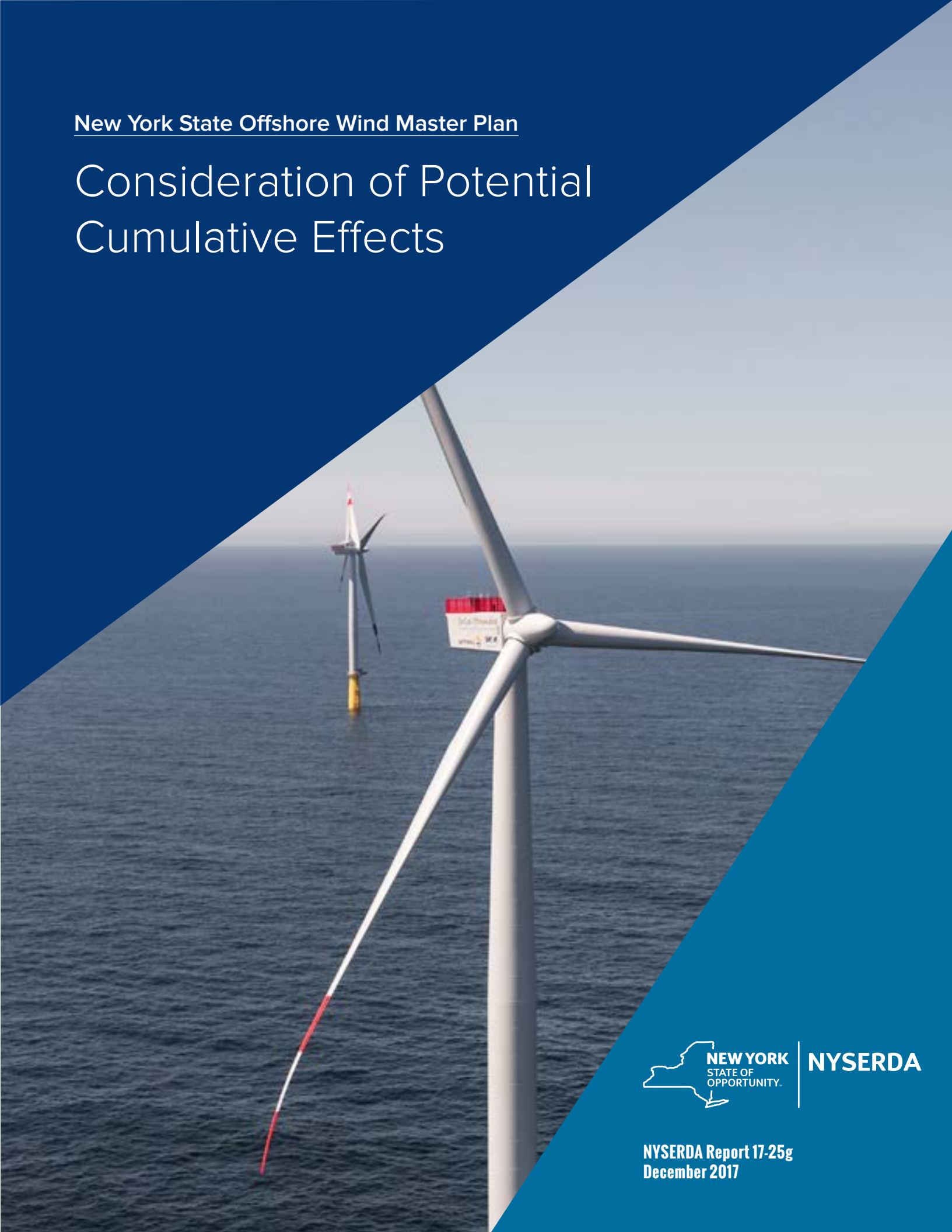


New York State Offshore Wind Master Plan

Consideration of Potential Cumulative Effects



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New York State Offshore Wind Master Plan Consideration of Potential Cumulative Effects

Final Report

Prepared for:

New York State Energy Research and Development Authority

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Acronyms and Abbreviations

AoA	Area of Analysis
BMP	best management practice
BOEM	(U.S.) Bureau of Ocean Energy Management
CEQ Handbook	<i>Considering Cumulative Effects Under the National Environmental Policy Act</i>

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COP	Construction and Operations Plan
dB	decibels
DC	direct current
DOS	New York State Department of State
ESA	Endangered Species Act
ESP	electrical service platform
FAA	Federal Aviation Administration
geographic scope	geographic scope of analysis
GIS	geographic information system
GW	gigawatts
LIPA	Long Island Power Authority
LNG	liquefied natural gas
m	meter
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MRS	munitions response sites
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MW	megawatts
NEPA	National Environmental Policy Act
nm	nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NYSERDA	New York State Energy Research and Development Authority
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OSA	offshore study area
RI/FS	Remedial Investigation/Feasibility Study
SAP	Site Assessment Plan
Study	Consideration of Potential Cumulative Effects study
TEU	20-foot equivalent units
U.S.C.	U.S. Code
USCG	U.S. Coast Guard
WTG	wind turbine generator

Summary

A cumulative effects analysis considers the impacts of an action on resources when added to past, present, and reasonably foreseeable actions. The principal objective of this Consideration of Potential Cumulative Effects study (Study) is to assess potential cumulative impacts from the conceptual development of 2.4 gigawatts (GW) of wind farms off the coast of New York State, along with impacts of other actions and potential actions, and to provide an analytical framework for future analyses of specific projects. The offshore study area (OSA), initially identified by the New York State Department of State as part of its two-year Offshore Atlantic Ocean study, is a 16,740-square-mile (43,356-square kilometer) area of the ocean extending from the south shore of Long Island and New York City to the continental shelf break, slope, and into oceanic waters to an approximate maximum depth of 2,500 meters (DOS 2013).

This assessment of cumulative effects follows a process consistent with the National Environmental Policy Act (NEPA), Council on Environmental Quality guidelines and typical implementation within a NEPA analysis, such that the analysis may inform future NEPA review by the Bureau of Ocean Energy Management (BOEM) of proposed wind energy leases within the OSA. The assessment begins with a high-level project description and analysis of potential impacts associated with construction and operation of a model offshore wind project (“Model Project”) in the OSA. The Model Project consists of 50 wind turbine generators of 8 megawatts (MW), yielding a 400 MW capacity. Common methods of avoidance, minimization, and mitigation for offshore wind projects based on the experience of developers and regulatory experts in the offshore wind industry and related industries are assumed as part of the design of the Model Project. For the purposes of this analysis, the magnitude of each type of potential impact is defined as negligible, minor, greater than minor, or beneficial, using definitions generally consistent with those used by BOEM. The environmental, cultural, and socioeconomic resources considered for this cumulative analysis are similar to the resource categories and impact factors from the BOEM (2016a) *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan* and (2016b) *Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan*. Appendix A provides a description of the Model Project, avoidance minimization and mitigation measures, and the types and magnitude of potential environmental, cultural, and socioeconomic impacts on marine resources. The analysis carries forward impacts considered minor, greater than minor, and beneficial, screening out negligible impacts from further analysis.

The criteria for gauging cumulative effects include the value and sensitivity of the environmental, cultural, and socioeconomic resources; the geographic scope of analysis of these resources; and the duration of the impacts. The “value” of a resource reflects legislative and regulatory protections, and “stakeholder concern and sensitivity” refers to the magnitude of potential impacts and associated concerns for potential cumulative effects. This Study defines a geographic scope of analysis for each key resource examined. The geographic scope for each resource encompasses the natural boundaries of the resource such as species distributions and economic regions, and the area of potential effects, which may extend beyond the area of direct impact of an action on a larger scale of human communities, marine communities, or airsheds. (CEQ 1997). Resource areas considered further for the analysis of potential cumulative effects are those of key importance, including fish, commercial and recreational fishing, and marine mammals and sea turtles. The duration of the impacts corresponds to the construction of 2.4 GW of offshore wind farms assumed to occur over approximately 10 years beginning in 2020 and their subsequent operation.

The types of impacts analyzed for past, present, and reasonably foreseeable actions include those that are similar to impacts expected for the Model Project and those with an incremental effect on a key resource that is greater than negligible. The types of activities that occur on the Atlantic coast and in the OSA with potential impacts similar to offshore wind farms include infrastructure, coastal storm risk management, military use, dredging, ocean dredged-material disposal, commercial and recreational fishing, and marine transportation. Appendix B describes these activity types, the nature of the similar potential impacts, and the estimated magnitude of impacts.

CEQ guidance recommends quantitative data whenever relevant data are available. This analysis uses a quantitative method for evaluating cumulative impacts by considering the physical space affected. It considers potential cumulative impacts on fish, marine mammals and sea turtles, and commercial and recreational fishing. Cumulative effects on fish resources could occur from noise impacts and displacement during construction, primarily associated with pile driving. Cumulative effects on marine mammals and sea turtles may result from impact of displacement from areas for typical foraging and reproduction into areas of higher vessel traffic during construction. Cumulative effects on commercial and recreational fishing may result from the potential displacement of fishing activity due to the conflict with the use of space. Overall, construction of full buildout of 2.4 GW of offshore wind energy projects potentially affects less than 3% of the geographic scope for the respective resource areas. In addition,

because of the anticipated sequential construction schedule of each offshore wind farm, overlap of construction is unlikely or minimal and it is not expected that this entire area would be affected at the same time. Past, present, and reasonably foreseeable activities potentially affect 1%, 8%, and 10% of the geographic scope for fish, marine mammals and sea turtles, and commercial and recreational fishing, respectively.

Operation of 2.4 GW of offshore wind-energy farms is expected to cause negligible impacts on fish from sensory disturbance and negligible displacement, disturbance, or loss of habitat impacts on marine mammals and sea turtles, and thus would not contribute to cumulative impacts on these resources. The area potentially affected by 2.4 GW of offshore wind farms, including a 1,000-foot area where commercial and recreational fishing may be restricted or excluded, represents approximately 251,000 acres, or 3% of the geographic scope for this resource.

1 Introduction

The Consideration of Potential Cumulative Effects (Study) is one of a collection of studies prepared on behalf of New York State in support of the New York State Offshore Wind Master Plan (Master Plan). These studies provide information on a variety of potential environmental, social, economic, regulatory, and infrastructure-related issues associated with the planning for future offshore wind energy development off the coast of the State. When the State embarked on these studies, it began by looking at a study area identified by the New York State Department of State (DOS) in its two-year Offshore Atlantic Ocean Study (DOS 2013). This study area, referred to as the “offshore study area (OSA),” is a 16,740-square-mile (43,356-square-kilometer) area of the Atlantic Ocean extending from New York City and the south shore of Long Island to beyond the continental shelf break and slope into oceanic waters to an approximate maximum depth of 2,500 meters (refer to Figures 3 through 7 for a depiction of the OSA). The OSA was a starting point for examining where turbines may best be located, and the area potentially impacted. Each of the State’s individual studies ultimately focused on a geographic Area of Analysis (AoA) that was unique to that respective study. The AoA for this Study is described below in Section 1.1.

The State envisions that its collection of studies will form a knowledge base for the area off the coast of New York that will serve a number of purposes, including (1) informing the preliminary identification of an area for the potential locating of offshore wind energy areas that was submitted to the Bureau of Ocean Energy Management (BOEM) on October 2, 2017 for consideration and further analysis; (2) providing current information about potential environmental and social sensitivities, economic and practical considerations, and regulatory requirements associated with any future offshore wind energy development; (3) identifying measures that could be considered or implemented with offshore wind projects to avoid or mitigate potential risks involving other uses and/or resources; and (4) informing the preparation of a Master Plan to articulate New York State’s vision of future offshore wind development. The Master Plan identifies the potential future wind energy areas that have been submitted for BOEM’s consideration, discusses the State’s goal of encouraging the development of 2,400 megawatts (MW) of wind energy off the New York coast by 2030, and sets forth suggested guidelines and best management practices (BMPs) that the State will encourage to be incorporated into future offshore wind energy development.

Each of the studies was prepared in support of the larger effort and was shared for comment with federal and State agencies, indigenous nations, and relevant stakeholders, including non-governmental organizations and commercial entities, as appropriate. The State addressed comments and incorporated feedback received into the studies. Feedback from these entities helped to strengthen the quality of the studies, and also helped to ensure that these work products will be of assistance to developers of proposed offshore wind projects in the future. A summary of the comments and issues identified by these external parties is included in the Outreach Engagement Summary, which is appended to the Master Plan.

The Energy Policy Act of 2005 amended Section 8 of the Outer Continental Shelf Lands Act (OCSLA) to give BOEM the authority to identify offshore wind development sites within the Outer Continental Shelf (OCS) and to issue leases on the OCS for activities that are not otherwise authorized by the OCSLA, including wind farms. The State recognizes that all development in the OCS is subject to review processes and decision-making by BOEM and other federal and State agencies. Neither this collection of studies nor the State's Master Plan commit the State or any other agency or entity to any specific course of action with respect to offshore wind energy development. Rather, the State's intent is to facilitate the principled planning of future offshore development off the New York coast, provide a resource for the various stakeholders, and encourage the achievement of the State's offshore wind energy goals.

1.1 Scope of Study

The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) define a cumulative impact as the “impact on the environment which results from the incremental impact of [an] action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 Code of Federal Regulations [CFR] 1508.7). Examples of cumulative impacts include urban sprawl, increases in pollutant concentrations in a water body from multiple discharges, and loss of habitat. The importance of considering cumulative impacts is that “individually minor” impacts may be “collectively significant” when more than one action takes place over time. This cumulative effects study considers the development of 2.4 gigawatts (GW) of wind energy farms off the coast of the State in the context of other marine activities having the same types of potential impacts from development of offshore wind energy. The consideration of 2.4 GW of wind energy farms is based on a hypothetical offshore wind project (referred to herein as the “Model Project”) and associated construction and operation activities and the potential impacts on environmental, cultural, and socioeconomic resources. Per CEQ guidance, the analysis must establish the geographic scope of analysis (“geographic scope”) to encompass the boundary of the environmental, cultural, and socioeconomic resources of concern and additional effects

(CEQ 1997). This Study defines a geographic scope for each resource examined. The geographic scope encompasses the AoA of each resource, plus additional area where cumulative effects on the resource may occur. Each of the AoAs were initially identified as part of the resource-specific studies that support the State's offshore wind master planning process. This Study follows NEPA regulations and guidance so that the analysis will inform future development of proposed leases off the coast of the State in a manner consistent with BOEM's NEPA review.

Section 1 introduces the scope and objectives of the Study. Section 2 presents a framework for the assessment of potential cumulative effects, including (1) describing the Model Project and identifying potential impacts during its construction and operation; (2) establishing criteria for assessing cumulative effects; and (3) identifying past, present, and reasonably foreseeable projects, as well as ongoing activities that occur within the geographic scope and identifying the impacts of these projects and ongoing activities. Section 3 provides an assessment of potential cumulative effects using the framework established. Section 4 is a list of references cited, and Appendices A through E provide supporting analyses for the information presented in Sections 1 through 3.

The CEQ published a handbook relating to cumulative effects assessment in general, *Considering Cumulative Effects Under the National Environmental Policy Act*¹ (CEQ Handbook). Cumulative effects analyses assess the effects of actions in the context of other activities and on a larger spatial scale than project evaluations and can include a community or region. According to the CEQ, the purpose of undertaking cumulative effects analyses under NEPA is to ensure that federal agency decisions consider the full range of consequences of actions, in furtherance of the goal of sustainable development (development that meets the needs of the present without compromising the ability of future generations to meet their own needs). In short, looking at any individual action in a vacuum may obscure the long-term effects on a resource caused by contributions of multiple activities.

¹ https://ceq.doe.gov/publications/cumulative_effects.html

The CEQ Handbook describes eight key principles of cumulative effects analysis, including three with particular bearing on this Study:

- Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.
- The list of environmental effects to be analyzed must focus on those that are truly meaningful.
- Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects based on its own time and space parameters.

These principles are cornerstones of performing and understanding cumulative analyses. For instance, societal or governmental expressions of concern or scientific information about a resource or type of cumulative effect can provide an indication of what effects are meaningful. Identifying meaningful effects requires an understanding of how society values particular resources and ecosystems and the magnitude and significance of specific impacts on those resources.

The CEQ Handbook explains that analyzing cumulative effects differs from the traditional approach to environmental impact assessment because it requires expanding the geographic boundaries and extending the time frame to encompass additional effects on the resources, ecosystems, and human communities of concern. A cumulative effects analysis considers both project-specific impact boundaries such as the project footprint, and the area in which cumulative effects may be meaningful, such as a landscape, an ecosystem, or a community. The timeframe for analysis may also be similarly narrow with respect to project impacts, and broad with respect to cumulative effects, to account for past, present and future actions. In project-specific NEPA analysis, the description of the affected environment is based on a list of resources that may be affected by the proposed project. In a cumulative effects analysis, the analyst must attempt to identify and characterize effects of other actions on those same resources.

NEPA environmental analysis is forward-looking, and effects of past and present actions are often considered as part of the baseline or existing environment. The CEQ Handbook explains that the timeframe for a project analysis does not usually extend beyond the point at which the project-specific impacts become insignificant; however, it may be necessary to expand the time frame to encompass effects occurring further into the future if the effects of the project could combine with the effects of other projects beyond the time frame of the proposed action. A cumulative effects analysis usually considers both the construction and operation phases of a project because they can have different types and magnitude of impacts, as well as the timeframes in which those impacts will occur.

The CEQ Handbook also explains the importance of identifying the past, present, and future actions to be included in the analysis of cumulative effects. Proximity, synergy, similarity, and magnitude of impacts from those actions are all factors in considering the cause and effect between past, present, and future actions and specific resources, ecosystems, or human community.

Finally, the CEQ Handbook describes a variety of both qualitative and quantitative methods and tools for evaluating cumulative impacts. This Study uses quantitative spatial data reflective of the physical scale of offshore wind, the affected ecosystem, and the species present. Ultimately, the evaluation of the significance of cumulative effects, as of any environmental impacts, is based on context and intensity. The contexts considered are society as a whole, the affected region, the affected interests, and the locality.

1.2 Objectives of Study

This purpose of this Study is to assess potential cumulative effects from the conceptual development of 2.4 GW of offshore wind farms in the OSA, along with other actions and potential actions, and to provide an analytical framework for future analyses of specific projects. This consideration of potential cumulative effects is intended to support an optimized use of the OSA (more particularly, the area within the OSA that extends 15 nautical miles [nm] from the shoreline to the continental shelf break) that minimizes adverse impacts from the development of 2.4 GW of wind energy. The principal objectives of the study are to

1. Characterize the potential impacts of development of 2.4 GW of offshore wind farms based on a Model Project
2. Develop criteria for evaluating the significance of activities contributing to cumulative effects as a foundation for future cumulative analyses of specific projects
3. Assess potential cumulative effects for resources of key importance where impacts are expected to be greater than negligible

1.3 Regulatory Framework and Guidance

Compliance with NEPA requires an analysis of cumulative effects for each action alternative being studied (40 CFR 1508.25[c][3])). Cumulative effects are the collective result of the incremental effects of an action that, when added to the impacts of other past, present, and reasonably foreseeable actions, would affect the same resources, regardless of what agency or person undertakes those actions (40 CFR 1508.7). The CEQ Handbook continues to serve as a resource across agencies today.

In 2012, the National Marine Fisheries Service (NMFS) published *Guidance on Cumulative Effects Analysis in Environmental Assessments and Environmental Impact Statements* for practical and cost-effective cumulative effects analyses focused on fishery management applications in the Northeast Region (NMFS 2012).

BOEM performs NEPA analyses for federal actions under its jurisdiction, including offshore renewable energy projects. Over the course of the commercial lease and development process for any offshore renewable energy projects on the OCS, BOEM must prepare at least two NEPA reviews. For competitive and noncompetitive leases, BOEM must conduct a NEPA review of the lease or lease sale and Site Assessment Plan (SAP) activities and a separate NEPA review for the Construction and Operations Plan (COP) activities (MMS 2009a). BOEM regulations related to “Renewable Energy Alternate Uses of Existing Facilities on the Outer Continental Shelf” (30 CFR Part 585) direct applicants submitting SAPs or COPs to provide sufficient data and information for the agency to complete the necessary NEPA analyses (30 CFR Part 285).

The State intends that this Study will inform future development of proposed leases in a manner consistent with BOEM’s NEPA review practices. Therefore, this Study undertakes to follow relevant NEPA regulations and guidance. BOEM’s practices in implementing NEPA for development of offshore wind projects are reflected in prior NEPA analyses and also guided this analysis. In addition, the thousands of wind turbines in Europe and their regulatory and operating history offer guidance for considering cumulative effects of offshore development. The lessons learned during their permitting, construction, and operation provide benchmarks for comparable impact studies.

1.4 Methodology

This methodology for assessment of the potential cumulative effects follows a stepwise process consistent with CEQ guidelines and typical implementation within a NEPA analysis. The five steps described below and illustrated in Figure 1 apply the principles and approach outlined by the CEQ Handbook.

Step 1: Identify Potential Impacts of Model Project (400 MW). The assessment begins with a Model Project description conceptualized as one of several offshore wind farms that could make up the State’s goal of 2.4 GW of offshore wind energy and identification of construction and operation activities with the potential to impact environmental, cultural, and socioeconomic resources in the geographic scope of analysis for each resource. The types of potential impacts reflect the “impacting factors” from BOEM’s *Guidelines for Information Requirements for a Renewable Site Assessment Plan* and *Guidelines for*

Information Requirements for a Renewable Energy Construction and Operations Plan (BOEM 2016a, 2016b). For example, BOEM considers the potential impacting factors for biological resources to include activities that disturb the sea bottom, introduce sound, displace, result in injury or death, etc. The magnitude of potential impacts, adapted from BOEM, are classified as negligible, minor, greater than minor, or beneficial. This assessment carries forward to the cumulative impact analysis the potential impacts considered as minor, greater than minor, or beneficial. Section 2.1 summarizes the results of this step; Appendix A provides the detailed assessment.

Step 2: Evaluate Value and Sensitivity of Environmental, Cultural, and Socioeconomic Resources.

The next step first considers the value and sensitivity of the resources in order to focus this Study on resources anticipated to be of most importance in the long-term development of offshore wind farms, then develops geographic and temporal scopes of analysis for these key resources. Resources anticipated to be of greatest importance are those that meet a majority of the value and sensitivity criteria and on which wind energy development is likely to have a beneficial incremental impact. Per the CEQ Handbook, the cumulative analysis must establish the geographic scope to encompass additional effects on the resources of concern (CEQ 1997). The geographic scope encompasses the AoA for each resource, plus additional area in which cumulative effects on the resource may occur. Section 2.2 summarizes this analysis.

Step 3: Identify Potential Impacts of Past, Present and Reasonably Foreseeable Activities Similar to Model Project.

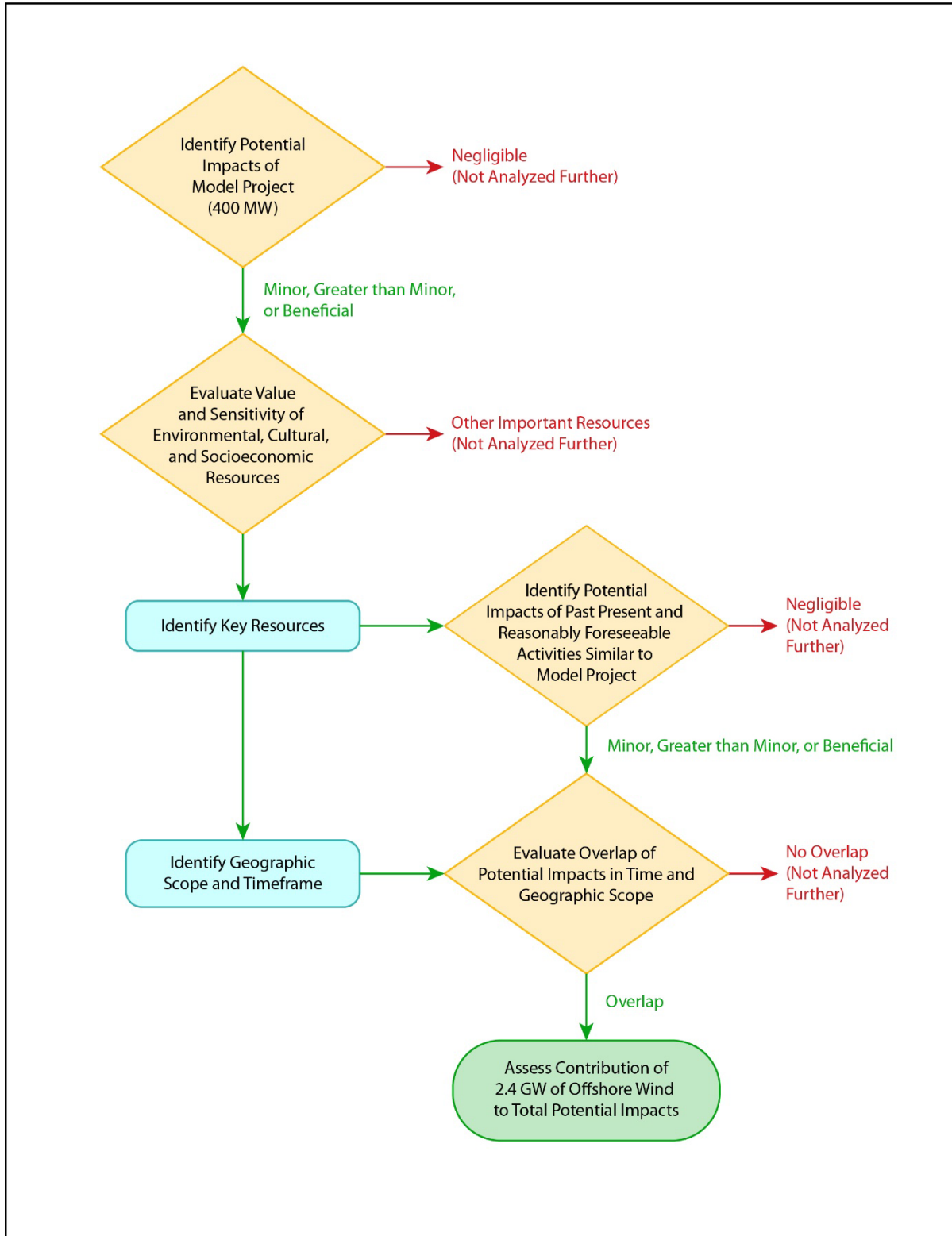
Activities that occur along the Atlantic coast and within the geographic scope of the cumulative analysis and that could have potential impacts similar to the Model Project were identified and assessed. Using the same criteria as those described for the assessment of impacts of the Model Project, the type and magnitude of potential impacts (i.e., negligible, minor, greater than minor, and beneficial) from past, present, and reasonably foreseeable activities are described. Appendix B provides the detailed assessment. The analysis carries forward the potential minor, greater than minor, or beneficial impacts similar to the Model Project that overlap temporally and geographically with the potential impacts of conceptual wind farm development.

Step 4: Evaluate Overlap of Potential Impacts in Time and Geographic Scope. Cumulative impacts may occur when multiple activities have impacts on the same resources during the same timeframe and within the same geographic area. Appendix D compares the temporal and distance characteristics of each past, present, and reasonably foreseeable activity to determine whether an overlap could occur with the geographic scope of the key resources or the temporal scope of the construction and operation of 2.4 GW of offshore wind-energy farms. Section 2.3 summarizes the results of these two steps.

