Tribe of Gay Head (Aquinnah); and
The Advisory Council on Historic Preservation;
Regarding
the "Smart from the Start" Atlantic Wind Energy Initiative:
Leasing and Site Assessment Activities offshore Massachusetts and Rhode Islands

WHEREAS, the Energy Policy Act of 2005, Pub. L. No. 109-58, added Section 8(p)(1)(C) to the Outer Continental Shelf Lands Act (OCSLA), which grants the Secretary of the Interior the authority to issue leases, easements, or rights-of-way on the Outer Continental Shelf (OCS) for the purpose of renewable energy development, including wind energy development. *See* 43 U.S.C. § 1337(p)(1)(C); and

WHEREAS, the Secretary delegated this authority to the former Minerals Management Service (MMS), now the Bureau of Ocean Energy Management (BOEM), and promulgated final regulations implementing this authority at 30 CFR Part 585; and

WHEREAS, under the renewable energy regulations, the issuance of leases and subsequent approval of wind energy development on the OCS is a staged decision-making process that occurs in distinct phases: lease issuance; approval of a site assessment plan (SAP); and approval of a construction and operation plan (COP); and

WHEREAS, BOEM is currently identifying areas that may be suitable for wind energy leasing through collaborative, consultative, and analytical processes; and

WHEREAS, the issuance of a commercial wind energy lease gives the lessee the exclusive right to subsequently seek BOEM approval of plans (SAPs and COPs) for the development of the leasehold; and

WHEREAS, the lease does not grant the lessee the right to construct any facilities; rather, the lease grants the lessee the right to use the leased area to develop its plans, which must be approved by BOEM before the lessee implements them. *See* 30 CFR 585.600 and 585.601; and

WHEREAS, the SAP contains the lessee's detailed proposal for the construction of a meteorological tower and/or the installation of meteorological buoys ("site assessment activities") on the leasehold. *See* 30 CFR 585.605 - 585.618; and

WHEREAS, the lessee's SAP must be approved by BOEM before it conducts these "site assessment" activities on the leasehold; and

Programmatic Agreement concerning the "Smart from the Start" Atlantic Wind Energy Initiative: Leasing and Site Assessment Activities offshore Massachusetts and Rhode Island

WHEREAS, BOEM may approve, approve with modification, or disapprove a lessee's SAP. *See* 30 CFR 585.613; and

WHEREAS, the COP is a detailed plan for the construction and operation of a wind energy project on the lease. *See* 30 CFR 585.620-585.638; and

WHEREAS, BOEM approval of a COP is a precondition to the construction of any wind energy facility on the OCS. *See* 30 CFR 585.600; and

WHEREAS, the regulations require that a lessee provide the results of surveys with its SAP and COP for the areas affected by the activities proposed in each plan, including an archaeological resource survey. *See* 30 CFR 585.610(b)(3) and 30 CFR 585.626(a)(5). BOEM refers to surveys undertaken to acquire this information as "site characterization" activities. *See Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585* at: http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/GGARCH4-11-2011-pdf.aspx; and

WHEREAS, BOEM has embarked upon the "Smart from the Start" Atlantic Wind Energy Initiative for the responsible development of wind energy resources on the Atlantic OCS; and

WHEREAS, under the "Smart from the Start" Initiative, BOEM has identified areas on the OCS that appear most suitable for future wind energy activities offshore the Commonwealth of Massachusetts (MA) and the State of Rhode Island (RI); and

WHEREAS these areas are located: (1) within the Rhode Island-Massachusetts Wind Energy Area (WEA); and (2) within the MA Call area east of the Rhode Island-Massachusetts WEA (hereafter known as "Areas"); and

WHEREAS BOEM may issue multiple renewable energy leases and approve multiple SAPs on leases issued within these Areas; and

WHEREAS, BOEM has determined that issuing leases and approving SAPs within these Areas constitute multiple undertakings subject to Section 106 of the National Historic Preservation Act (NHPA; 16 U.S.C. § 470f), and its implementing regulations (36 CFR 800); and

WHEREAS, BOEM has determined that the implementation of the program is complex as the decisions on these multiple undertakings are staged, pursuant to 36 CFR § 800.14(b); and

WHEREAS, the implementing regulations for Section 106 (36 CFR § 800) prescribe a process that seeks to accommodate historic preservation concerns with the needs of Federal undertakings through consultation among parties with an interest in the effects of the undertakings, commencing at the early stages of the process; and

Programmatic Agreement concerning the "Smart from the Start" Atlantic Wind Energy Initiative: Leasing and Site Assessment Activities offshore Massachusetts and Rhode Island