Step 5: Assess Contribution of 2.4 GW of Offshore Wind to Total Potential Impacts. The final step is a qualitative assessment and, when feasible, a quantitative assessment of the incremental potential impacts on resources of key importance from construction and operation of 2.4 GW of offshore wind-energy farms off the coast of the State when added to impacts of past, present, and reasonably foreseeable actions that overlap temporally and geographically with such wind energy development. Section 3 provides the final step of the cumulative analysis.

Figure 1. Methodology for Consideration of Potential Cumulative Effects

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2 Framework for Assessment of Potential Cumulative Effects

Section 2 presents an analytical framework for assessing potential cumulative effects during construction and operation of 2.4 GW of wind-energy farms—the goal of the Master Plan. Section 2.1 defines the Model Project; identifies expected avoidance, minimization, and mitigation measures that may be included for such a project; and summarizes potential impacts. Section 2.2 develops cumulative effects criteria, including the value of resources; geographic boundaries of the Model Project’s impacts and environmental and socioeconomic resources of key importance; and the duration of the potential impacts. Section 2.3 identifies relevant past, present, and reasonably foreseeable activities in the geographic scope of analysis, their potential similar impacts on key resources, and the potential for geographic and temporal overlap.

2.1 Model Project Description and Potential Impacts

The assessment begins with the development of a project description and analysis of potential impacts associated with construction and operation of the Model Project. Sections 2.1.1 through 2.1.3 summarize the Model Project’s characteristics; expected avoidance, minimization, and mitigation measures; and potential impacts. Appendix A provides a detailed description of the construction and operation activities associated with the Model Project; avoidance minimization and mitigation measures assumed to be incorporated into the design; and the analysis of the types and magnitude of potential environmental, cultural, and socioeconomic impacts.

2.1.1 Model Project Description

The proposed Model Project reflects a generating capacity similar to proposed projects in the region and that would be accommodated by the anticipated size of the first lease area. The Model Project is assumed to have a capacity of 400 MW. To generate 400 MW of energy, 50 wind turbine generators (WTGs) would be constructed for the Model Project, assuming that each WTG has a capacity of 8 MW. Table 1 summarizes key characteristics of the Model Project and its components. The Model Project components relevant to consideration of cumulative effects include the WTG foundation, electrical service platform (ESP), and the inter-array cables, as illustrated in Figure 2. A grid array of buried cables would collect electricity from the WTGs and direct it to the offshore ESP.

Table 1. Anticipated Design Characteristics of Model Project Components

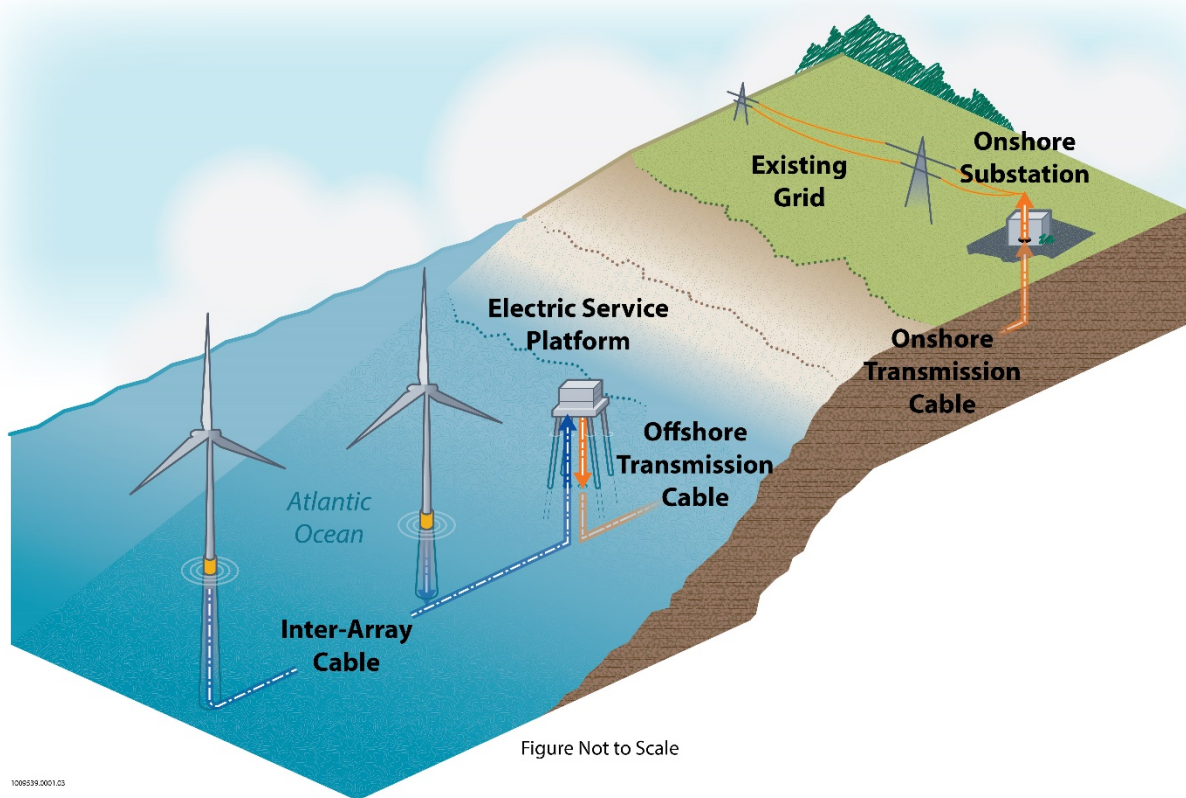
Component	Model Plan Design Characteristics	Description
Project Capacity	400 MW	Approximate output of a large-scale offshore wind project.
Lease Area	79,350 acres	The lease area corresponds to the first BOEM December 2016 auction for a 79,350-acre area.
WTG	8 MW	Projects in development today expect to use WTGs in the 6 to 8 MW range, with rotor diameters ranging from 417 to 590 feet (Windpower Monthly 2016).
Number of WTGs	50	Anticipated number assuming use of 8 MW WTGs and 400 MW of electrical output.
WTG Foundations	Monopile Foundation	A monopile foundation is a hollow steel pile driven into the seabed. An outer steel transition piece connects the steel pile with the WTG. The outer diameter of the monopile foundation matches the WTG tower mounting flange, which for 8 MW WTGs is approximately 23 feet (Energinet.dk 2015). In general, the monopile foundation is used at depths less than 98 feet based on economic factors.
	Jacket Foundation	A jacket foundation uses a four-legged steel lattice attached to the seabed, with piles at each corner. The expected diameter of each pile is up to 7 feet. The jacket foundation is generally utilized for deeper waters, due to the cost to manufacture and the transport equipment required.
Inter-Array Cables	66 kilovolt	The buried submarine inter-array cable transmits electricity generated from each WTG to the ESP.
Electrical Service Platform (ESP)	1 platform, with jacket foundation	An ESP provides the common electrical interconnection point for all of the WTGs. The inter-array cables interconnect with circuit breakers and transformers located on the ESP, which transmits electricity to the shore-connected cable system. The ESP uses a steel superstructure supporting a platform of 100 by 200 feet and a jacket foundation with six driven piles.

The ESP connects the Model Project to the onshore electric grid through a transmission cable buried in the sea floor; however, the scope of the analysis of the Model Project’s potential impacts does not include the potential impacts of the shore-connected cable system or the onshore activities. Each wind farm may connect directly to the onshore grid via one transmission cable, or multiple wind farms may connect to one transmission cable, or there may be a combination of these options. The location of the submarine cable systems for offshore wind activities is too speculative at this stage to arrive at any meaningful conclusions regarding the potential for specific effects; however, infrastructure activities, including potential connections associated with offshore wind development, are considered in the analysis of past, present, and reasonable foreseeable activities that could contribute to cumulative effects.

The Model Project components listed in Table 1 cover approximately 21 acres of sea floor assuming that all WTGs would be constructed using monopile foundations, or 92 acres assuming that all WTGs would be constructed using jacket foundations. These estimates sum the estimated footprint dimensions of the Project components, including the foundations and scour protection. The Model Project is located within a portion of the OSA that extends 15 nm from the shoreline to the continental shelf break.

The Model Project would use a spacing of approximately one mile between turbines (NYSERDA 2016). Within the Model Project lease area, WTG placement would likely avoid known obstacles and existing use conflicts such as shipping lanes, shipwrecks, underwater cables, navigational aids, and military practice areas, to the extent practicable. Similarly, the Model Project would likely avoid, to the extent practicable, locating WTGs near or anchoring on known sensitive seafloor habitats and ocean areas of high biological activity that support species protected under the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (BOEM 2016c).

Figure 2. Offshore Wind Farm Components



2.1.2 Avoidance, Minimization, and Mitigation Measures

Each offshore wind farm developer will perform geophysical and geological surveys, hazards surveys, archaeological surveys, and biological baseline collection studies for the purpose of preparing a SAP and COP in compliance with BOEM requirements (30 CFR 285). Measures available to avoid, minimize, and mitigate impacts on environmental, cultural, and socioeconomic resources from offshore wind projects reflect the results of past surveys and the experience of developers and regulatory experts in the offshore wind and related industries, and consultations under the ESA, MMPA, and MSFCMA prepared for past projects. Table 2 summarizes these measures, which are assumed to be incorporated into the design of the Model Project for purposes of this analysis. In practice, different or additional measures may be identified for site-specific or design-specific conditions or based on evolving experience and information; not all of these measures may be necessary or applicable to every project.

Table 2. Summary of Potential Avoidance, Minimization, and Mitigation Measures Assumed to be Used as Part of the Project Design

Resource	Potential Avoidance, Minimization, and Mitigation Measures	Reference
Benthic Resources	Avoid locating near or anchoring on known sensitive seafloor habitats.	BOEM 2016a, 2016b; USACE 2014a
	Use dynamic positioning vessels and jet plow embedment to minimize sediment disturbance and alteration during cable-laying process.	Deepwater Wind 2012
	Use scour protection.	MMS 2009b; USACE 2014a
Fish	Consult with the NMFS to determine when to avoid construction activities based on species-specific migration and spawning behavior.	BOEM 2016a, 2016b, 2016c
	Consult with appropriate agencies to ensure activities are not likely to jeopardize a threatened or endangered species and are not likely to destroy or adversely modify designated critical habitat.	30 CFR 285.801
	Use soft starts, pingers, and other sound-reducing materials during construction.	Deepwater Wind 2012; USACE 2014a; BOEM 2016c
	Avoid using explosives during construction.	BOEM 2016a, 2016b, 2016c
	Use proper electrical shielding on cables to minimize electromagnetic fields.	BOEM 2016a, 2016b, 2016c

Table notes are at the end of the table.

Table 2 continued

Resource	Potential Avoidance, Minimization, and Mitigation Measures	Reference
Marine Mammals and Sea Turtles	Travel at reduced speeds and maintain a reasonable distance when whales, small cetaceans, and sea turtles are present.	BOEM 2016a, 2016b, 2016c
	Comply with NMFS Regional Viewing Guidelines while in transit and NOAA vessel strike avoidance measures.	Deepwater Wind 2012
	Avoid construction activities based on species-specific migration and breeding behavior.	BOEM 2016a, 2016b, 2016c
	Follow federal regulations regarding vessel size, distance, and travel speed with consideration to North Atlantic right whales.	50 CFR 224
	Consult with appropriate agencies to ensure that activities are not likely to jeopardize a threatened or endangered species and are not likely to destroy or adversely modify designated critical habitat.	30 CFR 285.801
	Monitor for the presence of protected species within the exclusion zone radius established during the permitting process to avoid incidental take of threatened or endangered species.	BOEM 2016a, 2016b, 2016c; USACE 2014a; MMS 2009b
	Perform pile driving generally during daylight hours, starting 30 minutes after dawn and ending 30 minutes prior to dusk.	Deepwater Wind 2012
	Use soft starts and ramp-up procedures during construction.	Deepwater Wind 2012; USACE 2014a; BOEM 2012, 2016c
	Use noise reduction technologies during pile driving to reduce the sound levels in water.	Lucke et al. 2011; NYSERDA 2015
	Avoid using explosives during construction.	BOEM 2016a, 2016b
	Use proper electrical shielding on cables to minimize electromagnetic fields.	BOEM 2016a, 2016b
Birds and Bats	Evaluate areas of dense avian use and design projects to minimize or mitigate the potential for bird strikes and habitat loss.	BOEM 2016a, 2016b
	Use low-intensity strobe lights on turbines and identify other measures to discourage birds from perching on equipment during operation.	BOEM 2016a, 2016b
	Design turbine structures to minimize the potential for perch and roosting.	Palmquist and Gard 2017
	Consult with BOEM and other agencies, preferably three years before COP submission, to coordinate goals and expectations of a biological survey.	30 CFR 285.801
Cultural Resources	Avoid resources/sites identified through surveys and known resources, such as shipwrecks or other marine archaeological sites.	MMS 2009b; Deepwater Wind 2012
	Implement an Unanticipated Discovery Plan, including stop work and notification procedures, to address a potential encounter with a submerged potential archaeological resource.	Deepwater Wind 2012

Table notes are at the end of the table.

Table 2 continued

Resource	Potential Avoidance, Minimization, and Mitigation Measures	Reference
Visual Resources	Use U.S. Coast Guard (USCG)-approved lights at the base of towers that have a maximum visible range of 4.6 miles.	Deepwater Wind 2012
Recreation and Tourism	Inform mariners and boaters of construction activities and vessel movements.	BOEM 2016a, 2016b
Commercial and Recreational Fishing	Communicate with commercial and recreational fishing agencies to identify ways to minimize potential impacts of construction and operation of the project to their interests.	MMS 2009b
	Facilitate communication of construction activities and vessel movements through a project website, public notices to mariners and vessel float plans, and a fisheries liaison.	Deepwater Wind 2012
	Request deployment of fishing gear away from well-marked construction areas.	Deepwater Wind 2012
Aviation and Radar	Consider known obstacles and existing use conflicts, such as shipping lanes, navigational aids, and military practice areas during early stages of planning.	MMS 2009b
	Temporary notices submitted to the U.S. Department of Transportation's Federal Aviation Administration for cranes employed during construction.	Deepwater Wind 2012
	Closely match construction activities to Notices to Airmen, as published charts will not indicate the location of WTGs.	MMS 2009b
	Employ traffic management measures, establish a control center to maintain monitoring during operation, and/or provide mariners information on navigation safety issues.	MMS 2009b
	Use Federal Aviation Administration–approved marking and lighting to maintain daytime and nighttime visibility.	AC 70/7460-1L
	Use appropriate sound emitting apparatus to aid in navigation as described by the USCG.	30 CFR 67.10
Air Quality	Incorporate state, federal, and international guidelines on vessel emissions	BOEM 2016a, 2016b; International Maritime Organization Port Authority of New York and New Jersey Clean Air Strategy

Table notes are at the end of the table.

Table 2 continued

Resource	Potential Avoidance, Minimization, and Mitigation Measures	Reference
Water Quality and Sediment	Discharge water and wastewater, including bilge water, ballast water, and sanitary waste in compliance with USCG and federal regulations.	MMS 2009b
	Prepare and implement an Oil Spill Response Plan during construction and operations, if applicable, to prevent and/or minimize the occurrence of accidental spills of hazardous materials.	30 CFR 254
	The lessee must take measures to prevent unauthorized discharge of pollutants into offshore waters.	30 CFR 250.300
	Comply with the Bureau of Safety and Environmental Enforcement Notice to Lessee No. 2015-G03 for marine trash and debris awareness and elimination.	DOI BSEE 2015
	Install waste collection systems onboard each WTG using a container system for safe handling.	Deepwater Wind 2012
	Avoid disturbing known contamination areas and establish a buffer zone around areas of potential contamination such as dredged material placement areas.	NYSERDA 2010
	Conduct pre-construction surveys of sediments to be disturbed.	BOEM 2016a, 2016b
	Avoid known sand and gravel mining operations.	MMS 2009b

Note: The Model Project design does not incorporate specific measures related to socioeconomics.

2.1.3 Potential Impacts of the Model Project

Many NEPA analyses classify impacts as negligible, minor, moderate, and major. BOEM originally developed definitions for these levels of impacts in its Programmatic Environmental Impact Statement for alternative energy development on the OCS to provide consistency in its discussion of impacts (MMS 2007). For the purposes of this analysis, magnitudes of potential impacts are characterized as negligible, minor, greater than minor, and beneficial. The definitions of impact levels generally follow BOEM’s examples (BOEM 2015, 2016c). As used in this analysis, these impact levels are defined as follows:

- **Negligible** – No measurable impacts.
- **Minor** – Impacts on the affected resource that could be avoided with proper mitigation or, if impacts were to occur, the affected resource would recover completely without any mitigation once the impacting agent is eliminated.

- **Greater Than Minor** – Impacts where site-specific information and project design determine the ability of the affected resource to recover. Moderate impacts are unavoidable, and some impacts may be irreversible without mitigation; however, viability is not threatened and the affected resource will recover completely if proper mitigation is applied. Major impacts are also unavoidable and/or irreversible, the viability of the affected resource may be threatened, and the affected resource may not fully recover even if proper mitigation is applied.
- **Beneficial** – Impacts on the affected resource that could have short- or long-term benefits.

Appendix A provides a full description of the types and magnitude of potential environmental, cultural, and socioeconomic impacts on resources from the construction and operation activities associated with the Model Project. For a project to contribute to cumulative effects, its incremental impact to a resource must be greater than a negligible impact. Tables 3 and 4 summarize the conclusions regarding impacts considered minor, greater than minor, or beneficial for the Model Project during construction and operation, respectively, screening out negligible impacts from further analysis. As described in Appendix A, it is anticipated that potential impacts on bats, cultural resources, sediments, sand and gravel extraction, and aviation from the Model Project would be negligible. Similarly, potential impacts from accidental spills and vessel emissions would be negligible because of low probability, low magnitude, or the effectiveness of mitigation measures assumed in the Model Project design.

Table 3. Summary of Greater Than Negligible Potential Impacts During Construction of the Model Project

Resource	Types of Impacts	Magnitude		
		M	GTM	B
Benthic Resources	Turbidity and Suspended Sediments	✓		
Fish	Sensory Disturbance	✓		
Marine Mammals and Sea Turtles	Displacement/Habitat Disturbance, Loss, or Conversion		✓	
Birds	Injury or Mortality	✓		
Socioeconomics	Employment and Investment			✓
Recreation and Tourism	Conflicts with Use of Space	✓		
Commercial and Recreational Fishing	Conflicts with Use of Space	✓		
Radar	Conflicts with Use of Space	✓		
Water Quality	Turbidity and Suspended Sediments	✓		

Key:

B = Beneficial

GTM = Greater Than Minor

M = Minor

Table 4. Summary of Greater Than Negligible Potential Impacts During Operation of the Model Project

Resource	Type of Impacts	Magnitude		
		M	GTM	B
Fish	Habitat Conversion	✓		
Birds	Displacement/Habitat Disturbance or Conversion Injury or Mortality	✓		

Table notes are on the next page.

Table 4 continued

Resource	Type of Impacts	Magnitude		
		M	GTM	B
Visual	Aesthetic Disturbance	✓		
Socioeconomics	Employment and Investment			✓
Commercial and Recreational Fishing	Conflicts with Use of Space	✓		
Radar	Conflicts with Use of Space	✓		
Air Quality	Avoided Emissions			✓

Key:

B = Beneficial

GTM = Greater Than Minor

M = Minor

2.2 Cumulative Effects Criteria

Section 2.2 develops the boundaries of the analysis using geographic scope, the value and sensitivity of the environmental, cultural, and socioeconomic resources, and the duration of the impacts. The cumulative effects criteria were applied only to the resources carried forward as a result of the potentially minor or greater impacts described in Section 2.1.

2.2.1 Value and Sensitivities

To focus on resources expected to be of greatest importance, this analysis considered the resources' value and sensitivity. The value classification of a resource reflects legislative and regulatory protections and stakeholder concern, and sensitivity is defined by the magnitude of potential impacts and associated concerns for potential cumulative effects. Table 5 summarizes criteria describing these characteristics

and their applicability to the resources evaluated. These characteristics include a high level of concern or value expressed by society in general or by specific stakeholders; legislative or regulatory designations for protection, especially for species at risk; and other relevant factors. Resources of “key” importance are carried forward for further analysis, as shown in the methodology depicted in Figure 1.

Resource areas of key importance include fish, marine mammals and sea turtles, and commercial and recreational fishing because they meet the majority of the value and sensitivity criteria identified in Table 5. For example, the State recognizes the importance of its commercial and recreational fishing industry. Similarly, 16 National Oceanic and Atmospheric Administration (NOAA) Trust Resources (including fish and benthic species), 10 fish species of concern, and 143 fish, marine mammal, and sea turtle ESA-listed, candidate, or proposed species may be present within the geographic scope.

Table 5. Characteristics of Value and Sensitivity of Environmental, Cultural, and Socioeconomic Resources and Applicability to the Resources Evaluated

	Fish	Marine Mammals and Sea Turtles	Commercial and Recreational Fishing	Socio-economics	Air Quality	Benthic Resources	Birds	Visual	Recreation and Tourism	Radar	Water Quality
Stakeholders express concern for cumulative effects during scoping on other wind farms.	✓	✓	✓			✓	✓	✓	✓	✓	
State and federal agencies express concern about potential cumulative effects	✓	✓	✓							✓	
Legislative and regulatory designations for protection.	✓	✓	✓		✓	✓	✓			✓	✓
BOEM guidelines for minimizing disruption and disturbance.	✓	✓	✓	✓		✓	✓	✓	✓		✓
Concern for population level effects on marine resources.	✓	✓	✓								
Potentially incremental greater-than-minor impacts.		✓									

2.2.2 Geographic Scope of Analysis

The geographic scope for each resource is defined based on the cause and effect relationship of potential impacts and the space in which impacts may occur. Impacts of an activity often occur within only the immediate area affected by construction or operation of a project. Cumulative effects analysis should include large-scale groups and areas such as human communities, marine communities, and airsheds, in addition to the immediately impacted area of a single activity. The geographic scope for each resource expands this area and encompasses the natural boundaries of the resource such as species distributions and socioeconomic regions, and the area in which potential effects may extend beyond the area of direct impact. The geographic scope encompasses the AoA for the study associated with each resource and additional area in which cumulative effects on the resource may occur. Table 6 identifies both the geographic scope for each key resource identified in Section 2.2.1 based on the natural boundaries of the resource, and the area of potential impacts for offshore wind farms in the vicinity of the OSA. The rationale for each geographic scope and impact area is discussed in Sections 2.2.2.1 and 2.2.2.2. Figure 3 illustrates the geographic scope for fish, and marine mammals and sea turtles. Figure 4 illustrates the geographic scope for commercial and recreational fishing.

Table 6. Geographic Scope of Analysis for Key Resources and Area of Potential Impacts for an Offshore Wind Farm

Key Resource	Geographic Scope	Area of Potential Impacts for a Single Offshore Wind Farm
Fish Marine Mammals and Sea Turtles	1,000-meter area around the AoA	1,000-meter area around a project lease area
Commercial and Recreational Fishing	1,000-foot area around the AoA	1,000-foot area around a project lease area

2.2.2.1 Fish, Marine Mammals and Sea Turtles

As discussed in the *Marine Mammals and Sea Turtle Study*, which is appended to the Master Plan, the geographic scope of analysis for impacts on marine resources, including fish, marine mammals, and sea turtles, is extensive and broad, given the interdependent nature of these resources and their mobility (Figure 3). The natural boundaries of marine resources depend primarily on the species and the presence of defined spawning grounds or migration pathways. The OSA is located within waters designated as Essential Fish Habitat for 47 species, under the jurisdiction of the NOAA Fisheries Greater Atlantic Regional Fisheries Office. Similarly, the natural boundaries for species such as the fin whale,

North Atlantic right whale, humpback whale, sei whale, and sea turtles are extensive and broad. The highest concentrations of right whales occurs along the margins of the OSA, pinniped and sea turtle concentrations are low year-round throughout most of the OSA, and porpoises are broadly distributed throughout the OSA during the spring.

In addition to the areas where marine resources are naturally present, the area for potential cumulative effects extends beyond the area of direct impact to encompass potential changes in food web dynamics and foraging and reproductive behaviors, primarily related to the impacts of noise from pile driving during construction. While construction activities may be audible over great distances, studies indicate that injuries are more likely to occur close to high sound level sources and when exposed to multiple strike sounds. BEF Latvia, BEF Estonia, and EMI (2016) recommended this as the spatial extent of operation-related noise impacts on marine life from offshore wind farms. The geographic scope for marine resources is estimated as 1,000 m from the boundaries of the AoA, representing the distance at which sensory and displacement impacts from noise impacts may occur, including potential changes in foraging and reproductive behaviors. This geographic scope also encompasses areas with a known presence of specific species and defined spawning grounds of migration pathways determined by NOAA Fisheries.

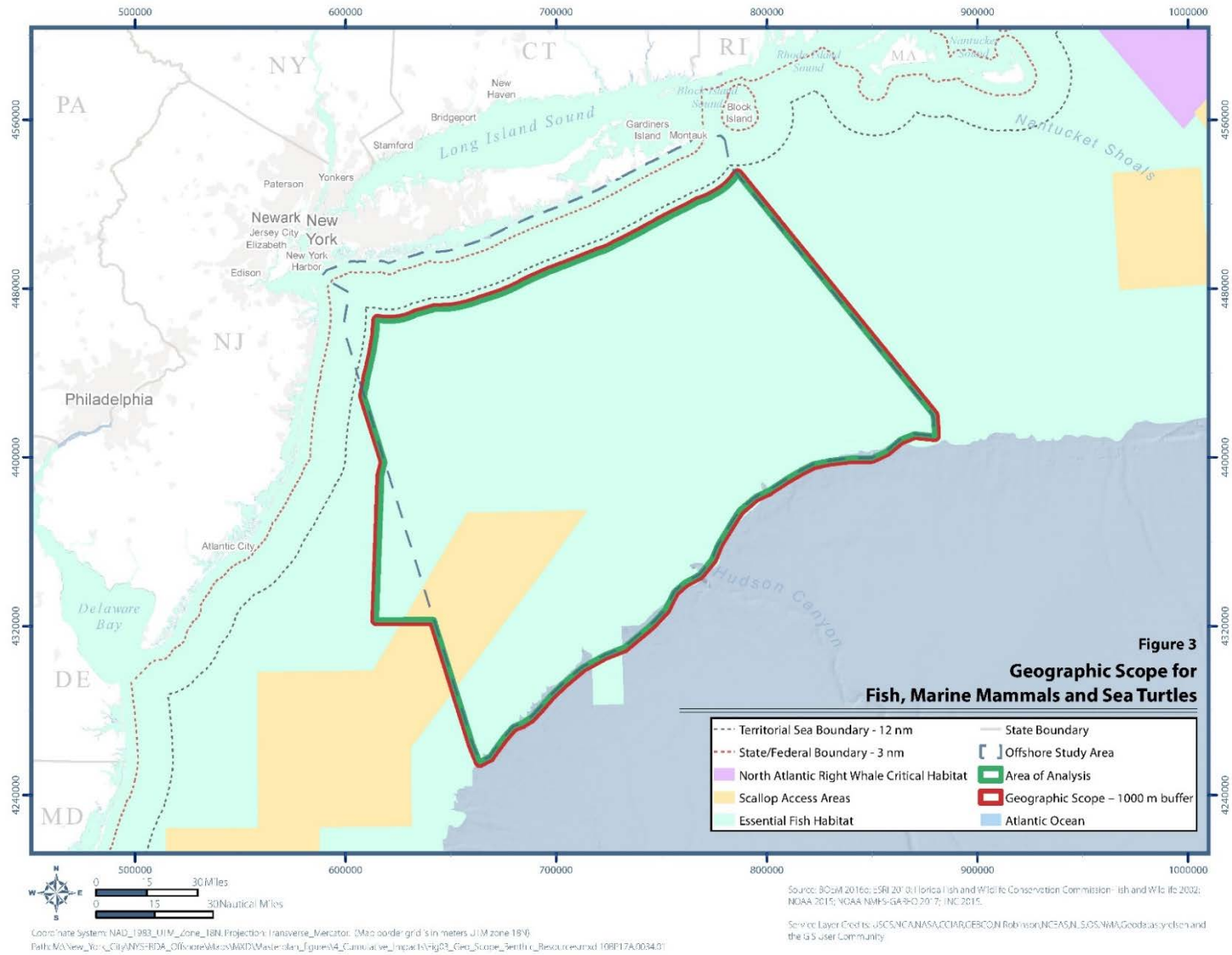
2.2.2.2 Commercial and Recreational Fishing

The geographic scope for analysis of commercial and recreational fishing is estimated as the boundaries of the AoA (Figure 4). The geographic scope of analysis is rich with fish targeted by commercial and recreational fishing. In addition, waters off New York and New Jersey substantially support recreational fishing activities (BOEM 2016c). Although New York State and the federal government do not anticipate imposing any restrictions on fishing among or around the wind turbines, which would be located approximately one mile apart from each other, at least some commercial fishers have stated that they intend to avoid the area occupied by WTGs.

The area of a project's impacts on commercial and recreational fishing stems from the presence of the WTGs that may create a barrier to use. Additionally, it is possible that newly introduced artificial reef-like habitat in previously open water column habitat may alter fish populations and typical catch seen by commercial and recreational fishers. The U.S. Coast Guard (USCG) typically assigns a 1,000-foot safety zone around WTGs (MMS 2009b). The 1,000-foot area of potential impact around a project lease area represents the boundaries of its impacts on commercial and recreational fishing.

Figure 3. Geographic Scope for Fish, Marine Mammals, and Sea Turtles

Source: BOEM 2016d; ESRI 2010; Florida Fish and Wildlife Conservation Commission – Fish and Wildlife 2002; NOAA 2-15; NOAA NMFS-GARHO 2017; TNC. 2015



2.2.3 Temporal Scope of Analysis

This cumulative analysis considers the timeframe of impacts from construction and operation of the Model Project and multiple offshore wind projects and the resilience of a resource against both temporary and permanent impacts. The Clean Energy Standard mandates that renewable energy provide 50% of New York State’s electricity needs by renewable energy by 2030, with the assumption that the contribution from offshore wind will be in place at that time. The operational lifetime of an offshore wind project is expected to be 30 years.

Table 7 provides a possible construction schedule for the Model Project, beginning in 2020, and for additional offshore wind projects off the coast of the State to reach a full build-out of approximately 2.4 GW of generation capacity to reach the renewable energy mandate by 2030. A construction timeframe of approximately two years was assumed for each project; larger projects may require longer construction periods.

Table 7. Potential Temporal Scope of Construction of Future Offshore Wind Energy

Installation Year	Size (MW)	Potential Number of Turbines
2020–2022	400	50
2023–2024	650	80
2025–2027	650	80
2028–2030	700	90
Total	2,400	300

Note: The estimated potential size and number are based on 8 MW turbines and the installation year, and assumes an approximate 2-year sequential construction schedule.

2.3 Past, Present, and Reasonably Foreseeable Activities

A cumulative impact analysis considers “the incremental impacts of the action when added to past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). This section identifies actions that may contribute to cumulative impacts with the development of offshore wind farms. The only actions considered are those with potential impacts similar to the Model Project. Literature reviews, agency outreach, and professional experience provided information on specific past, present, and reasonably foreseeable activities. Finally, using an Excel-based model and geographic information system (GIS) mapping, the temporal and geographic overlap of the activities was evaluated.

2.3.1 Activity Types and Potential Impacts

The following types of activities occur within the geographic scopes for key resources and have potential impacts similar to those of the Model Project:

- Offshore wind farms
- Infrastructure
- Coastal storm risk management
- Military use
- Dredging
- Ocean dredged-material disposal
- Commercial and recreational fishing
- Marine transportation

Table 8 describes these activity categories and identifies potential future trends or changes in these activities. Appendix B provides the evaluation of the nature of the similar potential impacts and the estimated magnitude of impacts for the key resources identified in Section 2.2.1. Table 9 summarizes the anticipated similar potential impacts of these activities with the Model Project.

2.3.2 Past, Present, and Reasonably Foreseeable Activities

Based on the screening for activities with potential impacts similar to the Model Project, Table 10 presents specific activities identified for consideration in the cumulative impacts analysis, including the following information for each activity:

- Name or sponsor/proponent.
- Activity type (e.g., biological surveys, infrastructure, etc.).
- Description.
- Status and timeline (e.g., proposed for May 2018, under construction, completed).
- Location.

Activities were identified through publicly accessible agency databases and websites and through agency consultation and outreach. Appendix C describes the process and primary information sources used for identifying past, present, and reasonably foreseeable activities and provides the responses to outreach from key agencies and stakeholders.

Table 8. Descriptions and Trends of Past, Present, and Reasonably Foreseeable Activity Types

Activity Type	Description and Trends
Offshore Wind Farm	Offshore wind farms are described in detail in Appendix A, Project Description and Potential Impacts. The Model Project incorporates industry standards for design, construction, and operation practices and federal and state guidelines for avoidance, minimization, and mitigation of impacts. The Energy Information Administration estimates purchase of more than 400,000 acres of federal leases for offshore wind in the mid-Atlantic region in 2017, reflecting a growing trend. New York State's goal is to encourage the development of 2,400 MW of wind energy by 2030.
Infrastructure	Infrastructure activities include installing telephone cables, transmission cables, and gas pipelines that are buried in the seabed to varying depths. Telephone cables from New York and New Jersey cross the Atlantic Ocean to landing points at various locations in Europe (MARCO 2017). Transmission cables and natural gas pipelines also cross the marine environment to connect to existing onshore facilities. Federal and state regulatory agencies with jurisdiction oversee the regulatory approvals and environmental assessments required to ensure compliance with regulatory standards and avoidance, minimization, and mitigation of impacts. Construction associated with infrastructure activities may include dredging, trenching, and backfilling for cables and pipelines and some vessels may be anchored. Excavation at any given location along the route would generally be limited to periods as short as a few hours and as long as a few weeks. Operation and maintenance activities consist of routine inspections and occasionally reburying or covering infrastructure to required depths. In the future, additional transmission cables would be needed to connect offshore wind farms to the existing transmission grid. Each wind farm may connect directly to the onshore grid via one transmission cable, or multiple wind farms may connect to one transmission cable, or there may be a combination of these options. Other infrastructure activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms.
Coastal Storm Risk Management	Coastal storm risk management activities include beach nourishment projects that use large volumes of outside sand resources. The U.S. Army Corps of Engineers (USACE) is responsible for these types of activities and undertakes environmental review as appropriate to identify measures for avoidance, minimization, and mitigation of impacts. Periodic re-nourishment design meets both prevention of long-term erosion and storm-survivability requirements via sand hydraulically dredged from offshore borrow areas. These projects can protect and create habitat for threatened or endangered species. Beach nourishment projects also can create and sustain socioeconomic benefits associated with wider beaches for recreational activities such as fishing and boating. In response to Hurricane Sandy in 2012, a number of projects have been implemented to reduce coastal storm damage risks, and other projects are planned. Coastal storm risk management activities are expected to increase throughout the construction and operation of offshore wind farms as funding becomes available in the future.
Military Use	Military use activities take place in military-designated spaces, restricting access to military personnel to perform various duties. Military use areas include munitions response sites, weapons training areas, military training routes, and military operations areas. Military uses also include vessel-borne radar and sonar systems. Activities within these areas involve air and vessel traffic that may include use of sonar and explosives. Military use activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms.
Dredging	The USACE uses a bucket or hydraulic cutter suction dredge to remove material from the seafloor to ensure safe navigation of vessel traffic. Periodic dredging activities at existing ports occur year-round. The Port of New York and New Jersey completed dredging to 50 feet in 2016 to accommodate larger vessels now transiting the recently expanded Panama Canal locks (PANYNJ 2015). Dredging activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms.
Dredged Material Ocean Disposal Sites	This activity group includes one active ocean disposal site that receives dredged material from public and private projects. The USACE issues permits for dredged material disposal in consultation with the U.S. Environmental Protection Agency and other federal agencies. Ocean disposal of dredged material activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms.

Table 8 continued

Activity Type	Description and Trends
Commercial and Recreational Fishing	Commercial and recreational fishing refers to fishing operations that sell their catch for profit, saltwater anglers that fish for sport, and subsistence fishermen (NMFS 2015). Fish can be caught using a variety of gear, including pots and traps, trawls and seines, gillnets, dredges, and hooks and lines. Commercial and recreational fishing activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms. Between 2010 and 2015, total commercial fishing landings (in pounds) and total landings revenue in New York State waters remained constant. Similarly, the amounts of recreational anglers and total fishing trips in this area were steady between 2010 and 2015 (NMFS 2015).
Marine Transportation	Marine transportation activities include the operation of vessels used for import and export services, construction work, recreational whale-watching, and cruise ships. General marine transportation activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms. Marine transportation activities for import and export services are expected to increase, although larger vessels may replace smaller vessels. The Port of New York and New Jersey completed dredging in 2016 to accommodate the 10,100 20-foot equivalent units (TEUs) cellular-capacity vessels now transiting the recently expanded Panama Canal locks. The average vessel calling on the Port of New York and New Jersey in 2016 has a capacity of 5,000 TEUs, meaning that new, larger ships will likely result in cargo coming in and out of the harbor on fewer ships. In addition, the new Panama class ships are the most advanced environmentally engineered ships afloat, dramatically reducing emissions per ship and emissions for total cargo handled (PANYNJ 2015).

Table 9. Summary of Potential Impacts of Activity Types on Key Resources

Key Resource	Potential Impacts Similar to Construction or Operation of the Model Offshore Wind Project							
	Model Offshore Wind Project	Infrastructure	Coastal Storm Risk Management	Military Use	Dredging	Ocean Dredged Material Sites	Commercial and Recreational Fishing	Marine Transportation
Fish	Sensory Disturbance	Sensory Disturbance	N	Sensory Disturbance	N	N	N	N
Marine Mammals and Sea Turtles	Displacement/Habitat Disturbance or Habitat Loss	Displacement/Habitat Disturbance or Habitat Loss	N	Displacement/Habitat Disturbance or Habitat Loss	Displacement/Habitat Disturbance or Habitat Loss	Displacement/Habitat Disturbance or Habitat Loss	N	Displacement/Habitat Disturbance or Habitat Loss
Commercial and Recreational Fishing	Conflicts with Use of Space	Conflicts with Use of Space	N	N	N	Conflicts with Use of Space	N/A	Conflicts with Use of Space

Key:

N = This activity is expected to have negligible impacts on the associated key resource.

N/A = Not Applicable.

Table 10. Past, Present, and Reasonably Foreseeable Activities

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Hurricane Sandy Reevaluation	Coastal Storm Risk Management	As a result of the impacts of Hurricane Sandy in 2012, recommendations were developed as part of the U.S. Army Corps of Engineers (USACE) response to the unprecedented destruction and economic damage to the communities within the project area. The plan along the Atlantic Ocean Shorefront and Jamaica Bay and Rockaway Inlet includes seawalls, beach nourishment with borrow sand, floodwalls, levees, and other activities. Estimated total construction cost is \$3.8 billion. A preliminary project schedule was prepared with a construction schedule of five years.	Draft Environmental Impact Statement completed August 2016	TBD	TBD	New York	USACE n.d.[a], 2016a; APM Institute and Logistics Management Institute 2017
Fire Island to Montauk Point Reformulation Study	Coastal Storm Risk Management	Construction of a beach berm and dune. The project provides for hurricane protection and beach erosion control along five reaches of the south shore of Long Island between Fire Island Inlet and Montauk Point, a distance of approximately 83 miles. The goal of the Reformulation Study is to identify storm risk management within the overall study area. After final report approval, a partnership agreement would be executed, allowing for initial construction of the various recommended project features. The Initial Project First cost is \$1.16 billion. The analysis uses a project base year of 2021, and a period of 50 years.	Final General Reformulation Report and Final Environmental Impact Statement by early 2019	2021	2071	New York	USACE n.d.[b], 2016b

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Jones Inlet to East Rockaway Inlet Storm Damage Reduction Project	Coastal Storm Risk Management	The project consists of a berm, dune and groin system that reduces risk against a 100-year storm event. The project's approximate volume of sand is 4,720,000 cubic yards. The project also includes rehabilitation of 17 existing groins and construction of up to four additional groins.	Ongoing	2016	2018	New York	USACE n.d.[c], 2015a
Hurricane and Storm Damage Reduction	Coastal Storm Risk Management	Occurring in Montauk Point, New York. The project consists of 840 feet of revetment, designed to a 73-year storm event to reduce risk to the historic Montauk Point Lighthouse complex from damage due to bluff failure. The project also provides reduction of risk to the various cultural resources associated with the lighthouse complex and stability to the natural environment that would support the continued use of the area as a recreational destination.	Design phase initiated in April 2017	TBD	TBD	New York	USACE n.d.[d], 2016c
Raritan Bay and Sandy Hook Bay at Union Beach	Coastal Storm Risk Management	The 2007 Authorized Plan is a beach berm and dune system with revetments, periodic nourishment over the 50-year life of the project, and two terminal groins along the Raritan Bayshore, with a system of levees and floodwalls provided along Chingarora and East Creeks and crossing Flat Creek.	Planning Stage	2022	2072	Monmouth County, New Jersey	USACE n.d.[e], 2016d

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Sandy Hook to Barnegat Inlet Beach Erosion Control	Coastal Storm Risk Management	The project involves constructing a 100-foot-wide berm, modifying three of the six larger stone groins, placing two feeder beaches to facilitate longshore sediment transfer past two of the remaining unmodified groins, modifying 17 existing stormwater outfalls, and a beach renourishment cycle of every six years for 32 years at an expected volume of 900,000 cubic yards of sand per cycle.	Ongoing	2014	TBD	Monmouth County, New Jersey	USACE n.d.[f], n.d.[g]
Commercial and Recreational Fishing	Commercial and Recreational Fishing	Commercial and recreational fishing refers to fishing operations that sell their catch for profit, saltwater anglers that fish for sport or subsistence fishermen, and aquaculture.	Ongoing	Ongoing	Ongoing	New York	Northeast Ocean Data Portal n.d.[a]
New York State Department of Environmental Conservation (DEC) Reef Program	Commercial and Recreational Fishing	The DEC is expanding three existing artificial reef sites within three miles of the Long Island coastline, at a total of 164 to 1,275 acres. They are also planning the creation of one new site within 15 miles of the Long Island coastline, at 850 acres, that is within federal waters.	Ongoing	Ongoing	Ongoing	New York	
USACE/BOEM/DOS Aquaculture	Commercial and Recreational Fishing	Manna fish farming is a potential offshore aquaculture project.	Unknown	Unknown	Unknown	Unknown	Holmyard 2016; Singh-Roy 2017
East Rockaway Inlet Maintenance Dredging	Dredging	The existing federal navigation project at East Rockaway Inlet provides for a 0.9-mile long channel 12 feet deep (mean low water), 250 feet wide, from a 12-foot depth contour in the Atlantic Ocean to a 12-foot depth contour in East Rockaway Inlet, New York.	Ongoing	Ongoing	Ongoing	New York	USACE n.d.[h]

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Rockaway Inlet Federal Navigation Channel Maintenance Dredging	Dredging	Project includes maintenance dredging of the East Rockaway Inlet Federal Navigation Channel and deposition basins with placement of 250,000 cubic yards of dredged material along the Far Rockaway southern shoreline in Queens County, New York.	Ongoing	Ongoing	Ongoing	New York	USACE n.d.[i], 2016e
Shark River Maintenance and Stewardship	Dredging	Shoals located at the entrance to the inlet continue to develop and are dredged annually in late spring. They were last dredged in July 2015. These same recurring shoals were previously dredged in 2015, 2014, 2013, 2012, and then on average every 6 months going back to 2006. Each time, approximately 25,000 to 30,000 cubic yards of dredged material was removed and placed north of the L-jetty at the Borough of Avon-by-the Sea as a near shore berm in approximately 10 to 14 feet of water for beneficial use purposes so that the sand can continue to nourish the down drift sand beaches. Dredging activities will be adjacent to the Atlantic coastline west of the AoA. Estimated annual federal cost is \$840,000.	Ongoing	Ongoing	Ongoing	New York	USACE n.d.[j]

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
USACE/BOEM/DOS Sand Borrow Area	Dredging	This project is investigating potential sand borrow area for beach renourishment.	Unknown	Unknown	Unknown	Unknown	
Neptune Cable	Infrastructure	The Neptune project provides up to 660 MW of electric power from the PJM Interconnection system to the Long Island Power Authority (LIPA) grid on Long Island via a 500-kilovolt, direct current (DC) cable. The DC cable extends between two converter stations: one in Sayreville, New Jersey, and one on Duffy Avenue in the community of New Cassel in the Town of North Hempstead. The DC cable runs approximately 50 miles under the Raritan River in New Jersey and the Atlantic Ocean, with an additional 15 miles buried alongside the Wantagh Parkway. The project interconnects to PJM in Sayreville at a nearby First Energy substation, and interconnects to the LIPA system at the Newbridge Road substation in Levittown. According to the LIPA, an economic assessment conducted prior to construction projected that the Neptune cable would provide about \$1.4 billion in net benefits to the LIPA.	Operating	2005	2007	New York and New Jersey	Neptune Regional Transmission System 2013a, 2013b

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Poseidon Transmission Anbaric Development Partners	Infrastructure	<p>The 78-mile Poseidon transmission line will begin in South Brunswick, New Jersey and connects to Long Island at the Ruland Road substation in Melville, New York. From Raritan Bay, it will be buried underwater in the outer New York Harbor and Atlantic Ocean until it reaches Long Island. The project received interconnection approvals from the PJM Interconnection and the New York Independent System Operator. Poseidon Transmission filed an Article VII application with the New York State Public Service Commission in September 2013. The Submarine Cable will make landfall at Jones Beach via horizontal directional drilling up to approximately 2,000 feet long. The Submarine Cable will be installed by a jet plow device that uses a process known as simultaneous lay and burial. Plans are to begin operations in 2020. Anbaric and Invenergy partnered to combine the transmission line developed by Anbaric with new onshore wind and solar farms, developed by Invenergy, called the Clean Energy Link.</p>	Unknown	TBD	2020	New York and New Jersey	LCG Consulting 2015; Poseidon Transmission LLC 2013, 2017

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Rockaway Delivery Lateral	Infrastructure	This project created a new delivery point in New York City through the construction of a new 3.2-mile pipeline connecting the Transco pipeline's existing Lower New York Bay Lateral to the Rockaway Peninsula. The project included one mile of horizontal directional drilling and 2.2 miles of conventionally laid 26-inch pipeline connected to the existing Transco system by two 18-inch hot taps and a subsea manifold used for maintenance and testing.	Operating	2014	2015	New York and New Jersey	FERC n.d., 2014
Cables, Pipelines, and Other Infrastructure	Infrastructure	Infrastructure activities include telephone cables, transmission cables, and gas pipelines buried in the seabed to varying depths. Telephone cables from New York and New Jersey cross the Atlantic Ocean and with landing points at various locations in Europe. Transmission cables and natural gas pipelines cross the marine environment to connect existing onshore facilities.	Ongoing	Ongoing	Ongoing	New York and New Jersey	MARCO 2017; TeleGeography n.d.

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Drift and Floatables Collection	Marine Transportation	The project consists of locating, collecting, removing, and disposing of up to 530,000 cubic feet of drift and floatables per year, or 225 forty-foot highway tractor-trailers. Drift collection vessels are used on a daily basis to collect large floating drift that is a threat to the many deep-draft cargo carriers and petroleum tankers, high-speed passenger commuter ferries, cruise ships and recreational vessels. The project is an ongoing year-round maintenance operation.	Ongoing	Ongoing	Ongoing	New York and New Jersey Harbor Estuary	USACE n.d.[k]
Prevention of Injurious and Obstructive Deposits	Marine Transportation	This continuing maintenance project involves the detection, investigation, and supervision of the removal of hazards and obstructions to navigation, in order to avoid serious jeopardy to the large volume of commercial and recreational vessel traffic in New York & New Jersey Harbor and its associated channels. The project is a year-round maintenance operation, consisting of two coordinated functional areas: the operation of vessels, which perform routine patrols during regular operations, as well as special surveillance and immediate response when required, and carrying out inspections, investigations, case management, and case resolution for specific incidents.	Ongoing	Ongoing	Ongoing	New York and New Jersey Harbor	USACE n.d.[l]

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Vessel Traffic	Marine Transportation	Marine Transportation activities include the operation of vessels used for import and export services, construction work, recreational whale watching, and cruise ships.	Ongoing	Ongoing	Ongoing	New York	Northeast Ocean Data Portal n.d.[b]
Martha's Vineyard Remedial Investigation	Military Use	The USACE, New England District conducted a Remedial Investigation/Feasibility Study (RI/FS) at three munitions response sites (MRSs) used to train naval aviators during and immediately following World War II. The sites are located or within the towns of Edgartown, Chilmark and West Tisbury, Martha's Vineyard, Massachusetts. The three MRSs include the former Cape Poge Little Neck Bomb Target Site, the Former Moving Target Machine Gun Range and Bomb Target Site at South Beach, and the former Tisbury Great Pond Bomb Site and Gunnery Range. The purpose of the project is to determine the nature and extent of munitions and explosives of concern and munitions debris at the MRSs. The objective of the RI/FS process was to gather information sufficient to support an informed risk management decision regarding which remedy appears the most appropriate for a given MRS.	Ongoing	Ongoing	Ongoing	Massachusetts	USACE n.d.[m], 2014b, 2015b
U.S. Coast Guard Weapons Training Areas	Military Use	Two existing weapons training areas located in the Sector New York area of responsibility are used to maintain law enforcement proficiency.	Existing	Ongoing	Ongoing	New York	USCG 2013

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
USCG Security Zone	Military Use	New York, Atlantic Ocean Marine Inspection Zone that USCG and Department of Homeland Security utilize to the security zone to protect personnel, vessels, and the surrounding waterway from terrorist acts, sabotage or other subversive acts, accidents, or other causes of a similar nature. Entry of vessels or persons into this zone is prohibited unless specifically authorized.	Enforcement activated whenever a vessel is anchored in the area described in paragraph 33 CFR 165.169 (a)(12)(i) or a USCG patrol vessel is on-scene.	Ongoing	Ongoing	New York	Federal Register 2009
Narragansett Bay Operating Area	Military Use	OPAREA consists of surface sea space and subsurface space. The offshore area provides infrastructure for U.S. Atlantic Fleet (surface and subsurface vessels) training and testing exercises.	Active during training/testing events.	Ongoing	Ongoing	New York, Rhode Island and Massachusetts	Ecology and Environment, Inc. 2016
Atlantic City Operating Area	Military Use	OPAREA consists of surface sea space and subsurface space. The offshore area provides infrastructure for U.S. Atlantic Fleet (surface and subsurface vessels) training and testing exercises. The offshore Atlantic City Range Complex additionally supports training and testing by other services, primarily U.S. Air Force units from nearby bases.	Active during training/testing events.	Ongoing	Ongoing	New Jersey	Ecology and Environment, Inc. 2016
Available Ocean Disposal Site for Dredged Materials	Ocean Dredged Material Sites	Active ocean disposal site that receives dredged material from public and private projects.	Ongoing	Ongoing	Ongoing	New York	

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Rhode Island Dredged Material Disposal	Ocean Dredged Material Sites	To ensure continued use, economic viability, and safety of the Rhode Island Region's navigation channels and navigation dependent facilities, periodic dredging must be performed to remove accumulated sediment. Through a site screening process, the U.S. Environmental Protection Agency identified two potential alternative open-water dredged material disposal sites that warranted a more detailed evaluation. If designated, one or more of these sites could be used for disposal of dredged material found suitable for open-water disposal from navigation projects and other sources from Rhode Island and southeastern Massachusetts.	Proposed. Designation only makes a site available for disposal	TBD	TBD	Rhode Island	USACE n.d.[n]
PNE Wind AG Statoil	Offshore Wind	There is competitive interest by both PNE Wind and AG Statoil in two parcels: OCS-A 0502 and OCS-A 0503, 248,015 acres and 140,554 acres respectively. PNE Wind proposes two 400 MW wind farms, and AG Statoil proposes "the more abstract idea of highlighting the overall potential of the area—which it determines is anywhere from 3 to 15 GW."	Proposed	TBD	TBD	Massachusetts	PNE Wind U.S.A., Inc. 2016; Statoil Wind U.S., LLC 2016a

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Cape Wind	Offshore Wind	Cape Wind will consist of 130 Siemens 3.6-MW offshore wind turbines with a capacity of 468 MW. Two-year lease suspension was approved by BOEM on July 24, 2015. During the lease suspension period, no construction or installation activities could occur. The lease suspension period expired July 24, 2017.	Fully Permitted	TBD	TBD	Massachusetts	DOE 2012; Cape Wind n.d.
Block Island Wind Farm	Offshore Wind	This Deepwater Wind offshore wind farm has a 30 MW capacity from five turbines. It has created 300+ jobs, and hopes to lower CO ₂ emissions by 40,000 tons/year (800,000 tons over 20-year lifespan).	Operating	2015	2016	Rhode Island	Deepwater Wind 2017a

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Bay State Wind	Offshore Wind	<p>An Ørsted and Eversource partnership project. In April of 2015, Ørsted secured newly assigned project development rights to a 300-square-mile ocean area 15 miles off the coast of Martha's Vineyard that was made available for lease by BOEM in a competitive solicitation. In August 2016, Massachusetts formally adopted a comprehensive energy bill that includes a first-of-its-kind mandate that state utilities purchase 1,600 MW of offshore wind power by 2027. The first state-led procurement process will begin in June 2017. This represents a landmark moment for the offshore wind industry in the U.S. Site OCS-A 500 is 187,523 acres and may have up to a 2,000 MW capacity. A Site Assessment Plan was approved by BOEM on June 29, 2017, which allows for installation of two floating light and detection ranging buoys and one metocean/current buoy.</p>	Approved SAP	TBD	2020	15 miles off the coast of Martha's Vineyard, MA	Renewables Now 2017; Tetra Tech, Inc. 2017
South Fork Wind Farm	Offshore Wind	<p>This Deepwater Wind project will generate 90 MW and will deliver energy to East Hampton, NY. It was approved in Jan 2017, and marine surveys are scheduled for summer 2017.</p>	Approved	2021	2022	New York	NYSERDA 2017 Deepwater Wind 2017b

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
NY4 Excelsior Wind Park	Offshore Wind	PNE Wind submitted a lease request in 2017 for 40,920 acres with 300 to 400 MW capacity and 30 to 50, 8 to 10 MW WTGs. Operations would begin no later than 2027.	Proposed	TBD	2027	New York	Delony 2017; 4C Offshore, Ltd. n.d.[a]
U.S. Wind Inc.	Offshore Wind	US Winds has a lease for 183,353 acres with a 1500 MW capacity. The lease for OCS-A0499 has been purchased. When constructed, the project will generate upwards of 1,500 MW of renewable energy—enough to power 640,000 homes. The SAP will be submitted on March 01, 2019.	Proposed	TBD	TBD	New Jersey	U.S. Wind, Inc. 2016; BOEM 2015
Ocean Wind	Offshore Wind	The RES American Developments Inc. and Ørsted project is 160,480 acres, with a 1,000 MW capacity.	Proposed	TBD	TBD	New Jersey	Windpower Engineering and Development 2016; BOEM 2016e
Vineyard Wind	Offshore Wind	A Copenhagen Infrastructure Partners (and Avangrid Renewables partnership lease was secured in April 2015 for OCS-A 501, which is 166,886 acres and has the potential for 1,600 MW. The project was formerly listed as Offshore MW, LLC.	Proposed	TBD	2027	Massachusetts	MV Times 2017; Vineyard Wind n.d.
Deepwater ONE	Offshore Wind	Deepwater Wind won the first auction for exclusive rights to develop this 256-square-mile site in 2013. Potential 1,000 MW capacity to supply southern New England and Eastern Long Island.	Proposed	TBD	TBD	Rhode Island and Massachusetts	Deepwater Wind 2017c

Table 10 continued

Activity Name	Activity Type	Description	Status	Start or Construction Commencement Date	Completion or Operation End Date	Location	Source
Statoil Wind	Offshore Wind	Statoil Wind US, LLC won the bid for this project in December 2016, and the lease was secured April 1, 2017. It is projected to be a 400 to 600 MW project to start, but potentially may accommodate more than 1 GW of offshore wind.	Proposed	Unknown	Unknown	New York	Statoil Wind U.S., LLC 2016b; BOEM n.d.
Revolution Wind Farm and Battery Storage System	Offshore Wind	Tesla and Deepwater Wind will pair a 144 MW offshore wind farm with a 40 MW hour battery storage system. The construction is anticipated to be finished in 2022, if the project is approved.	Proposed	TBD	2023	Massachusetts	Shallenberger 2017; 4C Offshore, Ltd. n.d.[b]

2.3.3 Temporal and Geographic Overlap

Cumulative impacts may occur when multiple activities have impacts on the same resources during the same timeframe and within the same geographic area. The geographic and temporal overlap is evaluated using a Microsoft Excel–based model that compares the temporal and distance characteristics of each activity with the timeframe and geographic scope of the key resources. Table D-1 in Appendix D compares the temporal and distance characteristics of each past, present, and reasonably foreseeable activity to determine whether an overlap could occur with the geographic scope for the key resources or the temporal scope of the construction and operation of 2.4 GW of offshore wind-energy farms. Construction of the additional wind energy farms equivalent to a total of 2.4 GW are anticipated to occur sequentially as described above and may include one or more of the specific proposed offshore wind farms identified in Table 10.