WHEREAS, the Section 106 consultations have been initiated and coordinated with other reviews, including the National Environmental Policy Act (NEPA), in accordance with 36 CFR § 800.3(b); and

WHEREAS, 36 CFR § 800.14(b)(3) provides for developing programmatic agreements (Agreements) for complex or multiple undertakings and § 800.14(b)(1)(ii) and (v) provide for developing Agreements when effects on historic properties cannot be fully determined prior to approval of an undertaking and for other circumstances warranting a departure from the normal section 106 process; and

WHEREAS, 36 CFR § 800.4(b)(2) provides for phased identification and evaluation of historic properties where alternatives consist of large land areas, and for the deferral of final identification and evaluation of historic properties when provided for in a Agreement executed pursuant to 36 CFR §800.14(b); and

WHEREAS, BOEM has determined that the identification and evaluation of historic properties shall be conducted through a phased approach, pursuant to 36 CFR § 800.4(b)(2), where the final identification of historic properties will occur after the issuance of a lease or leases and before the approval of a SAP; and

WHEREAS, the Section 106 consultations described in this Agreement will be used to establish a process for identifying historic properties located within the undertakings' Areas of Potential Effects (APE) that are listed in or eligible for listing in the National Register of Historic Places (National Register), and assess the potential adverse effects and avoid, reduce, or resolve any such effects through the process set forth in this Agreement; and

WHEREAS, according to 36 CFR § 800.16(l)(1) "historic property" means

> *any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria*; and

WHEREAS, the APEs, as defined in 36 CFR § 800.16(d) of the Advisory Council on Historic Preservation's (ACHP's) regulations implementing Section 106 of the NHPA, for the undertakings that are the subject of this Agreement, are: (1) the depth and breadth of the seabed that could potentially be impacted by seafloor/bottom-disturbing activities associated with the undertakings (e.g., core samples, anchorages and installation of meteorological towers and buoys); and (2) the viewshed from which lighted meteorological structures would be visible; and

WHEREAS, BOEM has identified and consulted with the State Historic Preservation Offices (SHPOs) for MA and RI, (collectively, "the SHPOs"); and

WHEREAS, BOEM initiated consultation in 2011 and 2012 through letters of invitation, telephone calls, emails, meetings, webinars, and the circulation and discussion of this Agreement in draft; and this outreach and notification included contacting over 66 individuals and entities, including federally-recognized Indian Tribes (Tribes), local governments, SHPOs, and the public; and

WHEREAS, BOEM has initiated formal government-to-government consultation with the following Tribes: the Mashpee Wampanoag Tribe, the Narragansett Indian Tribe, the Shinnecock Indian Nation, and the Wampanoag Tribe of Gay Head (Aquinnah); and

WHEREAS, these Tribes have chosen to consult with BOEM and participate in development of this Agreement, in which the term Tribe refers to them, within the meaning of 36 CFR § 800.16(m); and

WHEREAS, BOEM shall continue to consult with these Tribes to identify properties of religious and cultural significance that may be eligible for listing in the National Register of Historic Places (Traditional Cultural Properties or TCPs) and that may be affected by these undertakings; and

WHEREAS, BOEM involves the public and identifies other consulting parties through notifications, requests for comments, existing renewable energy task forces, contact with SHPOs, NEPA scoping meetings and communications for these proposed actions; and

WHEREAS, BOEM, the SHPOs, the Mashpee Wampanoag Tribe, the Narragansett Indian Tribe, and the Wampanoag Tribe of Gay Head (Aquinnah) and the ACHP are Signatories to this Agreement, and

WHEREAS, future submission of a COP and commercial-scale development that may or may not occur within the Areas would be separate undertakings and considered under future, separate Section 106 consultation(s) not under this Agreement; and

WHEREAS, BOEM requires a SAP to include the results of site characterization surveys that will identify potential archaeological resources that could be affected by the installation and operation of meteorological facilities. *See* (30 CFR § 585.611 (b)(6); and

WHEREAS, consultations conducted prior to the execution of this Agreement included all steps in the Section 106 process up to and including consulting on the scope of identification efforts that would be used to conduct site characterization surveys that would identify historic properties that may be impacted by activities described in the SAP pursuant to 36 CFR § 800.4(a); and

WHEREAS, these consultations resulted in recommendations to BOEM that the following items should be added to leases issued within the Areas, both to ensure that historic properties that may be impacted by activities described in the SAP are identified through a reasonable and good faith effort (§ 800.4(b)(1)), and also to ensure that properties identified through the geophysical surveys are not impacted by geotechnical sampling:

> *The lessee may only conduct geotechnical (sub-bottom) sampling activities in areas of the leasehold in which an analysis of the results of geophysical surveys has been completed for that area. The geophysical surveys must meet BOEM's minimum standards (see Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 285 at* http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/GGARCH4-11-2011-pdf.aspx*), and the analysis must be completed by a qualified marine archaeologist who both meets the Secretary of the Interior's Professional Qualifications Standards (48 FR 44738- 44739) and has experience analyzing marine geophysical data. This analysis must include a determination whether any potential archaeological resources are present in the area and the geotechnical (sub-bottom) sampling activities must avoid potential archaeological resources by a minimum of 50.0 meters (m; 164.0 feet). The avoidance distance must be calculated from the maximum discernible extent of the archaeological resource. In no case may the lessee's actions impact a potential archaeological resource without BOEM's prior approval*;

NOW, THEREFORE, BOEM, the ACHP, the SHPOs, Tribes, and the other concurring parties (the Parties), agree that Section 106 consultation shall be conducted in accordance with the following stipulations in order to defer final identification and evaluation of historic properties.

STIPULATIONS

I. SAP Decisions. Before making a decision on a SAP from a lessee, BOEM will treat all potential historic properties identified as a result of site characterization studies and consultations as historic properties potentially eligible for inclusion on the National Register and avoid them by requiring the lessee to relocate the proposed project, resulting in a finding of *No historic properties affected* (36 CFR § 800.4(d)(1)). If a potential historic property is identified, and the lessee chooses to conduct additional investigations, and:

   A. If additional investigations demonstrate that a historic property does not exist, then BOEM will make a determination of *No historic properties affected* and follow 36 CFR § 800.4(d)(1).

B. If additional investigations demonstrate that a historic property does exist and may be affected, BOEM will evaluate the historic significance of the property, in accordance with 800.4(c); make a determination of *Historic properties affected* and follow 36 CFR § 800.4(d)(2); and resolve any adverse effects by following 800.5.

II. Tribal Consultation. BOEM shall continue to consult with the Tribes throughout the implementation of this Agreement in a government-to-government manner consistent with Executive Order 13175, Presidential memoranda, and any Department of the Interior policies, on subjects related to the undertakings.

III. Public Participation

A. Because BOEM and the Parties recognize the importance of public participation in the Section 106 process, BOEM shall continue to provide opportunities for public participation in Section 106-related activities, and shall consult with the Parties on possible approaches for keeping the public involved and informed throughout the term of the Agreement.

B. BOEM shall keep the public informed and may produce reports on historic properties and on the Section 106 process that may be made available to the public at BOEM's headquarters, on the BOEM website, and through other reasonable means insofar as the information shared conforms to the confidentiality clause of this Agreement (Stipulation IV).

IV. Confidentiality. Because BOEM and the Parties agree that it is important to withhold from disclosure sensitive information such as that which is protected by NHPA Section 304 (16 U.S.C. § 470w-3) (*e.g.*, the location, character and ownership of an historic resource, if disclosure would cause a significant invasion of privacy, risk harm to the historic resources, or impede the use of a traditional religious site by practitioners), BOEM shall:

A. Request that each Party inform the other Parties if, by law or policy, it is unable to withhold sensitive data from public release.

B. Arrange for the Parties to consult as needed on how to protect such information collected or generated under this Agreement.

C. Follow, as appropriate, 36 CFR 800.11(c) for authorization to withhold information pursuant to NHPA Section 304, and otherwise withhold sensitive information to the extent allowable by laws including the Freedom of Information Act, 5 U.S.C. § 552, through the Department of the Interior regulations at 43 CFR Part 2.

D. Request that the Parties agree that materials generated during consultation be treated by the Parties as internal and pre-decisional until they are formally released, although the Parties understand that they may need to be released by one of the Parties if required by law.

V. Administrative Stipulations

A. In coordinating reviews, BOEM shall follow this process:

1. Standard Review: The Parties shall have a standard review period of thirty (30) calendar days for commenting on all documents which are developed under the terms of this Agreement, from the date they are sent by BOEM.

2. Expedited Request for Review: The Parties recognize the time-sensitive nature of this work and shall attempt to expedite comments or concurrence when BOEM so requests. The expedited comment period shall not be less than fifteen (15) calendar days from the date BOEM sends such a request.

3. If a Party cannot meet BOEM's expedited review period request, it shall notify BOEM in writing within the fifteen (15) calendar day period. If a Party fails to provide comments or respond within the time frame requested by BOEM (either standard or expedited), then BOEM may proceed as though it has received concurrence from that Party. BOEM shall consider all comments received within the review period.