Figures 5 and 6 show the locations of the specific past, present, and reasonably foreseeable activities that overlap in time and space and that have potential impacts on the same key resources. Figures 5 and 6 do not show activities that do not overlap the timeframe of the Model Project or the geographic scope of the key resources.

Figure 5. Activities within the Geographic Scope for Fish, Marine Mammals and Sea Turtles

Source: BOEM 2016d; ESRI 2010; Florida Fish and Wildlife Conservation – Fish and Wildlife 2002; NOAA 2015; NOAA NMFS – GARHO 2017; TNC 2015

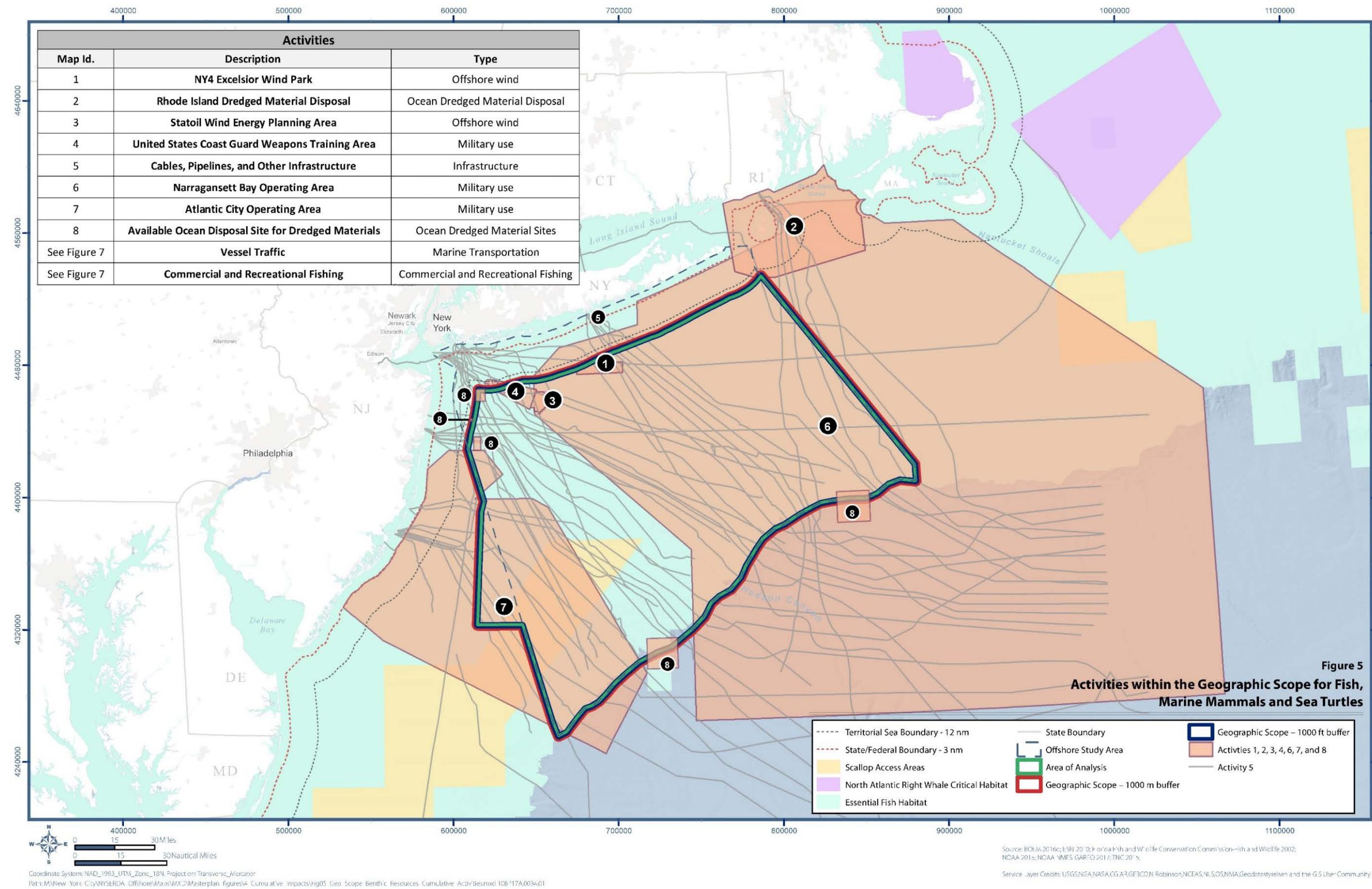
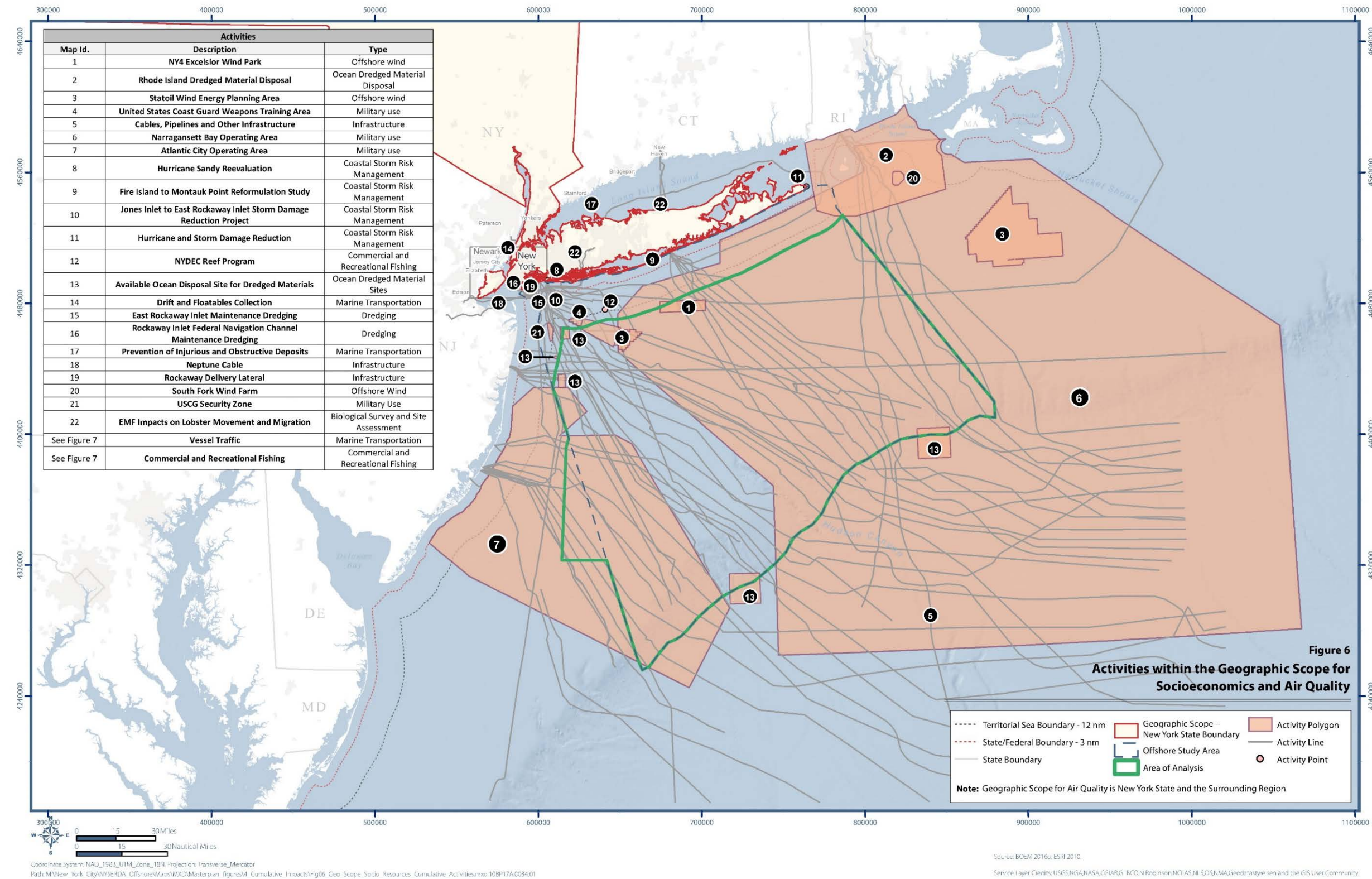


Figure 6. Overlap of Activities in the Geographic Scope for Commercial and Recreational Fishing

Source: BOEM 2016d; ESRI 2010



3 Assessment of Potential Cumulative Impacts

This section provides a qualitative assessment and, when feasible, a quantitative assessment of the incremental impacts on key resources from 2.4 GW of offshore wind farms when added to the past, present, and reasonably foreseeable actions that overlap in time and space. As described in Section 1.4, this analysis considers resources, activities, and impacts based on multiple screening criteria. Section 2.1 summarized the potential impacts of the Model Project, screening out negligible impacts from further analysis. Section 2.2 identified key resources carried forward for further analysis, screening out other important resources and defined the geographic and temporal scope of analysis. Section 2.3 identified activities with potential impacts similar to the Model Project that overlap temporally and geographically, screening out activities that do not overlap. As described previously, Figures 5 and 6 show the locations of the identified past, present, and reasonably foreseeable activities relative to the geographic scope of key resources and that overlap temporally with the development of offshore wind farms.

The resulting temporal overlap indicates potential for cumulative impacts during construction for

- Sensory disturbance to fish
- Displacement, disturbance, or loss of habitat for marine mammals and sea turtles
- Conflict with use of space for commercial and recreational fishing

The resulting temporal overlap indicates potential for cumulative impacts during operation for

- Conflict with use of space for commercial and recreational fishing.

The CEQ Handbook recommends quantitative data whenever relevant data are available. This analysis uses a quantitative method for evaluating cumulative impacts by considering the physical space affected. The full buildout of 2.4 GW of offshore wind farms would result in potential impacts similar to the Model Project in type and magnitude discussed in Appendix A, with some variations based on site-specific conditions. The full buildout of 2.4 GW of offshore wind energy projects represents approximately 300 WTGs. The full buildout is expected to potentially occupy approximately 240,000 acres that will depend on site-specific conditions and stakeholder input.

The potential impacts of 2.4 GW of offshore wind energy development are added to potential impacts of other activities in the geographic scope using acres of sea surface affected as follows:

- Potential cumulative impact area = area potentially affected by 2.4 GW + area potentially affected by other activities.

Finally, the incremental contribution of 2.4 GW of offshore wind energy development is assessed, in percentage of the potential cumulative impact.

3.1 Sensory Disturbance to Fish

Construction. The construction of 2.4 GW of offshore wind energy is expected to cause minor impacts on fish from sensory disturbance (noise) during pile driving, excavating, and vessel traffic. As discussed *Fish and Fisheries Study*, which is appended to the Master Plan, the greatest impact would arise from noise associated with pile-driving activities. Studies on noise generated from pile driving suggest that peak sound levels can range between 165 and 195 decibels (dB) within 10 m of the source and 135 dB within 1,000 m from the source. The distance of the avoidance response to the sensory disturbance is conservatively assumed to be at or beyond the 1,000 m area around the source of the noise where no injury would occur, according to injury thresholds established by the Fisheries Hydroacoustic Working Group (FHWG) and adopted by NOAA Fisheries (Buehler et al. 2015). As described in Appendix A, pile driving for monopole and jacket foundations occurs one at a time, sequentially, in appropriate sea and weather conditions. The area potentially affected by noise-related displacement during construction of a single pile, including a 1,000 m area around the piling, represents approximately 800 acres, or less than 0.01% of the geographic scope for fish. However, over the potential 10 years of construction of 2.4 GW of offshore wind farms, the area potentially affected by noise-related displacement, including a 1,000 m area around each assumed lease represents approximately 279,000 acres, or 3% of the geographic scope for fish. Activities expected to cause similar noise impacts on fish during construction include infrastructure and military use. Potential maintenance of the infrastructure activities could require excavation and would temporarily increase vessel traffic, which in turn would increase noise levels and duration above ambient conditions and increase noise impacts on fish. These impacts would not be similar to noise levels from pile driving. Military weapons training areas and operating areas involve underwater detonations, sonar use, and increased vessel traffic, all of which can contribute to noise impacts on fish. However, the increased noise levels would occur in temporary, isolated events and would be localized within the designated military training areas. The area potentially affected by military use activities in

the geographic scope for fish, including a 1,000 m area of potential impact, represents approximately 71,300 acres, or 1% of the geographic scope.

Cumulative effects on fish resources during construction of 2.4 GW of offshore wind in addition to the infrastructure and military use activities described above include increased noise and resulting potential displacement, which disrupts foraging and/or reproductive behaviors in fish. High levels of noise could also cause tissue damage, mask biologically important sounds, and may cause death. Fisheries provide dual criteria for potential injury to all fish species based on peak sound pressure level and cumulative sound exposure level depending on the weight of the fish (Buehler et al. 2015).). Because the potential noise impacts may exceed the cumulative sound exposure level criteria, fish are expected to relocate outside these areas. The potential cumulative impact area in which fish avoid sensory disturbance, is the sum of 279,000 acres and 71,300 acres, or approximately 350,000 acres, or 4% of the geographic scope for fish. The remaining 96% of the geographic scope would be available for fish to relocate to avoid sensory disturbance. As noted above, because pile driving for foundations occurs individually, at a given time the potential cumulative impact area could be significantly smaller. In this case, the potential cumulative impact area in which fish avoid sensory disturbance is the sum of 800 acres and 72,100 acres, or 1% of the geographic scope for fish, of which an individual pile driving accounts for approximately 1%.

Operation. Sensory disturbance impacts on fish from operation of the 2.4 GW offshore wind farms would be negligible, and thus no cumulative effects are expected.

3.2 Displacement, Disturbance, or Loss of Habitat for Marine Mammals and Sea Turtles

Potential cumulative effects on marine mammals and sea turtles include impacts from displacement, disturbance, or loss of habitat during construction.

Construction. The construction of 2.4 GW of offshore wind energy is expected to cause minor or greater impacts on marine mammals and sea turtles from displacement, disturbance, and loss of habitat due to temporary increases in noise associated with pile driving, excavating, and increases in vessel traffic that could displace species into areas of high activity, thereby increasing the chance of collisions. As discussed in Appendix A and the *Marine Mammals and Sea Turtle Study*, which is appended to the Master Plan, displacement increases the chance of vessel collisions with marine mammals particularly for at-risk species such as the fin whale, North Atlantic right whale, humpback whale, and sei whale.

No serious injury/mortality to marine mammals and sea turtles from development and operation of offshore wind farms is expected due to avoidance and minimization measures detailed in Table 2 of Section 2.1.2. Additionally, all activities would follow consultation with state and federal agencies and comply with the MMPA and ESA to minimize potential impacts. The area potentially affected by displacement for 2.4 GW of offshore wind farms, including a 1,000 m area of potential impact, represents approximately 279,000 acres, or 3% of the geographic scope of analysis for marine mammals and sea turtles.

Activities expected to cause similar noise and displacement impacts on marine mammals and sea turtles include infrastructure, military use, dredging, ocean disposal of dredged materials, and marine transportation. Maintenance of the infrastructure activities could potentially require excavation and temporarily increase vessel traffic, which in turn would increase noise and the possibility of displacement of marine mammals and sea turtles. The ongoing activities within military use areas (underwater detonations, sonar, and increased vessel traffic) and dredging and ocean disposal of dredged materials will contribute noise and displacement impacts on marine mammals and sea turtles. However, the increased noise impacts would occur in temporary, isolated events and would be localized within the designated military training areas. Marine transportation vessels may displace marine mammals and sea turtles from typical foraging and reproductive grounds as they are expected to avoid shipping corridors. The area potentially affected by military use activities and marine transportation in the geographic scope for marine mammals and sea turtles, as shown in Figure 5, including a 1,000 m area of potential impact, makes up approximately 766,000 acres, or 8% of the geographic scope.

Cumulative effects on marine mammals and sea turtles during construction of the 2.4 GW of offshore wind energy in addition to the activities described above may cause marine mammals and sea turtles to move into areas of higher vessel traffic. The potential cumulative impact area of displacement is the sum of 279,000 acres and 766,000 acres, or approximately 1 million acres or 11% of the geographic scope, leaving 89% of the geographic scope available for marine mammals and sea turtles to avoid collisions. Of this potential cumulative impact area, the incremental contribution of 2.4 GW of offshore wind represents approximately 27%. However, the area of potential displacement for 2.4 GW of offshore wind represents only 3% of the geographic scope for marine mammals and sea turtles. In addition, because of the anticipated sequential construction schedule of each offshore wind farm, overlap of construction is unlikely or minimal and it is not expected that this entire area would be affected at the same time.

Operation. Negligible displacement, disturbance or loss of habitat impacts on marine mammals and sea turtles are expected during operation of the 2.4 GW of offshore wind farms and therefore no cumulative effects are expected.

3.3 Conflict with Use of Space for Commercial and Recreational Fishing

Potential cumulative impacts on commercial and recreational fishing involve conflicts over use of space that can lead to the displacement of fish and fishers. Commercial and recreational fishing concerns associated with displacement typically include gear and vessel damage, financial risk, exclusion from typical areas and types of fishing, navigational hazards, and alteration of existing fish populations.

Construction and Operation. Construction and operation of 2.4 GW of offshore wind farms is expected to limit certain fishing practices, restrict access to fish, and/or displace fish from traditional fishing areas. The area potentially affected by 2.4 GW of offshore wind farms during construction and operation, including a 1,000-foot area of potential impact, represents approximately 251,000 acres, or 3% of the geographic scope for this resource, where commercial and recreational fishing may be restricted or excluded.

Activities expected to cause similar impacts on commercial and recreational fishing include infrastructure and marine transportation. The infrastructure activities that overlap with the geographic scope include the various telephone cables from New York and New Jersey crossing the Atlantic Ocean to landing points at locations in Europe. In the future, construction and operation of transmission cables connecting the offshore wind farms to the grid could also contribute to displacement due to the conflict with the use of the same space. As shown in Figure 6, a high density of commercial and recreational fishing currently occurs in the geographic scope, represented by multispecies fisheries activities from 2011 to 2014. Assuming that commercial and recreational fishers completely avoid infrastructure areas, including a 1,000-foot area of potential impact, the area potentially affected totals approximately 918,000 acres, or 10% of the geographic scope. Figure 6 also shows the density of existing vessel activity, including shipping routes, fairways, speed restriction areas, and traffic separation schemes as determined by a BOEM and NOAA data initiative program (NOAA 2017). However, the intermittent nature of vessel transportation does not permanently exclude fishing practices, restrict access to fish, or displace fish.

Construction and operation of 2.4 GW of offshore wind energy in addition to the infrastructure and marine transportation activities described above could increase displacement of fishing activities due to the conflict in use of the same space. The potential cumulative impact area that could limit certain fishing practices, restrict access to fish, or displace fish, is the sum of 251,000 acres and 918,000 acres, or approximately 1.2 million acres, or 12% of the geographic scope of analysis for commercial and recreational fishing, leaving 88% of the area available for fishing without potential limitations. Of this potential cumulative impact area, the incremental contribution from the construction and operation of 2.4 GW of offshore wind energy farms represents approximately 22%. However, the area of potential displacement resulting from construction and operation of 2.4 GW of offshore wind energy represents only 3% of the geographic scope for commercial and recreational fishing.

4 References

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Appendix A. Model Project Description and Potential Impacts

Construction and operation of a model offshore wind project (Model Project) based on current information, technology, and construction and operation techniques, provided the basis for a high-level project description and analysis of potential impacts related to offshore wind development off the coast of New York.

Section A.1 describes the Model Project and its construction and operation. Literature describing and analyzing these project components—reports pertaining to proposed and existing offshore wind farm projects on the East Coast—provided the bulk of the information for this section. Additional information on the potential impacts of different construction methods such as pile driving and excavations was obtained from literature and professional knowledge. Additionally, this analysis incorporates research and discussion of potential impacts associated with construction and operation of offshore wind projects from other studies being prepared on behalf of the State to inform the preparation of a Master Plan.

Section A.2 provides the anticipated approaches for avoidance, minimization, and mitigation of impacts incorporated as part of the Model Project design. These anticipated approaches reflect the literature reviewed and, particularly, the best management practices (BMPs) contained in the Bureau of Ocean Energy Management (BOEM) *Establishment of an OCS Alternative Energy and Alternate Use Program, Record of Decision Summarized in the Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan and Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan* (BOEM 2016b).

Section A.3 provides an analysis of potential impacts on environmental, cultural, and socioeconomic resources associated with construction and operation of the Model Project. Impacts include both beneficial and adverse effects on resources.

A.1 Model Project Description

A.1.1 Model Project Components

The proposed Model Project reflects a capacity similar to leading edge projects in the region and the size of the anticipated first lease area. The Model Project is assumed to have a capacity of 400 megawatts (MW). Assuming each wind turbine has a capacity of 8 MW, 50 wind turbines would be constructed for the Model Project. The Model Project components relevant to consideration of cumulative effects include the wind turbine generator (WTG), foundation, electrical service platform (ESP), and the inter-array cables. A grid array of buried cables would collect electricity from the WTGs and direct it to the offshore ESP. The ESP connects to the onshore electric grid through a transmission cable buried in the sea floor. The scope of this analysis does not include the shore-connected cable system or the onshore activities. Table A-1 and Figure A-1 summarize key characteristics of the Model Project and its components.

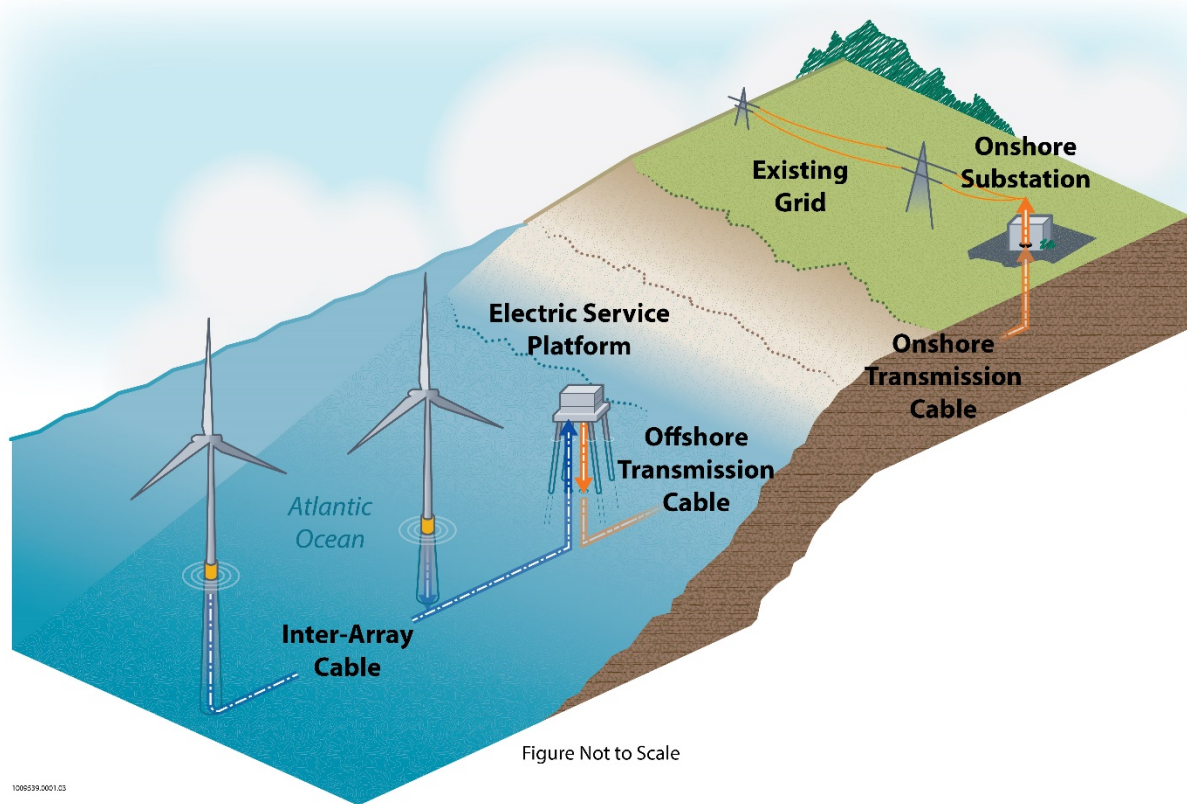
Within the offshore study area (OSA), depths to the sea floor range from less than 98 feet to more than 196 feet. The Model Project components listed in Table A-1 cover approximately 21 acres of sea floor, assuming all WTGs are constructed using monopile foundations, or 92 acres assuming all WTGs are constructed using jacket foundations. These estimates sum the estimated footprint dimensions of the Project components, including the foundations and scour protection.

Within the Model Project lease area, WTG placement would likely avoid known obstacles and existing- use conflicts, such as shipping lanes, shipwrecks, underwater cables, navigational aids, and military practice areas, to the extent practicable. Similarly, the Model Project would likely avoid locating near or anchoring on sensitive seafloor habitats and avoid ocean areas supporting species protected under the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), and Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), to the extent practicable.

Table A-1. Anticipated Design Characteristics of Model Project Components

Component	Model Plan Design Characteristics	Description
Project Capacity	400 MW	Approximate output of a large-scale offshore wind project.
Lease Area	79,350 acres	The lease area corresponds to the first BOEM December 2016 auction for a 79,350-acre area.
WTG	8 MW	Projects in development today expect to use WTGs in the 6 MW to 8 MW range, with rotor diameters ranging from 417 to 590 feet (Windpower Monthly 2016).
Number of WTGs	50	Anticipated number assuming use of 8 MW WTGs and 400 MW of electrical output.
WTG Foundations	Monopile Foundation	A monopile foundation drives a hollow steel pile into the seabed (Figure A-2). An outer steel transition piece connects the steel pile with the WTG. The outer diameter of the monopile foundation matches the WTG tower mounting flange, which for 8 MW WTGs is approximately 23 feet (Energinet.dk 2015). In general, the monopile foundation is used at depths less than 98 feet, based on economic factors.
	Jacket Foundation	A jacket foundation uses a four-legged steel lattice attached to the seabed, with piles at each corner (Figure A-3). The expected diameter of each pile is up to 7 feet. The jacket foundation is generally utilized for deeper waters, due to the cost of manufacturing and the transport equipment required.
Inter-Array Cables	66 kilovolt	The buried submarine inter-array cables transmit electricity generated from each WTG to the ESP.
Electrical Service Platform (ESP)	1 platform, with jacket foundation	An ESP provides the common electrical interconnection point for all of the WTGs. The inter-array cables interconnect with circuit breakers and transformers located on the ESP, which transmits electricity to the shore-connected cable system. The ESP uses a steel superstructure supporting a platform of 100 feet by 200 feet and a jacket foundation with six driven piles.

Figure A-1. Offshore Wind Farm Components



A.1.2 Construction and Operation of the Model Project

The following sections describe the construction and operation of the Model Project in the order of anticipated activities: vessel traffic, site preparation, foundations for the WTGs and ESP, inter-array cable installation, operation of the WTGs, and facility operation and maintenance. The descriptions focus on activities that potentially impact environmental, cultural, and socioeconomic resources.

A.1.2.1 Vessel Traffic to and from Port

Vessel traffic associated with the Model Project to and from existing port facilities using established shipping corridors in the New York City area during construction would include a wide variety of vessel types and sizes associated with the various stages of construction and operation, including large vessels, specialized vessels, barge traffic, and smaller vessels. Large-vessel traffic would include shipping the blades, likely from Europe, to an onshore assembly facility, where the tower sections would be constructed piece by piece (Kuffner 2016). Towers, blades, and transition pieces for the monopile foundations would be transported on barges to the lease area. Similarly, construction

of the piles, as well as the steel lattices for the jacket foundations, would occur on land, and vessels would transport the structures to the lease area. The jackets and transition decks likely would be fabricated in the U.S. Gulf of Mexico region and shipped to the lease area (Deepwater Wind 2012). Foundation installation vessels would travel from the port to the designated WTG locations. A specialized cable-transport vessel would deliver the inter-array cables to the cable installation barge at the lease area. Vessels generally operate with diesel-electric propulsion engines, although some use gas turbines propulsion systems.

Barges would transport three to four monopiles at a time to the work site (MMS 2009). This translates to approximately 13 to 17 trips for 50 monopile foundations. The jacket foundation would likely require fewer vessel trips given the smaller diameter (7 feet versus 23 feet), and lattice design (versus concrete). Barges would also deliver the ESP, fully fabricated on shore, to the installation site (MMS 2009).

Vessel speeds would vary depending on the type of vessel. Barges, tugs, and vessels delivering construction materials typically travel at 10 knots or less (Deepwater Wind 2012; MMS 2009). Crew boats that would deliver and return work crews to the lease area would travel at greater speeds, up to 21 knots (MMS 2009).

A.1.2.2 Vessel Traffic within the Lease Area

The number and types of vessels within the lease area would vary over the course of construction, depending on the component being installed. Barge and tug traffic within the lease area would include vessels to support foundation delivery and installation for the WTGs and the ESP and to stabilize the delivery vessels in the correct location and elevation. A dynamic-positioning cable-laying barge would be used to install the inter-array cables. Split hopper barges would be used for loading material excavated for any necessary seabed preparation (Ruiz de Temiño Alonso 2013). Crew boats would transport workers between work sites. Support vessels would host environmental and protected species monitors (Deepwater Wind 2012). Vessels and barges within the lease area would operate similarly to the vessels and barges transiting to and from port areas as above.

Installation of each WTG location would be supported by multiple vessels. Most of these vessels would be stationary or slow-moving barges and tugs conducting or supporting the installation (MMS 2009). A specialized vessel configured for the installation of the WTGs would carry the components necessary to erect up to eight WTGs (MMS 2009). The components would include transition pieces to place on the monopiles, towers, nacelles, hubs, and blades. Installation of each WTG may require up to 48 hours (Deepwater Wind 2012). The barges relocate to the next WTG location after each installation.

A.1.2.3 Vessel Positioning

Vessels would also serve as construction platforms for installation of various components, which in turn would necessitate stabilizing the platforms on location with either anchors or dynamic positioning systems, depending on the project component. Jack-up barges used to install monopiles and pilings for the ESP and jacket foundations would be anchored to the sea floor. Jack-up barges use up to six pads ranging from 9 to 20 feet in length and width (MMS 2009). After lowering the jack-up legs, the barge is raised to create a level work surface. Dynamic positioning used for cable laying minimizes sediment disturbance and alteration because the vessel maintains its position using thrusters instead of anchors.

A.1.2.4 Site Preparation

Before installing the jacket foundations for the ESP and WTGs, some seabed preparation may be necessary, particularly if the seabed is soft due to the presence of loose sand (NIRAS and Hjelmsted Consulting 2017). This may require dredging the first layer of material to reach a level of undisturbed soil (Ruiz de Temiño Alonso 2013). Similarly, before installing the inter-array cables, a vessel would follow the route to remove debris and provide clearance (Deepwater Wind 2012).

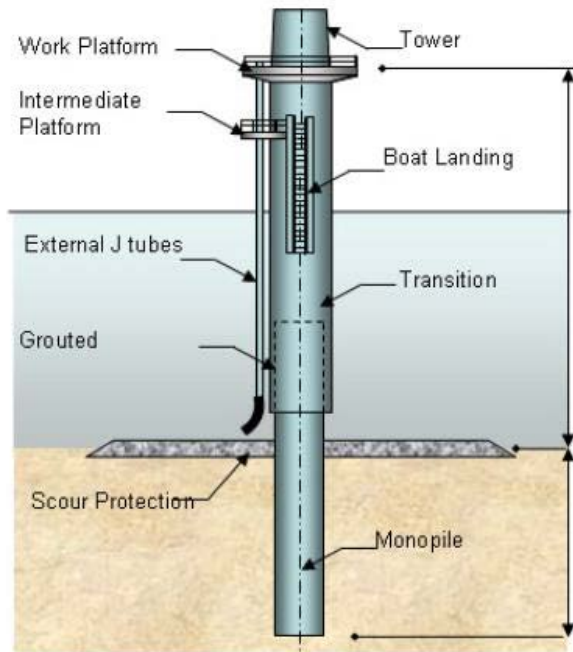
A.1.2.5 Foundations

A.1.2.5.1 Monopile Foundation

A monopile foundation is a hollow steel pile driven into the seabed (Figure A-2). The outer diameter of the monopile foundation for 8 MW WTGs is approximately 23 feet (Energinet.dk 2015). In general, the monopile foundation is used at depths less than 98 feet.

Figure A-2. Monopile Foundation

Source: NIRAS and Hjelmsted Consulting (2017)



If monopiles are used for the Model Project, a pile-driving ram or vibratory hammer would install the monopiles into the seabed (MMS 2009). The soft-start pile-driving method minimizes disruption and disturbance of marine life from sound emissions, as intended by BOEM's BMPs, to minimize disruption and disturbance to fish and marine life from pile driving sound emissions (BOEM 2016a). The impact hammer soft start requires three strike sets of increasing force, with a 1-minute wait period between each strike set.

Reaching the required depth depends on the geologic conditions at the site and typically requires 4 to 6 hours per monopile (NIRAS and Hjelmsted Consulting 2017). On average, the installation of a pile may require 4,000 to 6,000 hammer blows (Energinet.dk 2015). Installing a monopile and grouting a transition piece is estimated to require one day (NIRAS and Hjelmsted Consulting 2017). Generally, installation of foundations occurs one at a time, sequentially, and in appropriate sea and weather conditions. For 50 turbines, the installation of monopile foundations would require a minimum of 12 weeks, but likely more.

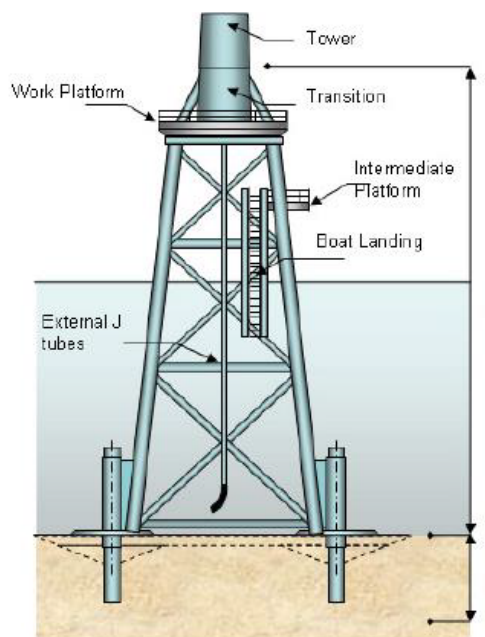
A.1.2.5.2 Jacket Foundation

A jacket foundation is a four-legged steel lattice attached to the seabed with piles at each corner (Figure A-3). If jacket foundations are used for the Model Project, the diameter of each pile is expected to be up to seven feet. The jacket foundation is generally used for deeper waters because of the cost to manufacture and transport the needed equipment.

The jacket foundation pilings would be inserted into each corner of the jacket in two segments. First, the lead sections would be inserted into the jacket legs and then driven into the seafloor. The second length of the piles would be placed on the lead pile section and welded into place. Pile driving would start with a low impact hydraulic hammer, followed by a higher energy impact hammer to reach final design penetration (Deepwater Wind 2012). On average, jacket foundations require about 1.5 times more blows per WTG and a longer piling time by a factor of 2.5, each normalized to MW installed, compared with monopile foundations (Norro et al. 2013). Each jacket foundation requires approximately seven days to complete installation, including approximately four days of pile driving (Deepwater Wind 2012). For 50 turbines, the installation of jacket foundations would require a minimum of 50 weeks, but likely more.

Figure A-3. Jacket Foundation

Source: NIRAS and Hjelmssted Consulting 2017.



A.1.2.5.3 Electrical Service Platform Foundation

An ESP provides the common electrical interconnection point for all of the WTGs. The ESP would have a steel superstructure supporting a platform of approximately 100 by 200 feet and a jacket foundation with six driven piles. Vibration and hammering would drive the six piles through the sleeves to the design depth.

A.1.2.6 Inter-array Cable Installation

Submarine cables within the WTG array transmit electricity generated from each WTG to the ESP. A jet plow would install the inter-array cables at approximately 6 feet below the seafloor, although the depth could vary between 4 and 8 feet, depending on the substrate encountered (Deepwater Wind 2012). In areas where the installation depth is less than four feet, concrete mattresses, rock piles, or grout bags would provide additional protection to avoid interactions with fishing gear and/or anchors (Deepwater Wind 2012; NIRAS and Hjelmsted Consulting 2017).

Jet plow embedment simultaneously lays and embeds submarine cable in one continuous trench between WTGs and then to the ESP (MMS 2009). Jet plow equipment uses pressurized seawater from water pump systems on board the cable vessel to fluidize sediments. A dynamic positioning cable-laying barge would pull the jet plow along the route, laying the cable within an approximately five-foot-wide trench (Deepwater Wind 2012). This method of laying and burying the cables would ensure the placement of the inter-array cable system at the target burial depth with minimum bottom disturbance and with much of the fluidized sediment settling back into the trench (MMS 2009).

A.1.2.7 WTG Operation

Projects in development today expect to use WTGs in the 6 MW to 8 MW range, with rotor diameters ranging from 417 to 590 feet (Windpower Monthly 2016). The anticipated spacing between WTGs would provide an area between WTGs for wildlife, fishing vessels, and recreational users. Manufacturing blades from dielectric materials and restricting WTG siting so that fixed receivers and transmitters are not located closer than approximately one mile to a WTG would minimize blockages associated with radio frequency signals originating from a microwave, land mobile, or broadcast antenna (MMS 2009).

The Model Project would likely use state-of-the-art, low-noise turbines to the extent practicable, in accordance with BOEM's current BMPs to minimize disruption and disturbance of marine life from sound emissions and sea floor disturbances (BOEM 2016a). The WTGs would use U.S. Department of Transportation's Federal Aviation Administration (FAA)-approved marking and lighting to maintain daytime and nighttime visibility (Deepwater Wind 2012). It is expected that the Project would comply with the FAA's "Development of Obstruction Lighting Standards for Wind Turbine Farms" guidance and recommendations where possible (FAA 2005). U.S. Coast Guard (USCG)-approved warning lights at the base of towers would have a maximum visible range of 4.6 miles (Deepwater Wind 2012). The WTGs around the perimeter would use foghorns for boating safety. They would operate only when fog is present and have a 0.50-mile audible range (MMS 2009).

A.1.2.8 Facility Operation and Maintenance

Activities during operation and maintenance would include scour protection, and inspection and maintenance, requiring vessels to and from the port and within the WTG array.

In addition, the developer/owner would have an Oil Spill Response Plan as required for facilities seaward of the coast (30 Code of Federal Regulations [CFR] 254).

Monopile foundations require extensive scour protection to minimize sediment transport. The presence of monopiles can result in scouring that can lead to a depression forming at the base of the foundations, ultimately compromising the stability of these structures (Shearer 2013). The scour-control system generally consists of either rock armor or a set of mats arranged to surround the pile. The Model Project is assumed to use scour control mats in deeper waters where current speeds are relatively slower and rock armor in shallow depths where current speeds are relatively faster (MMS 2009). Scour protection for jacket foundations would be employed as necessary. The scour mats would be placed on the seabed by a crane with final positioning performed with the assistance of divers (MMS 2009). A clamshell bucket or chute would place the rock armor and filter material on the seabed. The size of the rock armor stones would ensure they remain in place despite the force of the waves and currents and prevent movement of filter material. The filter layer of the rock armor scour-control would fill most of the scour hole that is expected to form. It would also reduce the possibility of wave action removing natural underlying sediments and reduce the potential for settlement of the rock armor into the natural underlying sediments (MMS 2009).

The facility operation and maintenance would include in-place inspections for the above-water and below-water structures of all facilities and for monitoring the corrosion protection for the above-water and below-water structures (30 CFR 585.824). Activity within the WTG array would generally include approximately two days of planned or preventive maintenance and three days of unplanned or forced outage emergency maintenance per year and after a major storm. The routine maintenance would require an estimated two vessels per working day, including one crew boat and one maintenance support vessel (MMS 2009). Routine service per WTG is usually a two-day exercise for three to four persons (MMS 2009). A major replacement of WTG components would require a special heavy lift jack-up vessel (MMS 2009). Similar to installation, the vessel would serve as a work platform and would be anchored to the sea floor.

Maintenance activities would also include inspecting the inter-array cable periodically (e.g., every five years) by a sub-bottom profiler or other underwater instrument (USACE 2014). Reburying inter-array cables may be required (MMS 2009). Other than these inspections, the inter-array cables would not require maintenance except in the case of a fault or failure.

Vessel transits would be permitted through WTG arrays and over buried inter-array cables (USACE 2014). Navigation exclusion areas around WTGs may or may not be required.

A.2 Avoidance, Minimization, and Mitigation Measures

Methods of avoidance, minimization, and mitigation of potential impacts on environmental, cultural, and socioeconomic resources from offshore wind projects reflect the experience of developers and regulatory experts in offshore wind and related industries and include measures that would likely be required through consultation under the ESA, MMPA, and MSFCMA. In addition, BOEM prepared a programmatic environmental impact statement to support the establishment of the Alternative Energy and Alternate Use Program, including BMPs that may be applicable to a range of offshore wind projects (BOEM 2016a). The design of the Model Project incorporates these measures to facilitate avoidance, minimization, and mitigation of impacts. Table A-2 summarizes these measures considered for the activities described above and assumed in the discussion of potential impacts below. Additional or different measures may be incorporated for site-specific or design-specific conditions or in light of evolving information and experience.

Table A-2. Summary of Potential Avoidance, Minimization, and Mitigation Measures Assumed as Part of the Project Design

Resource	Avoidance, Minimization, and Mitigation Measures	Reference
Benthic Resources	Avoid locating near or anchoring on sensitive seafloor habitats.	BOEM 2016b; USACE 2014
	Use dynamic-positioning vessels and jet plow embedment to minimize sediment disturbance and alteration during cable-laying process.	Deepwater Wind 2012
	Use scour protection.	MMS 2009; USACE 2014
Fish	Consult with National Marine Fisheries Service (NMFS) to determine when to avoid construction activities based on species-specific migration and spawning behavior.	BOEM 2016b, 2016c
	Consult with appropriate agencies to ensure activities are not likely to jeopardize a threatened or endangered species and are not likely to destroy or adversely modify designated critical habitat.	30 CFR 285.801
	Use soft starts, pingers, and other sound-reducing materials during construction.	Deepwater Wind 2012; USACE 2014; BOEM, 2016a
	Avoid using explosives during construction.	BOEM 2016b, 2016c
	Use proper electrical shielding on cables to minimize electromagnetic fields.	BOEM 2016b, 2016c
Marine Mammals and Sea Turtles	Travel at reduced speeds and maintain a reasonable distance when whales, small cetaceans, and sea turtles are present.	BOEM 2016b, 2016c
	Comply with NMFS Regional Viewing Guidelines while in transit and National Oceanic and Atmospheric Administration (NOAA) vessel strike avoidance measures.	Deepwater Wind 2012
	Avoid construction activities based on species-specific migration and breeding behavior.	BOEM 2016b, 2016c
	Follow federal regulations regarding vessel size, distance, and travel speed with consideration to North Atlantic right whales.	50 CFR 224
	Consult as required with appropriate agencies to ensure that activities are not likely to jeopardize a threatened or endangered species and are not likely to destroy or adversely modify designated critical habitat.	30 CFR 285.801
	Monitor for the presence of protected species within the exclusion zone radius established during the permitting process to avoid incidental take of threatened or endangered species.	BOEM 2016b, 2016c; USACE 2014; MMS 2009
	Perform pile driving generally during daylight hours, starting 30 minutes after dawn and ending 30 minutes prior to dusk.	Deepwater Wind 2012
	Use soft starts and ramp-up procedures during construction.	Deepwater Wind 2012; USACE 2014; BOEM 2012, 2016a
	Use noise reduction technologies during pile driving to reduce the sound levels in water.	Lucke et al. 2011; NYSERDA 2015
	Avoid using explosives during construction.	BOEM 2016b, 2016c

Table notes are at the end of the table.

Table A-2 continued

Resource	Avoidance, Minimization, and Mitigation Measures	Reference
	Use proper electrical shielding on cables to minimize electromagnetic fields.	BOEM 2016b, 2016c
Birds and Bats	Evaluate areas of dense avian use and design project to minimize or mitigate the potential for bird strikes and habitat loss.	BOEM 2016b, 2016c
	Use low-intensity strobe lights on turbines and identify other measures to discourage birds from perching on equipment during operation.	BOEM 2016b, 2016c
	Design turbine structures to minimize the potential for perch and roosting.	Palmquist and Gard 2017
	Consult with BOEM and other agencies, preferably three years before Construction and Operations Plan submission, to coordinate goals and expectations of a biological survey.	30 CFR 285.801
Cultural Resources	Avoid resources/sites identified through surveys and known resources, such as shipwrecks or other marine archaeological sites.	MMS 2009; Deepwater Wind 2012
	Implement an Unanticipated Discovery Plan, including stop work and notification procedures, to address a potential encounter with a submerged potential archaeological resource.	Deepwater Wind 2012
Visual Resources	Use USCG-approved lights at the base of towers that have a maximum visible range of 4.6 miles.	Deepwater Wind 2012
Recreation and Tourism	Inform mariners and boaters of construction activities and vessel movements.	BOEM 2016b, 2016c
Commercial and Recreational Fishing	Communicate with commercial and recreational fishing agencies to identify ways to minimize potential impacts of construction and operation of the project to their interests.	MMS 2009
	Facilitate communication of construction activities and vessel movements through a project website, public notices to mariners and vessel float plans, and a fisheries liaison.	Deepwater Wind 2012
	Request deployment of fishing gear away from well-marked construction areas.	Deepwater Wind 2012
Aviation and Radar	Consider known obstacles and existing use conflicts, such as shipping lanes, navigational aids, and military practice areas during early stages of planning.	MMS 2009
	Temporary notices submitted to the U.S. Department of Transportation's Federal Aviation Administration for cranes employed during construction.	Deepwater Wind 2012
	Closely match construction activities to Notices to Airmen, as published charts will not indicate the location of WTGs.	MMS 2009
	Employ traffic management measures, establish a control center to maintain monitoring during operation, and/or provide mariners information on navigation safety issues.	MMS 2009

Table notes are at the end of the table.

Table A-2 continued

Resource	Avoidance, Minimization, and Mitigation Measures	Reference
	Use FAA-approved marking and lighting to maintain daytime and nighttime visibility.	AC 70/7460-1L
	Use appropriate sound emitting apparatus to aid in navigation as described by the USCG.	30 CFR 67.10
Air Quality	Incorporate state, federal, and international guidelines on vessel emissions	BOEM 2016b, 2016c International Maritime Organization Port Authority of New York and New Jersey Clean Air Strategy
Water Quality and Sediments	Discharge water and wastewater, including bilge water, ballast water, and sanitary waste in compliance with USCG and federal regulations.	MMS 2009
	Prepare and implement an Oil Spill Response Plan during construction and operations, if applicable, to prevent and/or minimize the occurrence of accidental spills of hazardous materials.	30 CFR 254
	The lessee must take measures to prevent unauthorized discharge of pollutants into offshore waters.	30 CFR 250.300
	Comply with the Bureau of Safety and Environmental Enforcement Notice to Lessee No. 2015-G03 for marine trash and debris awareness and elimination.	DOI BSEE 2015
	Install waste collection systems onboard each WTG using a container system for safe handling.	Deepwater Wind 2012
	Avoid disturbing known contamination areas and establish a buffer zone around areas of potential contamination such as dredged material placement areas.	NYSERDA 2010
	Conduct pre-construction surveys of sediments to be disturbed.	BOEM 2016b, 2016c
	Avoid known sand and gravel mining operations.	MMS 2009
Avoid known contamination areas and establish a buffer zone around areas of potential contamination such as dredged material placement.	NYSERDA 2010	

Note: The Model Project design does not incorporate specific measures related to socioeconomics.

A.3 Potential Impacts of the Model Project

The literature sources reviewed and additional studies provided information on the types and magnitude of potential impacts on resources that could occur during construction and operation of the Model Project. Table A-3 cross-references the impacting factors on the resources considered for this cumulative analysis with the resource categories from the BOEM’s *Guidelines for Information Requirements for a Renewable Site Assessment Plan and Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan* (BOEM 2016b, 2016c).

Table A-3. Cross Reference of Consideration of Potential Cumulative Effects with BOEM Environmental Information Requirements for a Renewable Site Assessment Plan or Construction Operation Plan to Comply with NEPA and other Environmental Laws

Resource Areas Considered for This Cumulative Effects Analysis	BOEM Guidelines for Information Requirements for NEPA	
	BOEM Resource Categories	Impacting Factors
Benthic Resources Fish Marine Mammals and Sea Turtles Birds and Bats	Biological Resources Threatened and Endangered Species Sensitive Biological Resources or Habitats	<ul style="list-style-type: none"> • Sea Floor Disturbances • Displacement • Turbidity and Suspended Sediments • Injury and Mortality • Sound • Lighting • Accidental Spills
Cultural Resources Visual Resources	Archaeological / Historic Resources	<ul style="list-style-type: none"> • Sea Floor Disturbances • Visual Impacts
Socioeconomics Recreation and Tourism Commercial and Recreational Fishing	Social and Economic Resources	<ul style="list-style-type: none"> • Displacement of Fishing, Recreation, and Tourism • Employment
Sand and Gravel Extraction Aviation and Radar	Coastal and Marine Uses	<ul style="list-style-type: none"> • Conflicts with Use of Space
Air Quality	Not included	<ul style="list-style-type: none"> • Vessel Emissions^a • Avoided Future Emissions^a
Water Quality Sediment	Water Quality	<ul style="list-style-type: none"> • Sea Floor Disturbances • Accidental Spills

^a Vessel emissions and avoided future emissions are included in this analysis but are not BOEM-defined impacting factors.

The conclusions for many NEPA analyses classify impacts as negligible, minor, moderate, and major. BOEM originally developed definitions for these levels of impacts in its (MMS 2007) to provide consistency in its discussion of impacts. This Study considers all potentially minor or greater impacts. For the purposes of this analysis, the magnitude of potential impacts is classified as negligible, minor, greater than minor, or beneficial. The definitions of these impact levels are based in the definitions originally developed by BOEM:

- **Negligible** – No measurable impacts.
- **Minor** – Impacts on the affected resource that could be avoided with proper mitigation or, if impacts were to occur, the affected resource would recover completely without any mitigation once the impacting agent is eliminated.

- **Greater Than Minor** – Impacts where site-specific information and project design determine the ability of the affected resource to recover. Moderate impacts are unavoidable, and some impacts may be irreversible; however, viability is not threatened and the affected resource will recover completely if proper mitigation is applied. Major impacts are also unavoidable and/or irreversible, the viability of the affected resource may be threatened, and the affected resource may not fully recover even if proper mitigation is applied.
- **Beneficial** – Impacts on the affected resource that could have positive short- or long-term impact.

The sections below summarize potential impacts on affected resources based on the respective individual Studies performed and other offshore wind farms. Each of the State’s individual studies identifies an Area of Analysis (AoA), which is the geographic scope of analysis for that respective study. Any reference to an AoA below refers to the area evaluated in the respective study of benthic communities, aviation and radar, birds and bats, cultural resources, fish and fisheries, marine mammals and sea turtles, or sand and gravel.

As discussed in the *Environmental Sensitivity Analysis* that is appended to the Master Plan, the potential impacts from electromagnetic fields are not considered further due to lack of demonstrated impacts on marine resources. Vessels associated with construction and operation contain fuel oil and other materials. The likelihood of an accidental spill is remote, and the USCG requires vessel operators to comply with regulations to prevent and control potential spills. Given the low probability of occurrence, the small volume of spilled material, and compliance with USCG requirements, the impacts of accidental spills would be negligible and are not considered further in the discussions below.

A.3.1 Benthic Resources

The primary potential impacts on benthic resources during construction and operation are turbidity and sediment suspension, sea floor disturbance, and injury/mortality.