4. All Parties will send correspondence and materials for review via electronic media unless a Party requests, in writing, that BOEM transmit the materials by an alternate method specified by that Party. Should BOEM transmit the review materials by the alternate method, the review period will begin on the date the materials were received by the Party, as confirmed by delivery receipt.

5. MA and RI SHPO Review Specifications: All submittals to the MA and RI SHPOs shall be in paper format and shall be delivered to the MA and RI SHPOs' offices by US Mail, by a delivery service, or by hand. Plans and specifications submitted to the MA and RI SHPOs shall measure no larger than 11" x 17" paper format (unless another format is specified in consultation). The MA and RI SHPOs shall review and comment on all adequately documented project submittals within 30 calendar days of receipt unless a response has been requested within the expedited review period specified in Stipulation V.A.2.

6. Each Signatory shall designate a point of contact for carrying out this Agreement and provide this contact's information to the other Parties, updating it as necessary while this Agreement is in force. Updating a point of contact alone shall not necessitate an amendment to this Agreement.

B. Dispute Resolution. Should any Signatory object in writing to BOEM regarding an action carried out in accordance with this Agreement, or lack of compliance with the terms of this Agreement, the Signatories shall consult to resolve the objection. Should the Signatories be unable to resolve the disagreement, BOEM shall forward its background information on the dispute as well as its proposed resolution of the dispute to the ACHP. Within 45 calendar days after receipt of all pertinent documentation, the ACHP shall either: (1) provide BOEM with written recommendations, which BOEM shall take into account in reaching a final decision regarding the dispute; or (2) notify BOEM that it shall comment pursuant to 36 CFR 800.7(c), and proceed to comment. BOEM shall take this ACHP comment into account, in accordance with 36 CFR 800.7(c)(4). Any ACHP recommendation or comment shall be understood to pertain only to the subject matter of the dispute; BOEM's responsibility to carry out all actions under this Agreement that are not subjects of dispute shall remain unchanged.

C. Amendments. Any Signatory may propose to BOEM in writing that the Agreement be amended, whereupon BOEM shall consult with the Parties to consider such amendment. This Agreement may then be amended when agreed to in writing by all Signatories, becoming effective on the date that the amendment is executed by the ACHP as the last Signatory.

D. Adding Federal Agencies. In the event that another Federal agency believes it has Section 106 responsibilities related to the undertakings which are the subject of this Agreement, that agency may attempt to satisfy its Section 106 responsibilities by agreeing in writing to the terms of this Agreement and notifying and consulting with the SHPOs and the ACHP. Any modifications to this agreement that may be necessary for meeting that agency's Section 106 obligations shall be considered in accordance with this Agreement.

E. Adding Concurring Parties. In the event that another party wishes to assert its support of this Agreement, that party may prepare a letter indicating its concurrence, which BOEM will attach to the Agreement and circulate among the Signatories.

F. Term of Agreement. The Agreement shall remain in full force until BOEM makes a final decision on the last SAP submitted under a lease issued under this portion of the "Smart from the Start" initiative, or for ten (10) years from the date the Agreement is executed, defined as the date the last signatory signs, whichever is earlier, unless otherwise extended by amendment in accordance with this Agreement.

G. Termination.

1. If any Signatory determines that the terms of the Agreement cannot or are not being carried out, that Party shall notify the other Signatories in writing and consult with them to seek amendment of the Agreement. If within sixty (60) calendar days, an amendment cannot be made, any Signatory may terminate the Agreement upon written notice to the other Signatories.

2. If termination is occasioned by BOEM's final decision on the last SAP contemplated under this portion of the "Smart from the Start" Initiative, BOEM shall notify the Parties and the public, in writing.

H. Anti-Deficiency Act. Pursuant to 31 U.S.C. § 1341(a)(1), nothing in this Agreement shall be construed as binding the United States to expend in any one fiscal year any sum in excess of appropriations made by Congress for this purpose, or to involve the United States in any contract or obligation for the further expenditure of money in excess of such appropriations.

I. Existing Law and Rights. Nothing in this Agreement shall abrogate existing laws or the rights of any consulting party or agency party to this Agreement.

J. Compliance with Section 106. Execution and implementation of this Agreement evidences that BOEM has satisfied its Section 106 responsibilities for all aspects of these proposed undertakings by taking into account the effects of these undertakings on historic properties and affording the ACHP a reasonable opportunity to comment with regard to the undertakings.