A.3.1.1 Turbidity and Suspended Sediment

Construction. Suspension of sediments within the water column and corresponding increases in turbidity potentially decrease feeding efficiency and biological diversity. The extent of impacts from suspended sediments depends on the type of sediment and the duration of the activity. Generally, coarser sediments fall out of the water column and resettle quickly after disturbance (hours), while finer sediments could remain suspended in the water column for longer periods of time (days). Based on information derived from NOAA, the U.S. Geological Survey, and The Nature Conservancy, sediment of 0.013 inches or

more (i.e., medium sand, coarse sand, and pebbles) occur in the AoA. This characteristic would minimize suspended sediment compared to fine-grained material. Impacts on filter-feeding organisms also occur when turbid waters and deposition of sediments clog feeding and respiration organs of filter feeders and benthic fauna such as bivalves (MMS 2009). Construction activities that cause suspended sediment would occur over a period of days to weeks at each WTG location. Installation of foundations would occur individually and sequentially. Benthic fauna generally adapt to minor, temporary increases in suspended sediments by physiological mechanisms such as expelling filtered sediments or reducing filtration rates (Clarke and Wilbur 2000). Given the expected grain size within the AoA, the suspended sediments would occur within the water column only temporarily near construction activities and would settle to pre-existing conditions within days of completion of an installation. Additionally, the site-specific Sediment Profile Imaging and Plan View camera and multibeam echosounder surveys conducted in the summer of 2017 and discussed in the *Analysis of Multibeam Echo Sounder and Benthic Survey Data* that is appended to the Master Plan found no evidence of sensitive benthic habitat within surveyed areas of the AoA. Overall, turbidity and suspended sediments from construction activities is expected to result in **minor**, direct impacts on benthic resources.

Indirect impacts of increased sedimentation and turbidity can decrease the biological diversity of an area by decreasing fertilization, larval survival, and settlement in some species (Vaselli et al. 2008; WWF 2014). Changes in diversity and species composition can change the health and productivity of the ecosystem (Balata et al. 2007). However, considering the expected sediment grain size, the duration of typical construction activities, and the adaptable nature of benthic species, these indirect impacts are unlikely to result from the Model Project.

Operation. No impacts from suspended sediments are expected during operation and maintenance activities associated with the Model Project.

A.3.1.2 Sea Floor Disturbance

Construction. The loss of benthic habitat depends on the amount of surface area replaced by physical structures and the new habitat provided. The Model Project would use approximately 21 or 92 acres of sea floor, assuming the use of all monopile or all jacket foundations, respectively. Given the relatively small areal extent of benthic disturbance compared with the overall area of available benthic habitat within and near the AoA, and the lack of sensitive benthic habitat within the surveyed areas of the AoA, it is expected that the Model Project would result in **negligible** impacts on benthic habitat from construction activities.

As discussed in the *Fish and Fisheries Study*, which is appended to the Master Plan, the effect of vibrations on bottom dwelling fish and benthic invertebrates alters the ability to sense vibrations that aid in burrowing, feeding, and detection of predators. Vibratory impacts are expected to minimally affect bottom dwelling fish and mobile benthic species, which are expected to temporarily relocate. Impacts to fish populations as a whole are likely to be **negligible**.

Operation. Beneficial impacts on benthic communities due to benthic habitat conversion are likely. After disturbance, different species stabilize the surface and rework the sediments, mixing oxygen into the sediment, which creates a more hospitable environment for other benthic communities. The rate of nutrient recycling would increase and larger successional taxa would outcompete the earlier stages. Overall, benthic habitat conversion provides a **benefit** to the benthic community.

A.3.1.3 Injury and Mortality

Construction. In the footprint of the pile-driving and excavation activities, essentially 100% mortality of benthic organisms would occur from either direct contact, removal, or smothering. Similar to habitat disturbance, the extent of impacts from direct injury and mortality also depends on the area affected. Bivalve species in particular could also experience changes in valve closures from vibration, as described above. However, given the areal extent of benthic disturbance from construction activities compared with the overall area of available benthic habitat within and near the AoA, it is expected that the Model Project would result in **negligible** injury/mortality impacts to benthic populations.

Operation. Periodic maintenance during the operation of WTGs and the ESP may require removing the foundations of benthic colonies. As benthic communities increase colonization on the foundations, the accumulating biomass may require periodic cleaning, which would eliminate the established colonies from the structures (WWF 2014). However, benthic communities continually re-colonize and periodic removal would result in temporary and **negligible** impacts on the benthic community as a whole.

A.3.2 Fish

The primary potential impacts on fish resources during construction and operation activities are turbidity and suspended sediment, sensory disturbance, and habitat conversion.

A.3.2.1 Turbidity and Suspended Sediment

Construction. Turbidity and suspended sediment directly affect fish by interfering with gill gas absorption, which decreases available dissolved oxygen, which is discussed more in the *Fish and Fisheries Study*, which is appended to the Master Plan. These impacts can cause respiratory stress, which is typically associated with long-term exposure to elevated turbidities (NOAA 2012). Short-term impacts are not expected to occur below suspended sediment levels of approximately 500 milligrams per liter, and suspended sediment levels may be as high as 700,000 milligrams per liter before acute mortality occurs, depending on the species (NOAA 2012). As described above, given the expected grain size within the AoA, the majority of sediments are expected to settle quickly, minimizing turbidity. In addition, mobile species relocate to avoid impacts. Any negative impacts on fish from turbidity during construction are expected to be temporary and **negligible**.

Operation. No turbidity and suspended sediment impacts are expected from operation or maintenance activities associated with the Model Project.

A.3.2.2 Sensory Disturbance

Construction. Fish experience noise or sensory disturbance that can disrupt foraging and reproductive behaviors. Increased noise can also cause disorientation and tissue damage, mask biologically important sounds, and even cause death (WWF 2014). Herring in particular are sensitive to noise (Thomsen et al. 2006), and herring have designated larval, juvenile, and adult Essential Fish Habitat within the AoA. The noise increase during construction would be temporary and limited to the construction timeframe, primarily pile driving at each WTG. BMPs would minimize noise impacts on fish, including using a pinger device that transmits acoustic signals underwater to scare fish away before commencing noise-generating activities and soft starts to pile driving. Fish populations would return to original habitat and behavior once noise activities cease. Therefore, noise is expected to result in a **minor** impact on fish.

Operation. Noise and vibration generated from the operating WTGs, gearbox, and generator may cause physiological and behavioral response in fish. Studies have shown that fish within 100 meters (m) of WTGs doubled in number after WTGs operation stopped (see *Fish and Fisheries Study*). However, noise generated from wind farms is typically masked underwater by wind or the surface of the water, and individual WTGs are expected to generate less noise at the source than that produced by existing vessel

traffic. Additionally, vibrations would be extremely localized in nature (Nedwell et al. 2003; Andersson 2011). Although studies have shown localized effects, fish populations within 100 m doubled in number after WTGs operation stopped (see *Fish and Fisheries Study*). The minimal impacts expected from noise and vibration during operation are likely to result in **negligible** impacts on fish.

A.3.2.3 Habitat Conversion

Construction. Removal and disturbance of fish habitat would occur within a limited area due to construction activities. As noted above for disturbances to benthic habitats, the areal extent of habitat removal or disturbance from construction would be small compared with the overall area of available habitat within and near the AoA.

Construction activities that cause sensory disturbances can also affect fish habitat. Fish may be displaced from regular swimming, foraging, and spawning habitats and may relocate to nearby habitats. The Model Project would likely avoid location near or anchoring on sensitive seafloor habitats, avoid ocean areas supporting species protected, and implement BMPs to minimize or mitigate the potential for habitat loss, particularly designated critical habitat. Agency consultation would likely result in requirements that construction avoid species-specific migration and spawning locations and seasons. The use of approximately 21 or 92 acres of sea floor, assuming all monopile or all jacket foundations, respectively, represents a small areal extent of potential habitat disturbance compared with the overall available habitat within and near the AoA. Therefore, construction activities would result in **negligible** impacts on fish habitat.

Operation. The placement of WTGs in the seafloor would convert an open water habitat to one with fixed structures. The areal extent of the potential impacts of the Model Project would be 88,500 acres, including the 79,350-acre Model Project lease area and the 1,000 m area of potential impact, which represents approximately 1% of the AoA. Added structures would create a new hard-bottom habitat similar to an artificial reef and differing from the pre-existing sandy bottom conditions in the AoA. The expected re-colonization of communities on installed structures may increase available food patches for larger pelagic predators, having a **beneficial** impact on fish resources. Additionally, artificial reef-like habitats may attract fish species not pre-existing in the area to use the structures as habitat or as a refuge from predators. Species typically caught via trawl and other bottom-dragging nets may flourish due to the decrease in trawling capabilities within wind farms.

The introduction of new species or the shift in species diversity and number within an area may also increase competition and shift dominant populations. The potential for benthic and fish invasive species to colonize may increase as a result of habitat conversion and the increase of vessels potentially carrying invasive species. Additionally, some studies show that species diversity actually decreased over time after the installation of wind farms (Stenberg et al. 2011). Surveys after the installation of WTGs in Sweden found that fishermen did not note any evidence of an increase in fish utilizing the habitat (Gray et al. 2016). A change in species diversity and number due to a converted habitat may alter the habitat in a way that causes shifts in the food chain and current fishing practices. Because of the uncertainty of impacts, and because fish are expected recover without mitigation, habitat disturbance and conversion may potentially result in **minor** impacts on fish.

A.3.3 Marine Mammals and Sea Turtles

The primary potential impacts on marine mammals and sea turtles during construction and operation activities are displacement and injury/mortality.

A.3.3.1 Displacement, Disturbance, Loss, or Conversion of Habitat

Construction. Marine mammals and sea turtles could experience displacement, disturbance, and loss of habitat from construction activities. Increased noise from vessel traffic, pile driving, and excavation activities may have the temporary impact of displacing marine mammals and sea turtles from typical foraging and reproductive grounds (RI CRMC 2010; MMS 2009; WWF 2014). Moreover, noise can also interfere with the ability to send and receive acoustic signals, disrupting the ability of marine mammals to communicate, forage, and navigate. As described in the *Marine Mammals and Sea Turtle Study*, which is appended to the Master Plan, displacement due to noise could cause marine mammals to move into areas of higher vessel traffic, such as shipping corridors, increasing the chance of vessel collisions for particularly at-risk species such as the fin whale, North Atlantic right whale, humpback whale, and sei whale.

However, because the highest concentrations of right whales occur along the margins of the AoA, this species may avoid noise-related impacts from construction. Similarly, pinniped and sea turtle concentrations are low year-round throughout most of the AoA. Marine mammals with hearing ranges greater than 180 kilohertz (high-frequency cetaceans) are broadly distributed throughout the AoA during the spring months and are therefore somewhat more vulnerable to displacement impacts from

construction-related noise during the spring. With the incorporation of the avoidance, minimization, and mitigation measures previously described, and the temporary timeframe of the construction activities, impacts from displacement of marine mammals and turtles may still be unavoidable. In addition, due to the occurrence of protected species in the AoA, impacts could be **minor to greater**.

Operation. Large marine mammals may not return to an area with a high density of closely spaced WTGs after construction is complete because of insufficient room for easy movement and feeding. Conversely, smaller marine mammals and sea turtles would likely return to developed areas as benthic and fish communities grow around the structures (described above). However, the Model Project assumes a spacing of approximately one mile, thereby limiting any potential spatial impact on marine mammals and sea turtles. Displacement of marine mammals and sea turtles due to operation of wind farms is expected to be **negligible**.

A.3.3.2 Injury and Mortality

Construction. The Marine Mammal Protection Act (MMPA) protects marine mammals to support sustainable populations (16 U.S. Code [U.S.C.] 1361 Sec. 2[2]). The MMPA prohibits “take” of marine mammals including harassment, injuring, or killing unless permitted under incidental harassment/take authorizations (16 U.S.C. 1361). Similarly, the Federal Endangered Species Act of 1973 (ESA) protects all species listed as endangered or threatened in U.S. waters and prohibits take or harassment of endangered species (16 U.S.C. 1531-1544). Sea turtles in the AoA are listed under the ESA (81 FR 20057, 35 FR 18319, 35 FR 8491, 76 FR 58868) and require Incidental Take Permits for federal actions in cases where take is expected to occur (16 U.S.C. 1536). This regulatory framework manages take, including injury, mortality, and harassment of marine mammals and sea turtles. The authorizations required by the MMPA and ESA require engagement with NOAA (and in some cases, the U.S. Fish and Wildlife Service) and implementation of permit conditions to minimize potential impacts (see *Marine Mammals and Sea Turtles Study*). Permit conditions may include the use of pingers (described above for fish) and the use of soft starts and vibratory devices for pile installations, which would avoid and minimize potential noise impacts on marine mammals and sea turtles. The Model Project is expected to implement avoidance, minimization, and mitigation measures that are typically required where marine mammals and sea turtles occur. Incidental take would be limited to, at most, harassment. Mitigation measures and BMPs are expected to reduce the potential for auditory injury (Level A harassment under MMPA) from construction noise to negligible levels. Take authorizations for marine mammals can only be issued under MMPA if such take is of small numbers and will have negligible impacts on the stock (16 U.S.C. 1371 Sec. 101[5]). The ESA requires that take

is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat (16 U.S.C. 1536). Mitigation measures and BMPs are expected to reduce the potential for serious injury/mortality to marine mammals and sea turtles during construction of wind farms in the AoA to a **negligible** level.

Operation. During operation, a small volume of vessel traffic would occur between the lease area and the port and within the lease area. With incorporation of the avoidance, minimization, and mitigation measures previously described, vessel traffic during operation is not expected to result in injury or mortality impacts on marine mammals and sea turtles.

A.3.4 Birds and Bats

The primary potential impacts on avian and bat species during construction and operation activities include displacement from habitat, disturbance, and injury/mortality.

Impacts on bats are expected to be **negligible**. Bat studies in Atlantic offshore waters suggest that fall migration represents a time when bats are most likely to occur within offshore waters. Impacts on bats have the potential to occur during the migratory season, and bat occurrences greater than 5 miles offshore are expected to be limited to migratory movements (MMS 2009; see *Birds and Bats Study*, which is appended to the Master Plan). Construction and operation activities are unlikely to attract bats for foraging or roosting. Given the brief seasonal presence of bats offshore and the limited overlap of bat habitat within the AoA, construction and operation would result in negligible impacts to bats.

A.3.4.1 Displacement

Construction. Noise, increased human presence, increased vessel traffic, and the presence of large construction structures may temporarily displace waterfowl from migrating, breeding, foraging, and nesting areas. In addition, displacement to alternative foraging sites can contribute to over-crowding and competition at those sites. Vibrations from pile driving could temporarily displace fish prey. Jet plow activities may increase turbidity, which could temporarily impede fish foraging. However, seafloor disturbance during jet plow activities could attract prey fish to feed on disturbed benthic organisms, which, in turn, may attract foraging avian species (MMS 2009). Construction activities are not expected to have measurable impacts on bird populations, thus resulting in **negligible** potential impacts from displacement.

Operation. An operational offshore wind farm may cause direct habitat disturbance and displacement of avian species. Indirect impacts of habitat disturbance can include changes in breeding success and predator-prey behavior, as a decrease in prey availability can lead to a decrease in breeding success and an increase in energy expenditure. The presence of the WTGs may also create a physical barrier in a migratory flight path, or barrier effect (see *Birds and Bats Study*). Multiple avian taxa migrate offshore, including shorebirds, marine birds, and waterfowl, as well as raptors and passerines that may be blown offshore by weather events. Avian species displaced by the barrier effect are likely to experience indirect impacts of increased energy expenditure in order to alter migratory patterns and paths. The impact of habitat disturbance on avian species is dependent on the siting of WTGs and the distance between the WTGs and suitable foraging areas. Birds also exhibit high variability in their sensitivity to habitat displacement. While birds may occur anywhere in the AoA, available data indicate that overall bird use is greatest in three core habitat areas: shallower waters along the northern and northwestern boundaries of the AoA, the Hudson Shelf Valley, and the continental shelf break (see *Birds and Bats Study*). Regularly occurring species are generally concentrated in one or more of these core areas. For example, waterfowl use of the AoA is generally concentrated in shallow waters in the north and the shallower portions of the Hudson Shelf Valley. Conversely, pelagic birds are most commonly observed near the continental shelf break. The Model Project design would consider, and avoid to the extent practicable, areas of dense avian use to minimize or mitigate the potential for habitat loss. Impacts to an individual species may occur; however, overall bird populations would not be affected. Therefore, impacts are expected to be **minor**.

A.3.4.2 Injury and Mortality

Construction. Cranes and stationary WTGs may lead to avian injury and mortality due to direct collision. Because the AoA lies partially within and near the Atlantic Flyway migratory corridor, migratory birds are at risk of injury and mortality. Construction lighting equipment may disorient birds during heavy fog or rain events, which could also lead to collision. Birds, especially those that migrate at night, may become disoriented by or attracted to lit structures, and the majority of avian collisions with structures take place at night during inclement weather events (see *Birds and Bats Study*; Kerlinger et al. 2010). A species' sensitivity to injury and mortality depends on its conservation status and population size, as well as its potential to use habitat in and near the area of the Model Project. Typical BMPs such as avoiding areas of dense avian use, using low-intensity strobe lights to discourage perching on WTGs, and designing turbine structures to minimize perching and roosting potential, would reduce the potential for bird strikes such that bird populations would not be affected. With the implementation of such BMPs, the overall impacts to birds from injury and mortality are expected to be **minor**.

Operation. Operating WTGs may lead to avian injury and mortality due to direct collision. Species identified with highest collision sensitivity typically have flight characteristics that place them in rotor-swept zones (see *Birds and Bats Study*). The Model Project design would consider, and avoid to the extent practicable, areas of dense avian use to minimize or mitigate the potential for bird strikes. Impacts to an individual species may occur; however, overall bird populations would not be affected. During operation, the overall injury and mortality impact on birds is expected to be **minor**.

A.3.5 Cultural Resources

The primary potential impacts on cultural resources during construction and operation activities are potential disturbance of submerged historical resources, including shipwrecks, planes, debris fields, and submarine cables on the sea floor. Section A.3.6, below, discusses potential visual impacts on historically significant land-based sites.

Construction. During construction, site preparation activities, pile driving, and jet plowing could potentially disturb submerged cultural resources and paleo-landforms on the seafloor; however, it can be expected that pre-construction surveys and appropriate siting of project structures would avoid these resources to the extent practicable. As a result, direct impacts on cultural resources during construction activities would be **negligible**. It can be expected that the Model Project would implement an Unanticipated Discovery Plan to avoid and minimize impacts on any previously undiscovered cultural resources found during construction activities.

Operation. During operation, it can be expected that anchoring of vessels during maintenance activities would also avoid submerged historic resources to the extent practicable. Therefore, no or **negligible** direct impacts on culturally significant resources would occur during operation activities.

A.3.6 Visual Resources

The primary potential impacts on visual resources during construction and operation activities are potential aesthetic changes to cultural, historic, and recreational sites.

Construction. During construction, visual impacts could result from the presence of construction equipment (e.g., jack-up barges and cranes), commuting vessels, and partially built WTG structures. The majority of construction activities would occur during daytime hours. Visual impacts on viewsheds could occur from vessels carrying construction equipment to and from existing port facilities, in addition to crew boats transporting works between sites, and vessels and barges for installing WTGs. However,

most vessels support pile-driving activities, and the duration of exposure to viewers is limited to the construction phase. For activities that would occur at night, construction equipment and vessels would use USCG-regulated nighttime lights in addition to work lights, angled downward, for worker safety. The number and types of vessels used would be dependent on the phase of construction. Given the current level of vessel activity, the existing environment already includes vessels using USCG-regulated nighttime lights. Overall, visual impacts from construction activities are expected to be temporary and **negligible**.

Operation. Visibility of WTGs from the shore is largely dependent on their size and height, as well as topographical conditions between them and viewers. During operation, the Model Project would comprise WTGs with a rotor diameter of 417 to 590 feet. BOEM has found that small to moderately sized WTGs (351 feet rotor diameter and 449 feet total height) were barely visible at distances greater than 26 miles, with turbine blade movement visible up to 24 miles (Sullivan et al. 2013). At distances less than 10 miles, wind facilities were a major focus of visual attention, regardless of facility size or lighting conditions (Sullivan et al. 2013). In addition, nighttime aerial hazard navigation lighting was visible at 24 miles or greater. Table A-4 summarizes the United Kingdom Department of Trade and Industry (DTI) guidance to determine visual impact from offshore wind facilities (BMT Cordah 2003).

Table A-4. United Kingdom Department of Trade and Industry Visual Impact Guidelines for Offshore Wind Facilities

Distance From Shore	Visual Impact
0–5 miles (0–8 km)	High
5–8 miles (8–13 km)	Moderate
8–14.9 miles (13–24 km)	Low
>14.9 miles (>24 km)	Not Significant

Visual simulations for the Cape Wind Energy Project based on wind turbines with 364 feet rotor diameters and 440 feet total height, and located six miles from the nearest shoreline, determined that the offshore project could not be seen from locations greater than 300 feet inland (MMS 2009). All or portions of the Model Project may be visible from shore under clear viewing conditions, although not in major focus due to the distance from shore. The Model Project is therefore expected to result in **minor** visual impacts during operation.

A.3.7 Socioeconomics

The primary potential socioeconomic impacts from construction and operation of the Model Project would be beneficial, including increased employment opportunities, new business opportunities, and local and regional purchases of construction materials and services and resources required to maintain and service project facilities.

The Model Project also has the potential to have economic impacts related to displacement of commercial and recreational fishing activities, in the form of extra expense to travel further, reduced take, and/or reduced employment. Potential impacts on these industries are discussed in Section A.3.9 relative to the potential conflicts with the use of the same space.

A.3.7.1 Employment

The Model Project would directly create jobs for the duration of construction and operation and maintenance over its anticipated 30-year life. Increased employment opportunities would result in benefits to employment and investment in New York State. Secondary employment estimates would include inter-industry effects (i.e., industries buying from local industries) and local spending by local households. Construction and operation of the Model Project would result in **benefits** to employment in New York State.

A.3.7.2 Business Opportunities and Purchases of Materials and Services

Installation and operation of WTGs would contribute to the economy by attracting investment from outside the state, thus creating **beneficial** impacts. In addition, some of the equipment (heavy components such as foundations, concrete, and steel towers), vessels, and crews for construction and to support operational maintenance may be sourced within New York State (NYSERDA 2013).

A.3.8 Recreation and Tourism

The primary potential impacts on recreation and tourism of offshore wind energy development can result from conflicts with the use of space due to exclusion from construction areas and the presence of vessel traffic.

A.3.8.1 Conflicts with the Use of Space

Construction. If support and construction vessel routes pass through recreational use areas, they could disrupt recreationists' enjoyment or safety. The northwestern and northeastern corners of the AoA overlap with whale watching areas; however, compared with similar operations along other areas of the Northeast Coast, impacts from construction and operation areas of the Model Project would be relatively small. Temporary exclusion areas around the work areas would restrict the area of recreational use during construction. Establishing construction work areas to avoid recreation and tourism hotspots/seasons would minimize conflicts with the use of space. BMPs for the Model Project would include a robust communication plan to disseminate the location and timing of construction activities and vessel movements. The increased transit of vessels and their proximity to recreational use areas is expected to result in **minor** impacts to recreation and tourism during construction.

Operation. During operation and maintenance, temporary exclusion zones established during construction would likely be eliminated (see *Marine Recreational Uses Study*, which is appended to the Master Plan). Navigation exclusion areas around WTGs, if required, would be located around the footprint of the WTGs and ESP. It is anticipated that WTG placement would intentionally avoid known obstructions, such as shipwrecks, which would minimize impacts on underwater recreational activities (i.e., scuba diving) during operation. Assuming that recreational users avoid the entire lease area and a 1,000-foot area of potential impact, the areal extent of displacement represents approximately 1% of the area available in the AoA. Given the few vessel trips associated with operation and maintenance and the areal extent of the lease area, conflicts with the use of space due to exclusion of recreationists during operation would be **negligible**.

A.3.9 Commercial and Recreational Fishing

The primary potential impacts on commercial and recreational fishing could result from conflicts with the use of space that causes displacement of commercial and recreational vessels from fishing areas or displacement of fish from the areas accessible by commercial and recreational vessels.

A.3.9.1 Conflicts from Use of Space

Construction. If support and construction vessels pass through, or construction activities occur in, commercial and recreational fishing areas, they could cause temporary exclusion areas where fishing would not be possible. Displacement from traditional fishing areas during construction activities may result in reduced income or other economic impacts (Reilly et al. 2016). Similarly, fish may be

displaced from typical habitats, altering typical catch. Anticipated BMPs would include a robust communication plan to inform commercial and recreational fishers of the location and timing of construction activities and vessel movements. Displacement from particular commercial and recreational fishing areas during construction activities would be short term; therefore, construction-related impacts to commercial and recreational fishing are expected to be **minor**.

Operation. An operating offshore wind farm may limit certain fishing practices, restrict access to fish, or displace fish from traditional fishing areas. Depending on the depth of burial of the inter-array cables, trawl fishing and anchoring of vessels may be restricted. Exclusion areas may be imposed around each WTG. In the United Kingdom, a 164-foot (50 m) exclusion area was established around each WTG during operation (RI CRMC 2010). In the U.S., Deepwater Wind required a 300-foot exclusion area on the seafloor around each WTG for Block Island Wind (Deepwater Wind 2012). Cape Wind Associates, LLC, did not propose an exclusion area during operation (MMS 2009). The USCG, in partnership with the USACE in state waters and BOEM in federal waters, determines the need for exclusion areas around WTGs. There is no current formal policy to limit fishing around and through offshore wind farms, and the USCG evaluates the need for exclusion areas on a case-by-case basis (BOEM 2014; RI CRMC 2010). Although there are no current regulations limiting access around offshore wind farms, marine insurance companies may consider increasing insurance premiums for fishing vessels operating within the operational wind farm. As of 2010, Sunderland Marine, the world's largest insurer of fishing vessels, did not impose restrictions or higher premiums on their members (RI CRMC 2010).

Commercial and recreational fishing concerns typically include gear and vessel damage, financial risk, exclusion from typical areas and types of fishing, navigational hazards, and alteration of existing fish populations. To avoid potential risks of fishing within or near wind farms, commercial and recreational fishers may choose to travel further than they would otherwise, which would increase fuel costs, and potentially diminish the number of landings and catch due to a more limited fishing timeframe. Fish typically caught within the Model Project area may be displaced during operation (see *Fish and Fisheries Study*). The areal extent of the Model Project represents approximately 1% of the AoA including a 1,000-foot area of potential impact. Overall, displacement of commercial and recreational fishing is expected to be **minor** during operation-related activities.

A.3.10 Sand and Gravel Extraction

No offshore sand and gravel mines (historic or currently active) occur in the AoA. It is also expected that no sand and gravel mining will occur in the near future, as it is likely not economically viable to perform this activity so far from shore (see *Sand and Gravel Resources Study*, which is appended to the Master Plan). Therefore, development in the Model Project lease area would not conflict with areas of sand and gravel extraction operations.

A.3.11 Aviation and Radar

The primary potential impacts on aviation and radar during construction and operation activities include potential conflicts with the use of air space. It is anticipated that WTG placement would intentionally avoid known obstacles and conflicts with existing uses, such as shipping lanes, underwater cables, navigational aids, and military practice areas.

Impacts on aviation are expected to be **negligible**. Over open water, the FAA specifies a minimum clearance of 500 feet for aircraft from any structure or vessel (14 CFR 91.119). Although WTGs do represent obstacles to flight near the ocean's surface, charts identify their location, and aviators have the option to fly over or around the WTG array (MMS 2009). The FAA requires lighting equipment on structures to increase visibility and, consequently, facilitate early obstruction recognition by pilots (see *Aviation and Radar Assets Study*, which is appended to the Master Plan). The areal extent of the potential impacts of the Model Project is 88,500 acres, or the 79,350-acre lease area and the 1,000 m area of potential impact, which represents approximately 1% of the AoA, which is a relatively small percentage of the overall area. As negligible impacts on aviation are expected, aviation is not further discussed herein. Potential impacts on radar, including air traffic control, military radar, and vessel radar, are discussed below.

A.3.11.1 Conflicts from Use of Space

Construction. WTGs are large structures that block transmission of radar signals in a manner similar to tall buildings, and although the effect from a single WTG is small, problems may arise when multiple WTGs are being installed within an area (MMS 2007). The presence of WTG structures (prior to operation) has the potential to temporarily degrade the ability of air traffic control and military radar systems to perform their intended functions; the magnitude of the effect depends on the number and location of the pre-operational WTGs (DOD 2006). At angles close to the horizon, wind turbines can “clutter” the radar screen, making it difficult to resolve each WTG separately (MMS 2009). Depending

on the power and sophistication of the radar system, this effect can extend up to 92 miles from the wind farm, but the greatest impacts are confined to the general region of the WTGs (MMS 2009). These impacts can also be encountered by weather radar systems located near wind farms and can result in incorrect storm cell identification and tracking (MMS 2007). The Model Project is expected to have temporary **minor** impacts on radar systems in the lease area during construction.

Operation. During operation, impacts on radar within and near WTGs can mask real structures or produce “false echoes” (RI CRMC 2010; MMS 2009). The USCG found moderate impairment to radar of vessels operating within the array, but concluded that the impact could be reduced through mitigation (MMS 2009). Typical mitigation measures identified included traffic management measures, such as recommended vessel routes and specially marked traffic lanes, establishment of a control center to maintain monitoring during operation, and educational measures to provide mariners information on navigation safety issues related to travel within and near the wind farm (MMS 2009). The Model Project is expected to have **minor** impacts on radar systems in the lease area.

A.3.12 Air Quality

The primary potential impacts on air quality occur from vessel emissions during construction and during operation and maintenance.

Vessels used during offshore construction activities generate emissions from the combustion of fuel. Similar to the Cape Wind project, emissions from crew boats, tugs, and support vessels to and from the lease area for the Model Project would be regulated by the U.S. Environmental Protection Agency. The air quality impact analysis for all emissions during construction of the Cape Wind project predicted concentrations below all National Ambient Air Quality Standards (MMS 2009). With the incorporation of state, federal, and international guidelines and regulations on vessel emissions, **negligible** impacts on air quality are expected to occur during construction activities. Vessel use during operation will be similar in nature but less frequent; therefore, **negligible** impacts on air quality are expected to occur during operation activities.

A.3.13 Water Quality

The primary potential impacts on water quality during construction and operation activities involve sediment suspension from sea floor disturbance and contaminated sediments.

A.3.13.1 Turbidity and Suspended Sediment

Construction. Construction activities involving disturbance of the sea floor cause suspension of sediments in the water column and corresponding temporary increases in turbidity. As described above for Benthic Resources, construction activities that could cause increased suspended sediment leading to increased turbidity include site preparation, pile driving for monopiles and/or jacket foundations, jet plowing to lay the cable, and vessels that may anchor. Impacts associated with scour protection placement materials are expected to be negligible due to rapid settling of the suspended sediments associated with scour protection materials (MMS 2009).

As discussed above for Benthic Resources, the extent of impacts from suspended sediments depends on the type of sediment and the intensity and duration of the activity. Use of dynamically positioned vessels where possible would limit sediment disturbance impacts from anchor sweep. Similarly, use of monopile and jacket foundations would minimize impacts due to the relatively small footprints compared to alternative gravity foundations that typically require tens to hundreds of square meters of seafloor (MMS 2007). During jet plowing, temporary and localized sediment disturbance would occur, with heavier particles settling in the immediate area and finer particles expected to settle within a few hundred yards (Deepwater Wind 2012; RI CRMC 2010). After the jet plow passes, elevated suspended sediment levels may last for up to two days for areas with very weak currents and fine bottom sediments (MMS 2009). Construction is expected to cause temporary **minor** impacts on water quality from turbidity and suspended sediment near the WTG and ESP foundations and along the submarine cable corridors (Deepwater Wind 2012; MMS 2009).

Operation. As long as the inter-array cables remain buried, the cables would not be expected to have any significant effect on suspended sediment levels (RI CRMC 2010). In addition, the use of scour protection would limit the erosion of sediment supporting the WTG and ESP foundations (RI CRMC 2010). Consequently, the impacts of turbidity and suspended sediments on water quality are expected to be **negligible** during operation.

A.3.13.2 Contaminated Sediments

Sediments disturbed during construction activities may contain contaminants. However, contaminated sediments are less likely to occur away from the coast. Within the Model Project lease area, it is anticipated that WTG placement would intentionally avoid known contamination areas and establish

a buffer zone around areas of potential contamination such as the one location of dredged material placement (NYSERDA 2010). With the implementation of this avoidance measure, impacts from sediment contamination would be **negligible** for both construction and operation.

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Appendix B. Potential Impacts of Past, Present, and Reasonably Foreseeable Activities

The following types of activities occur within the geographic scope of key resources and have potential impacts similar to those of the Model Project:

- Offshore wind farms
- Infrastructure
- Coastal storm risk management
- Military use
- Dredging
- Ocean disposal of dredged material
- Commercial and recreational fishing
- Marine transportation

Table B-1 describes these activity types and identifies potential future trends or changes. The following activities are not included in the analysis because they do not occur in the geographic scope or are not reasonably foreseeable activities in the geographic scope:

- Biological surveys are likely to occur, but their impacts are expected to be negligible. Biological surveys refer to ongoing environmental studies, many of which are conducted or funded by the Bureau of Ocean Energy Management to collect information about the surrounding marine environment. This activity group includes acoustic aerial surveys and nest trapping of seabirds, aerial surveys of whales and sea turtles, and trapping and tagging of sensitive marine species. Any impacts from use of vessels and equipment is negligible because the very nature of the activity is to better understand, preserve, and manage species.
- Oil and gas development and exploration were not considered in this analysis because there are no currently active oil and gas leases or oil and gas exploration, development, or production activities on the Atlantic Outer Continental Shelf (BOEM 2014).
- Marine mineral use was also not considered as a reasonably foreseeable activity category during the 2020 to 2030 timeframe because it is not expected to be economically viable to mine sand and gravel so far from shore, as discussed in the *Sand and Gravel Resources Study*, which is appended to the Master Plan.
- Geo-sequestration, which involves injecting supercritical carbon dioxide in deep underground formations, is primarily considered for mitigating impacts of carbon dioxide from fossil fuel-fired electricity-generating plants. Because there are no regulatory requirements for geo-sequestration and no active or pending applications for geo-sequestration, this analysis assumes that geo-sequestration activities are not reasonably foreseeable.

- Deepwater liquid natural gas (LNG) terminals transfer LNG to ships or pipelines for import or export, respectively. The U.S Coast Guard (USCG) issues Deepwater Port Licenses to import or export LNG. However, there are no active or pending deepwater port applications (MARAD 2017). Therefore, the cumulative analysis assumes that deepwater LNG port construction is not a reasonably foreseeable activity.

Appendix A described the potential impacts of offshore wind farms identified through an analysis of the Model Project. Table B-2 summarizes potential impacts from past, present, and reasonably foreseeable activity types that are similar to potential impacts from the Model Project. The sections that follow the table describe whether the magnitude of these potential impacts on key resources identified in Section 2.2.1 are negligible, minor, minor or greater, or beneficial.

Table B-5. Descriptions and Trends of Past, Present, and Reasonably Foreseeable Activity Types

Activity Type	Description and Trends
Offshore Wind Farm	Offshore wind farms are described in detail in Appendix A, Project Description and Potential Impacts. The Model Project incorporates industry standards for design, construction, and operation practices to ensure compliance with regulatory standards and with federal and state guidelines for avoidance, minimization, and mitigation of impacts. The Energy Information Administration estimates purchase of more than 400,000 acres of federal leases for offshore wind in the mid-Atlantic region in 2017, reflecting a growing trend. New York State’s goal is to encourage the development of 2,400 megawatts of wind energy by 2030.
Infrastructure	Infrastructure activities include installing telephone cables, transmission cables, and gas pipelines that are buried in the seabed to varying depths. Telephone cables from New York and New Jersey cross the Atlantic Ocean to landing points at various locations in Europe (MARCO 2017; see <i>Cables, Pipelines, and Other Infrastructure</i> appended to the Master Plan). Transmission cables and natural gas pipelines also cross the marine environment to connect to existing onshore facilities. Federal and state regulatory agencies with jurisdiction oversee the regulatory approvals and environmental assessments required to ensure compliance with regulatory standards and avoidance, minimization, and mitigation of impacts. Construction associated with infrastructure activities may include dredging, trenching, and backfilling for cables and pipelines, and some vessels may be anchored. Excavation at any given location along the route will generally be limited to periods as short as a few hours or as long as a few weeks. Operation and maintenance activities consist of routine inspections and occasionally reburying or covering infrastructure to required depths. In the future, additional transmission cables will be needed to connect offshore wind farms to the existing transmission grid. Other infrastructure activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms.
Coastal Storm Risk Management	Coastal storm risk management activities include beach nourishment projects that use large volumes of outside sand resources. The U.S. Army Corps of Engineers (USACE) is responsible for these types of activities and undertakes environmental review as appropriate to identify measures for avoidance, minimization, and mitigation of impacts. Periodic re-nourishment design meets both prevention of long-term erosion and storm-survivability requirements via sand hydraulically dredged from offshore borrow areas. These projects can protect and create habitat for threatened or endangered species. Beach nourishment projects also can create and sustain socioeconomic benefits associated with wider beaches for recreational activities such as fishing and boating. In response to Hurricane Sandy in 2012, a number of projects have been implemented to reduce coastal storm damage risks, and other projects are planned. Coastal storm risk management activities are expected to increase throughout the construction and operation of offshore wind farms as funding becomes available in the future.

Table B-1 continued

Activity Type	Description and Trends
Military Use	Military use activities take place in military-designated spaces, restricting access to military personnel to perform various duties. Military use areas include munitions response sites, weapons training areas, military training routes, and military operations areas. Military uses also include vessel-borne radar and sonar systems. Activities within these areas involve air and vessel traffic that may include use of sonar and explosives. Military use activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms.
Dredging	The USACE uses a bucket or hydraulic cutter suction dredge to remove material from the seafloor to ensure safe navigation of vessel traffic. Periodic dredging activities at existing ports occur year-round. The Port of New York and New Jersey completed dredging to 50 feet in 2016 to accommodate larger vessels now transiting the recently expanded Panama Canal locks (PANYNJ 2015). Dredging activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms.
Dredged Material Ocean Disposal Sites	This activity group includes one active ocean disposal site that receives dredged material from public and private projects. The USACE issues permits for dredged material disposal in consultation with the U.S. Environmental Protection Agency and other federal agencies. Ocean disposal of dredged material activities is expected to continue at about the present level throughout the construction and operation of offshore wind farms.
Commercial and Recreational Fishing	Commercial and recreational fishing refers to fishing operations that sell their catch for profit, saltwater anglers that fish for sport, and subsistence fishermen (NMFS 2015). Fish can be caught using a variety of gear, including pots and traps, trawls and seines, gillnets, dredges, and hooks and lines. Commercial and recreational fishing activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms. Between 2010 to 2015, total commercial fishing landings (in pounds) and total landings revenue in New York State waters have remained constant. Similarly, the amount of recreational anglers and total fishing trips in this area have been steady between 2010 and 2015 (NMFS 2015).
Marine Transportation	Marine transportation activities include the operation of vessels used for import and export services, construction work, recreational whale-watching, and cruise ships. General marine transportation activities are expected to continue at about the present level throughout the construction and operation of offshore wind farms. Marine transportation activities for import and export services are expected to increase, although larger vessels may replace smaller vessels. The Port of New York and New Jersey completed dredging in 2016 to accommodate the 10,100 TEUs (twenty-foot equivalent units) cellular-capacity vessels now transiting the recently expanded Panama Canal locks. The average vessel calling on the Port of New York and New Jersey in 2016 has a capacity of 5,000 TEUs, meaning new, larger ships will likely result in cargo coming in and out of the harbor on fewer ships. In addition, the new Panama class ships are the most advanced environmentally engineered ships afloat, dramatically reducing emissions per ship and emissions for total cargo handled (PANYNJ 2016).

Table B-6. Summary of Potential Impacts of Activity Types on Key Resources

Key Resource	Potential Impacts Similar to Construction or Operation of the Model Offshore Wind Project							
	Model Offshore Wind Project	Infrastructure	Coastal Storm Risk Management	Military Use	Dredging	Ocean Dredged Material Sites	Commercial and Recreational Fishing	Marine Transportation
Fish	Sensory Disturbance	Sensory Disturbance	N	Sensory Disturbance	N	N	N	N
Marine Mammals and Sea Turtles	Displacement, Disturbance or Loss of Habitat	Displacement, Disturbance or Loss of Habitat	N	Displacement, Disturbance or Loss of Habitat	Displacement, Disturbance or Loss of Habitat	Displacement, Disturbance or Loss of Habitat	N	Displacement, Disturbance or Loss of Habitat
Commercial and Recreational Fishing	Conflicts with Use of Space	Conflicts with Use of Space	N	N	N	Conflicts with Use of Space	N	Conflicts with Use of Space

N = This activity is expected to have negligible impacts on the associated key resource.

B.1 Sensory Disturbance to Fish

Infrastructure. Construction associated with installing infrastructure would likely have impacts on fish from increased underwater noise levels associated with excavation, trenching, vessel traffic, and related activities. The increased noise levels would be temporary and localized in a small area along the length of the cable or pipeline. Considering the duration of the expected increased noise and the implementation of best management practices, noise is expected to result in a **minor** sensory disturbance of fish.

Coastal Storm Risk Management, Dredging, and Ocean Disposal of Dredged Material. Sand removal and fill activities associated with the implementation of Coastal Storm Risk Management, Dredging, and Ocean Disposal of Dredged Materials activities will include excavation and increased vessel traffic that will increase noise and therefore sensory disturbance to fish. However, these activities will be isolated and sporadic events (not likely to occur all at once or for sustained periods). Fish are likely to temporarily re-locate during the activity and return when the underwater noise ceases. As impacts will be temporary and as sensory disturbance from excavation and vessel traffic are not likely to be injurious, these activities are expected to result in **negligible** sensory disturbance impacts to fish.

Military Use. Military use activities are expected to consist of underwater detonations, sonar, and vessel traffic, which would cause fish to experience increased noise and vibration. The increased noise and vibration levels would occur in temporary, isolated events during training activities and would be localized within the designated military training areas. Noise and vibrations from military use activities are expected to result in **minor** sensory disturbance impacts on fish.

Commercial and Recreational Fishing. Although commercial and recreational fishing vessel traffic is expected to temporarily shift from typical routes, the amount of vessel traffic is not expected to increase. As discussed in the *Fish and Fisheries Study*, which is appended to the Master Plan, resident fish are already exposed to vessel traffic, and the associated noise prompts a potential startle response in fish immediately adjacent to the passing vessels. Commercial and recreational fishing activity is expected to have only **negligible** sensory disturbance impacts on fish.

Marine Transportation. Marine transportation activities have the potential to disturb fish due to increased vessel traffic noise. However, resident fish are already exposed to existing vessel traffic, and the noise generated is not enough to impact fish other than to prompt a potential startle response in fish immediately adjacent to the passing vessels (see *Fish and Fisheries Study*). Marine transportation activities will be sporadic and short-term events and are therefore expected to have only **negligible** sensory disturbance impacts on fish.

Similarly, the dredging and excavating activities associated with installing infrastructure, coastal storm risk management, dredging, and dredged-material ocean disposal are expected to have only short-term and localized impacts. Potential sensory disturbance impacts from these activities on fish are therefore **negligible**.

B.2 Displacement, Disturbance, or Loss of Habitat for Marine Mammals and Sea Turtles

Infrastructure, Military Use, Dredging, Ocean Disposal of Dredged Materials Sites, and Marine Transportation. Increased noise from vessel traffic, excavation, and underwater detonations associated with infrastructure construction and maintenance, military uses, dredging, and dredged-material ocean disposal, and marine transportation activities may displace marine mammals and sea turtles from typical foraging and reproductive grounds. Displacement due to noise and the physical presence of equipment could cause marine mammals to move into areas of higher vessel traffic, such as shipping corridors, increasing the chance of vessel collisions for particularly at-risk species such as the fin whale, North Atlantic right whale, humpback whale, and sei whale (see *Marine Mammals and Sea Turtles Study*). However, because of the temporary nature of construction and the incorporation of avoidance, minimization, and mitigation measures, impacts from displacement of marine mammals and turtles are expected to be **minor**.

Coastal Storm Risk Management. Coastal storm risk management activities are, by definition, near the coastline, which minimizes the potential for impacts on marine mammals or sea turtles. However, typical projects in this activity category involve re-nourishment of beaches, and some marine mammals and sea turtles could be present in nearshore environments and could be displaced by the vessel traffic, excavations, and sediment disposal associated with the activity type. Although some marine mammals and sea turtles may be present in coastal/near-shore areas and may vacate the area during coastal storm risk management activities, they are likely to return to existing habitats when activities are completed. As these activities are expected to be short-term, isolated events, the impact is expected to be **negligible**.

Commercial and Recreational Fishing. The expected adjustments of commercial and recreational fishing routes may temporarily displace marine mammals from typical foraging and reproductive grounds around the geographic scope. However, fishing activity is expected to continue at about the present level. Because avoidance, minimization, and mitigation measures such as those included in Table A-2 (Appendix A) will be incorporated and the displacement of marine mammals and turtles will be temporary, impacts are expected to be **negligible**. Moreover, fishing vessels may avoid the offshore wind farm area due to safety concerns, allowing for a sheltering effect for marine animals (see *Marine Mammals and Sea Turtles Study*).

B.3 Conflicts with Use of Space for Commercial and Recreational Fishing

Coastal Storm Risk Management. Because coastal storm risk management activities are near the coastline, potential impacts on commercial and recreational fishers would be minimal. However, typical activities in this category involve re-nourishment of beaches, and some onshore/nearshore fishing activities could be displaced by vessel traffic, excavations, and sediment disposal. In addition, fishing and operational activities already within the nearshore environment are already exposed to this activity type, and the impacts are expected to be localized. As these activities are expected to be short-term, isolated events, any impact will be **negligible**.

Infrastructure, Military Use, Dredging, and Dredged Material Ocean Disposal. Vessel traffic associated with infrastructure construction, military use, and disposal of dredged material in the ocean could temporarily displace both fish and commercial and recreational vessels from fishing areas accessible to commercial and recreational vessels. Such vessel traffic could restrict access to fishing grounds and potentially interfere with charter vessel transits. A loss or disturbance of typical fishing grounds may lead to fishing vessels traveling farther, thus increasing fuel costs. However, vessel traffic associated with infrastructure construction, military use, and dredged material ocean disposal activities is localized and of short duration and therefore these activities are expected to cause **negligible** impacts on commercial and recreational fishing.

The presence of infrastructure, dredging, and dredged material ocean disposal sites may permanently reduce available fishing grounds. For infrastructure activities, USACE standard conditions for burial depths of transmission cable require adequate clearance for navigation channels and maintenance dredging (NYSPSC 2004). Where cable installation occurs on top of the seafloor with a protective layer, fish habitat may be modified and bottom conditions may not be compatible with trawl fishing.

Depending on the depth of burial, trawl fishing and vessel anchoring near infrastructure may be restricted. Dredging sites and dredged material ocean disposal sites also change the seafloor and may modify fish habitat, either increasing or decreasing availability of specific species within the footprint of the activity. However, the footprint of these activities is small, and dredging is expected to have **negligible** impacts on commercial and recreational fishing resources. Infrastructure also occupies only a small footprint and is not expected to permanently affect the population of any commercial or recreational fish species. Therefore, infrastructure and infrastructure installation are expected to have **minor** impacts on commercial and recreational fishing.

Marine Transportation. Marine transportation activities could cause temporary conflicts with use of space that displaces commercial and recreational vessels from fishing areas. Transportation vessel traffic could restrict access to fishing grounds and potentially interfere with charter vessel transits. A loss or disturbance of typical fishing grounds may cause vessels to travel farther, increasing fuel costs, and potentially affecting catch. Additionally, increased vessel traffic noise and habitat displacement have the potential to disturb fish, resulting in a loss of catch for local fishers (see *Fish and Fisheries Study*). Commercial and recreational fishing is already occurring alongside existing marine transportation activities, and vessel traffic would increase during construction of wind farms. However, only minimal traffic would be associated with maintenance during operation of wind farms. As the resource is expected to recover after construction, marine transportation is therefore expected to cause **minor** impacts on commercial and recreational fishing.

B.4 References

- BOEM (Bureau of Ocean Energy Management). 2014. Programmatic Environmental Impact Statement For Atlantic OCS Proposed Geological and Geophysical Activities in the Mid-Atlantic and South Atlantic Planning Areas. Accessed August 2017. <http://www.boem.gov/Oil-and-Gas-Energy-Program/GOMR/GandG.aspx>.
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- MAROA (Mid-Atlantic Regional Ocean Assessment). 2017. *Ocean Uses: Status, Trends, and Linkages*. Accessed September 2017. <http://roa.midatlanticocean.org/ocean-uses/status-trends-and-linkages/national-security-and-military-uses/>.

NMFS (National Marine Fisheries Service). 2015. *Fisheries Economics of the United States, 2015*. U.S. Department of Commerce: NOAA Technical Memorandum NMFS-F/SPO-170. Accessed September 2017. http://www.st.nmfs.noaa.gov/Assets/economics/publications/FEUS/FEUS-2015/Report-Chapters/FEUS%202015-AllChapters_Final.pdf.

NYSPSC (New York State Public Service Commission). 2004. *Opinion and Order Adopting Joint Proposal and Granting Certificate of Environmental Compatibility and Public Need for a Transmission Facility from New Jersey to Long Island*. Case 02-T-0036, Neptune Regional Transmission System, LLC.

PANYNJ (Port Authority of New York and New Jersey). 2015. *Delivering the Goods*. Accessed September 2017. <https://www.panynj.gov/port/pdf/delivering-the-goods.pdf>.

Appendix C. Identifying Past, Present, and Reasonably Foreseeable Activities

Literature reviews, agency outreach, and professional experience provided information on past, present, and reasonably foreseeable activities. Past and present activities include ongoing activities under construction. In some cases, completed activities were eliminated from further analysis unless operation could contribute to cumulative impacts. Reasonably foreseeable activities were screened for review by verifying status in a regulatory or planning process as of August 2017. In many cases, the lack of information available on activities creates an unavoidable level of uncertainty. This screening criterion addresses some of the uncertainty and qualitative judgment associated with identifying viable, reasonably foreseeable activities and assessing their contribution to potential cumulative effects. Primary sources of information about relevant activities in the region included the USACE, BOEM, and the USCG. The information sources searched included publicly accessible agency databases and websites.

Reasonably foreseeable activities were also identified through agency consultation and outreach. The following entities received requests for information on planned development activities within five miles of the AoA:

- Bureau of Ocean Energy Management
- Mid-Atlantic Fishery Management Council
- New England Fishery Management Council
- New York Power Authority
- New Jersey Department of Environmental Protection
- New York Department of Environmental Conservation
- Rhode Island Department of Environmental Management
- U.S. Navy Department of Defense
- U.S. Army Corps of Engineers
- U.S. Coast Guard
- U.S. Fish and Wildlife Service
- New York Independent System Operator

The responses were reviewed for pertinent information on types of activities in the OSA and specific activities reflected in the analysis. Attachment C-1 provides copies of the responses received from the information request.

Attachment C-1: Agency Outreach Letters

Agency Consultation:
United States Coast Guard



August 1, 2017

Michele DesAutels
USCG
408 Atlantic Avenue
Boston, MA 02110

Re: Offshore Wind Master Plan
New York State Energy Research and Development Authority
Information Request

Dear Mr. DesAutels:

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan to help meet the state's Clean Energy Standard renewable energy mandate and to ensure that offshore wind in New York is developed in the most responsible and cost-effective manner possible. The Master Plan will identify potential offshore wind sites within the Offshore Study Area (OSA) [Attachment A] that meet the State's siting standards and take into consideration environmental, maritime, social, economic, and indigenous issues.

As part of the master planning process, NYSERDA is identifying reasonably foreseeable activities occurring in and near the OSA that may have impacts similar to construction and operation of offshore wind farms. E & E is requesting the following information:

- A copy of the USCG Comprehensive Plan, as applicable;
- A list of planned offshore USCG development projects within 5 miles of the OSA;
- For each planned offshore development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;
- A list of planned coastal development projects in the vicinity of the OSA;
- For each planned coastal development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;

We recognize that we are requesting information that may come from multiple departments, divisions, or offices, and are therefore willing to coordinate directly with the appropriate contact person. If there are other persons within that would have this information, please provide their contact information. We can also provide shapefiles to use in geographic information system (GIS) programs or a KMZ file to use in GoogleEarth via email upon request, if that would assist your review.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me at (201) 850-3690, or via email at kohleth@ene.com. We appreciate your assistance and thank you for your attention to this request.

Sincerely,

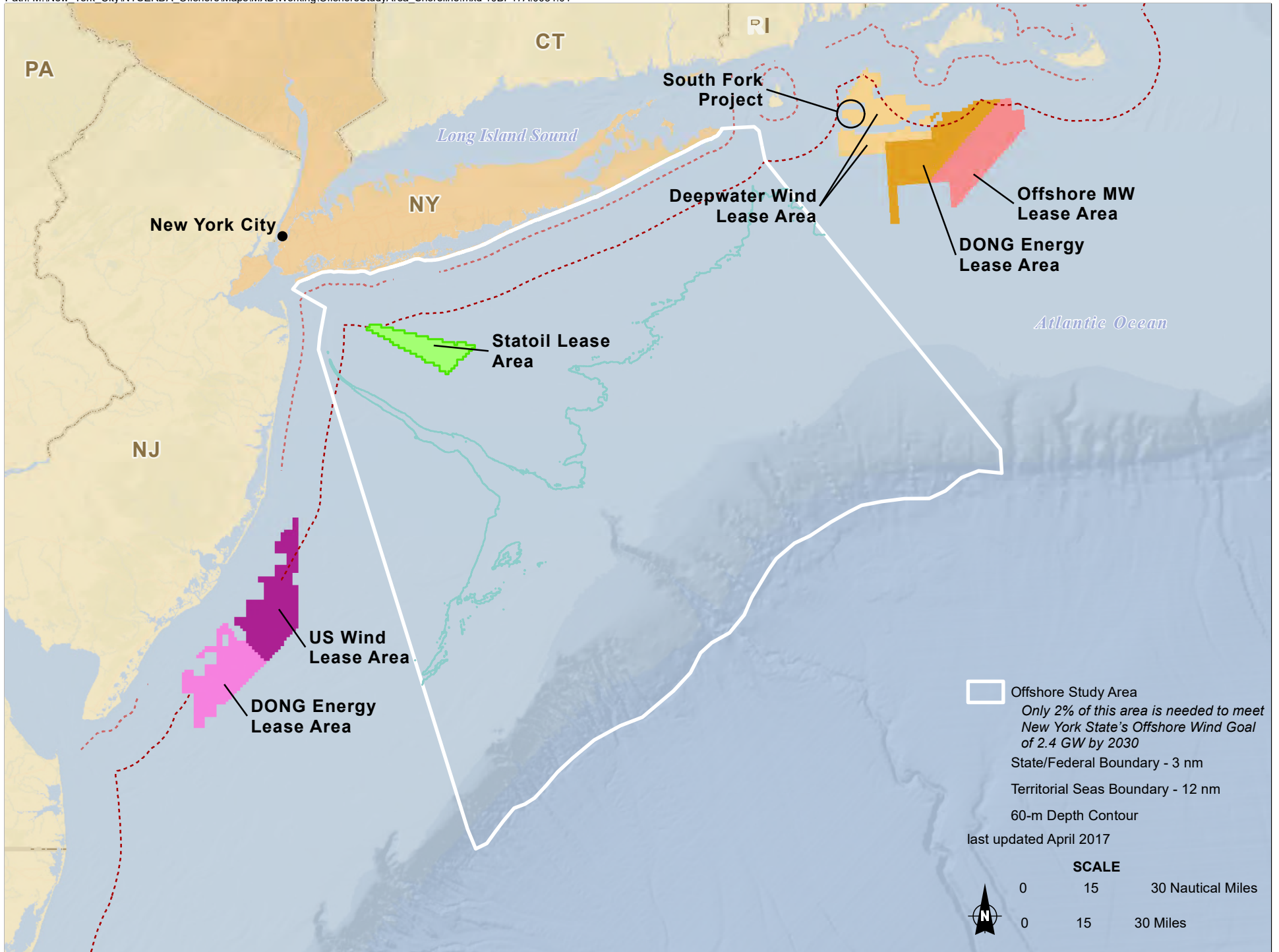
A handwritten signature in blue ink, appearing to read "K. Ohleth", is centered on the page.

Kris Ohleth
Project Manager

ECOLOGY & ENVIRONMENT, INC.

Attachment: Attachment A - New York Offshore Study Area

Attachment A
Offshore Wind Planning Area and Potential Project Area



Archived: Wednesday, September 13, 2017 2:39:24 PM
From: Ohleth, Kris
Sent: Fri, 18 Aug 2017 15:00:15
To: DesAutels, Michele E CIV
Cc: Whitken, Janine
Subject: RE: Information Requested for NY OSW Master Plan
Importance: Normal

Thanks for the input, Michele! We will note it accordingly.

Best,
Kris

-----Original Message-----

From: DesAutels, Michele E CIV [<mailto:Michele.E.DesAutels@uscg.mil>]
Sent: Wednesday, August 16, 2017 8:44 AM
To: Ohleth, Kris <KOhleth@ene.com>
Subject: RE: Information Requested for NY OSW Master Plan

Hi Kris,

As we discussed on the phone, Coast Guard is typically a cooperating/consulting agency on other federal (or state) agency NEPA processes.

That said, there are Coast Guard uses in the water to be aware of - mostly ad hoc and in response to emergencies. We already have commented to BOEM about our Weapons Training Areas. Additionally, we may have need for Search and Rescue activities but of course we don't know when or where.

Other items of interest include marine event permits. The recurring events are in CFR. Non recurring events are not specifically tracked but communicated in the local notice to mariners.

Finally, other items of interest might be regulated navigation areas (anchorage grounds, TSS, etc) and these are also in CFR and charted.

Hope this helps!

Best,
Michele

-----Original Message-----

From: Ohleth, Kris [<mailto:KOhleth@ene.com>]
Sent: Sunday, August 06, 2017 9:39 PM
To: DesAutels, Michele E CIV
Subject: [Non-DoD Source] Information Requested for NY OSW Master Plan

Dear Michele,

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan that supports the state's mandate to meet 50 percent of its electricity needs from renewable sources by 2030. The Master Plan will be a comprehensive planning document for developing offshore wind resources in New York State, and will include recommendations on the best solutions and practices for developing offshore wind in the most

responsible and cost-effective manner possible.

As part of the master planning process, NYSERDA is conducting a cumulative analysis that will identify potential cumulative effects on key resources associated with the development of offshore wind energy sites within the Offshore Study Area (OSA) of the Master Plan. In order to develop a robust and thorough analysis of the potential cumulative effects, we would like your assistance in obtaining information on planned offshore and coastal development projects within the vicinity of the OSA. The attached letter describes the analysis in greater detail, the information that we are requesting from your agency, and the location of the study area.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me. We appreciate your assistance by responding to the attached by Friday August 25, and thank you for your attention to this request.

Best,

Kris

[<https://urldefense.proofpoint.com/v2/url?u=http-3A_www.ene.com_&d=DwMFaQ&c=0NKfg44GVknAU-XkWXjNxQ&r=7NT6Wdg6oAveXuf0jDLfUhlGkb8CROK17Mjy2GUXc0A&m=iDNJTQRU8f7ayMGfj3Z63pstxmyLrUrEKAsYUpWhy2M&s=heyhSx0_U-dx95Vv65EIBnHo4G6xNcMvaaSxNJekwwU&e=>](https://urldefense.proofpoint.com/v2/url?u=http-3A_www.ene.com_&d=DwMFaQ&c=0NKfg44GVknAU-XkWXjNxQ&r=7NT6Wdg6oAveXuf0jDLfUhlGkb8CROK17Mjy2GUXc0A&m=iDNJTQRU8f7ayMGfj3Z63pstxmyLrUrEKAsYUpWhy2M&s=heyhSx0_U-dx95Vv65EIBnHo4G6xNcMvaaSxNJekwwU&e=>)

Kris Ohleth

201-850-3690

kohleth@ene.com <<mailto:kohleth@ene.com>> • www.ene.com <https://urldefense.proofpoint.com/v2/url?u=http-3A_www.ene.com_&d=DwMFaQ&c=0NKfg44GVknAU-XkWXjNxQ&r=7NT6Wdg6oAveXuf0jDLfUhlGkb8CROK17Mjy2GUXc0A&m=iDNJTQRU8f7ayMGfj3Z63pstxmyLrUrEKAsYUpWhy2M&s=heyhSx0_U-dx95Vv65EIBnHo4G6xNcMvaaSxNJekwwU&e=>>

Agency Consultation:
United States Army Corps of Engineers

August 1, 2017

Naomi Handel
USACE
26 Federal Plaza
New York, NY 10278

Re: Offshore Wind Master Plan
New York State Energy Research and Development Authority
Information Request

Dear Ms. Handel:

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan to help meet the state's Clean Energy Standard renewable energy mandate and to ensure that offshore wind in New York is developed in the most responsible and cost-effective manner possible. The Master Plan will identify potential offshore wind sites within the Offshore Study Area (OSA) [Attachment A] that meet the State's siting standards and take into consideration environmental, maritime, social, economic, and indigenous issues.

As part of the master planning process, NYSERDA is identifying reasonably foreseeable activities occurring in and near the OSA that may have impacts similar to construction and operation of offshore wind farms. E & E is requesting the following information:

- A copy of the USACE Comprehensive Plan, as applicable;
- A list of planned offshore USACE development projects within 5 miles of the OSA;
- For each planned offshore development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;
- A list of planned coastal development projects in the vicinity of the OSA;
- For each planned coastal development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;

We recognize that we are requesting information that may come from multiple departments, divisions, or offices, and are therefore willing to coordinate directly with the appropriate contact person. If there are other persons within that would have this information, please provide their contact information. We can also provide shapefiles to use in geographic information system (GIS) programs or a KMZ file to use in GoogleEarth via email upon request, if that would assist your review.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me at (201) 850-3690, or via email at kohleth@ene.com. We appreciate your assistance and thank you for your attention to this request.

Sincerely,

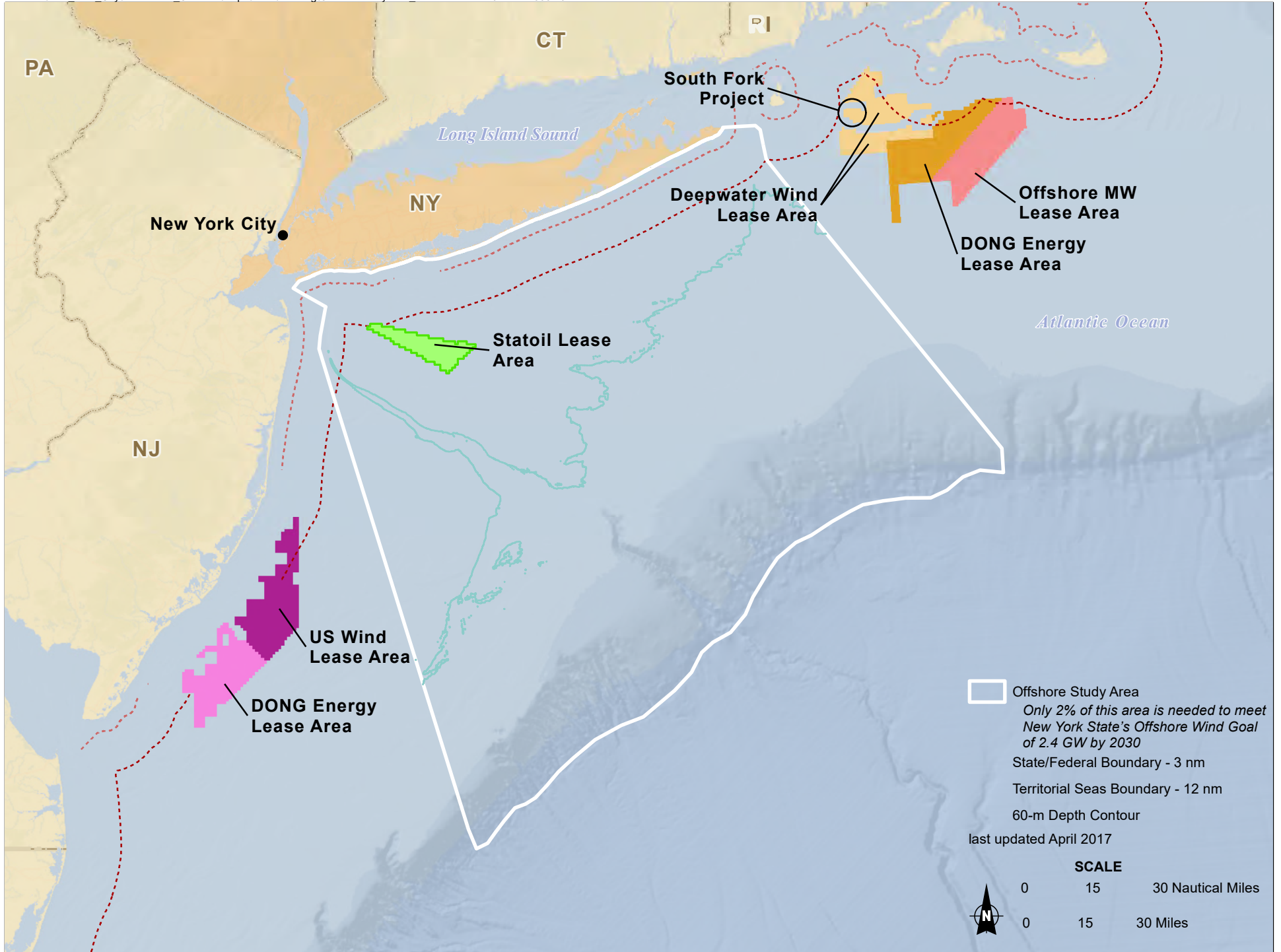
A handwritten signature in blue ink, appearing to read "K. Ohleth", is centered below the text "Sincerely,".

Kris Ohleth
Project Manager

ECOLOGY & ENVIRONMENT, INC.

Attachment: Attachment A - New York Offshore Study Area

Attachment A
Offshore Wind Planning Area and Potential Project Area



-----Original Message-----

From: Handell, Naomi J CIV USARMY CENAN (US) [<mailto:Naomi.J.Handell@usace.army.mil>]

Sent: Tuesday, August 08, 2017 10:18 AM

To: Ohleth, Kris <KOhleth@ene.com>

Subject: RE: Information Requested for NY OSW Master Plan

Hi Kris,

The best way to obtain the type of information you are looking for in your August 1, 2017 letter would be through a FOIA request. The contact information is listed below:

To submit a Freedom of Information Request:

VIA FAX: 212-264-8171, Attn: Annette Baden

or

VIA EMAIL: foia-nan@usace.army.mil

or

SUBMIT IN WRITING TO:

Attn: Annette Baden (Assistant to the Freedom of Information Act Officer)
U.S. Army Corps of Engineers
26 Federal Plaza
Office of Counsel, Room 1837
New York , NY 10278-0090
917-790-8058

Thank you,
Naomi

Naomi Handell
Project Manager
U.S. Army Corps of Engineers
New York District
Regulatory Branch-Eastern Section
26 Federal Plaza, Room 1937
New York, New York 10278
P: 917-790-8523
F: 212-264-4260

PLEASE USE THE ABOVE 18-CHARACTER FILE NUMBER ON ALL CORRESPONDENCE WITH THIS OFFICE.

-----Original Message-----

From: Ohleth, Kris [<mailto:KOhleth@ene.com>]

Sent: Sunday, August 06, 2017 9:40 PM

To: Handell, Naomi J CIV USARMY CENAN (US) <Naomi.J.Handell@usace.army.mil>

Subject: [Non-DoD Source] Information Requested for NY OSW Master Plan

Dear Naomi,

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan that supports the state's mandate to meet 50 percent of its electricity needs from renewable sources by 2030. The Master Plan will be a comprehensive planning document for developing offshore wind resources in New York State, and will include recommendations on the best solutions and practices for developing offshore wind in the most responsible and cost-effective manner possible.

As part of the master planning process, NYSERDA is conducting a cumulative analysis that will identify potential cumulative effects on key resources associated with the development of offshore wind energy sites within the Offshore Study Area (OSA) of the Master Plan. In order to develop a robust and thorough analysis of the potential cumulative effects, we would like your assistance in obtaining information on planned offshore and coastal development projects within the vicinity of the OSA. The attached letter describes the analysis in greater detail, the information that we are requesting from your agency, and the location of the study area.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me. We appreciate your assistance by responding to the attached by Friday August 25, and thank you for your attention to this request.

Best,

Kris

<Blocked<http://www.ene.com/>>

Kris Ohleth

201-850-3690

kohleth@ene.com <<mailto:kohleth@ene.com>> • Blockedwww.ene.com <Blocked<http://www.ene.com/>>

Agency Consultation:

Rhode Island Department of Environmental Management



August 1, 2017

Jason McNamee
Rhode Island DEM
3 Ft. Wetherhill Road
Jamestown, RI 02835

Re: Offshore Wind Master Plan
New York State Energy Research and Development Authority
Information Request

Dear Mr. McNamee:

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan to help meet the state's Clean Energy Standard renewable energy mandate and to ensure that offshore wind in New York is developed in the most responsible and cost-effective manner possible. The Master Plan will identify potential offshore wind sites within the Offshore Study Area (OSA) [Attachment A] that meet the State's siting standards and take into consideration environmental, maritime, social, economic, and indigenous issues.

As part of the master planning process, NYSERDA is identifying reasonably foreseeable activities occurring in and near the OSA that may have impacts similar to construction and operation of offshore wind farms. E & E is requesting the following information:

- A copy of the Rhode Island DEM Comprehensive Plan, as applicable;
- A list of planned offshore Rhode Island DEM development projects within 5 miles of the OSA;
- For each planned offshore development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;
- A list of planned coastal development projects in the vicinity of the OSA;
- For each planned coastal development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;

We recognize that we are requesting information that may come from multiple departments, divisions, or offices, and are therefore willing to coordinate directly with the appropriate contact person. If there are other persons within that would have this information, please provide their contact information. We can also provide shapefiles to use in geographic information system (GIS) programs or a KMZ file to use in GoogleEarth via email upon request, if that would assist your review.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me at (201) 850-3690, or via email at kohleth@ene.com. We appreciate your assistance and thank you for your attention to this request.

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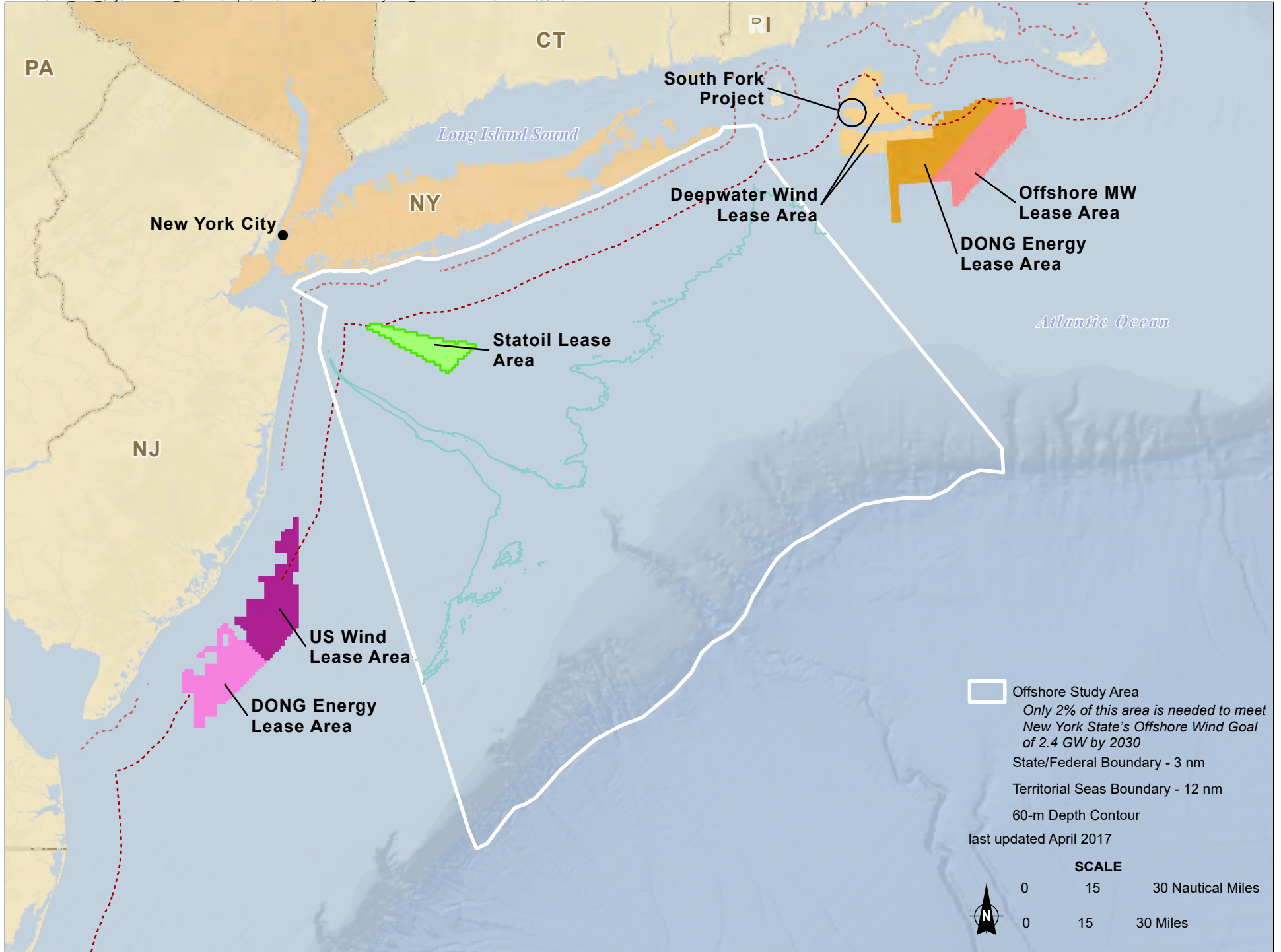
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Kris Ohleth
Project Manager

ECOLOGY & ENVIRONMENT, INC.

Attachment: Attachment A - New York Offshore Study Area

Attachment A
Offshore Wind Planning Area and Potential Project Area



Jason,

That is incredibly helpful.

Many thanks,
Kris



Kris Ohleth
201-850-3690
kohleth@ene.com • www.ene.com

From: McNamee, Jason (DEM) [<mailto:jason.mcnamee@dem.ri.gov>]
Sent: Friday, August 11, 2017 11:45 AM
To: Ohleth, Kris <KOhleth@ene.com>
Cc: Gagnon, Ron (DEM) <Ron.Gagnon@dem.ri.gov>; Dave Beutel <dbeutel@crmc.ri.gov>; 'Grover Fugate' <[gfugate@crmc.ri.gov](mailto:gufugate@crmc.ri.gov)>; Coit, Janet (DEM) <janet.coit@dem.ri.gov>
Subject: FW: [EXTERNAL] : Information Requested for NY OSW Master Plan

Hello Kris. I am copying in Ron Gagnon of RIDEM and David Beutel of RI CRMC to this email. They are the more appropriate individuals to answer the questions posed in your letter. We at RIDEM Div of Marine Fisheries do have some analyses that may prove beneficial or informative, but we will coordinate the submission of that information to you through Ron at the appropriate time. I have also copied in Director Coit from DEM and Executive Director Fugate from CRMC so they are apprised of the request.

Thanks
-Jason McNamee

From: Ohleth, Kris [<mailto:KOhleth@ene.com>]
Sent: Sunday, August 06, 2017 9:38 PM
To: McNamee, Jason (DEM) <jason.mcnamee@dem.ri.gov>
Subject: [EXTERNAL] : Information Requested for NY OSW Master Plan

Dear Jason,

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan that supports the state's mandate to meet 50 percent of its electricity needs from renewable sources by 2030. The Master Plan will be a comprehensive planning document for developing offshore wind resources in New York State, and will include recommendations on the best solutions and practices for developing offshore wind in the most responsible and cost-effective manner possible.

As part of the master planning process, NYSERDA is conducting a cumulative analysis that will identify potential cumulative effects on key resources associated with the development of offshore wind energy sites within the Offshore Study Area (OSA) of the Master Plan. In order to develop a robust and thorough analysis of the potential cumulative effects, we would like your assistance in obtaining information on planned offshore and coastal development projects within the vicinity of the OSA. The attached letter describes the analysis in greater detail, the information that we are requesting from your agency, and the location of the study area.

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Best,
Kris



ecology and environment, inc.

Kris Ohleth
201-850-3690
kohleth@ene.com • www.ene.com

Agency Consultation:
Bureau of Ocean Energy Management



August 1, 2017

Luke Feinberg
BOEM
45600 Woodland Road
Sterling, VA 20166

Re: Offshore Wind Master Plan
New York State Energy Research and Development Authority
Information Request

Dear Mr. Feinberg:

Ecology and Environment, Inc. (E&E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan to help meet the state's Clean Energy Standard renewable energy mandate and to ensure that offshore wind in New York is developed in the most responsible and cost-effective manner possible. The Master Plan will identify potential offshore wind sites within the Offshore Study Area (OSA) [Attachment A] that meet the State's siting standards and take into consideration environmental, maritime, social, economic, and indigenous issues.

As part of the master planning process, NYSERDA is identifying reasonably foreseeable activities occurring in and near the OSA that may have impacts similar to construction and operation of offshore wind farms. E & E is requesting the following information:

- A copy of the BOEM Comprehensive Plan, as applicable;
- A list of planned offshore BOEM development projects within 5 miles of the OSA;
- For each planned offshore development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;
- A list of planned coastal development projects in the vicinity of the OSA;
- For each planned coastal development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;

We recognize that we are requesting information that may come from multiple departments, divisions, or offices, and are therefore willing to coordinate directly with the appropriate contact person. If there are other persons within that would have this information, please provide their contact information. We can also provide shapefiles to use in geographic information system (GIS) programs or a KMZ file to use in GoogleEarth via email upon request, if that would assist your review.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me at (201) 850-3690, or via email at kohleth@ene.com. We appreciate your assistance and thank you for your attention to this request.

Sincerely,

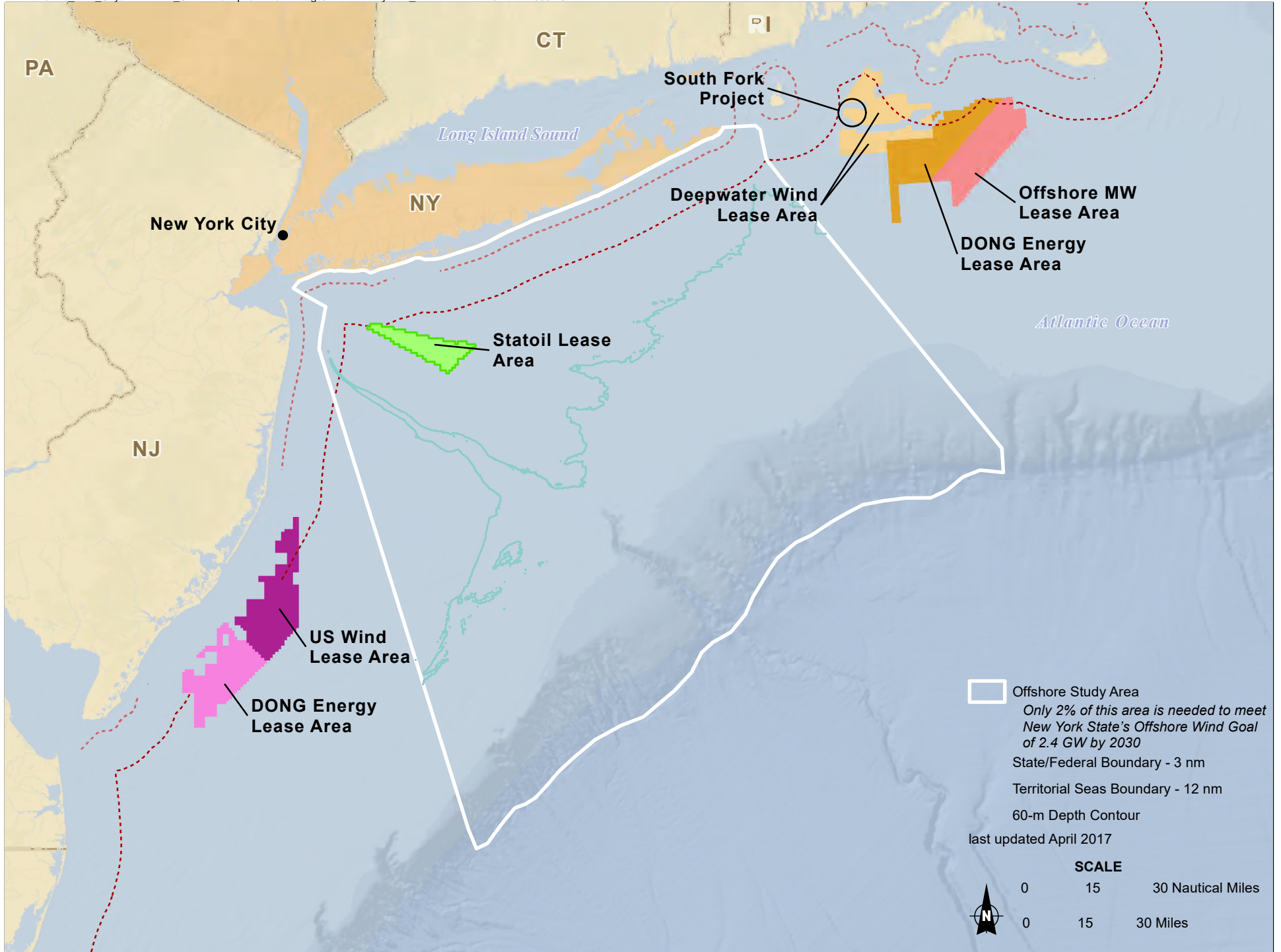
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Kris Ohleth
Project Manager

ECOLOGY & ENVIRONMENT, INC.

Attachment: Attachment A - New York Offshore Study Area

Attachment A
Offshore Wind Planning Area and Potential Project Area



From: Feinberg, Lucas [mailto:lucas.feinberg@boem.gov]
Sent: Friday, August 25, 2017 9:05 AM
To: Ohleth, Kris <KOhleth@ene.com>
Cc: Joshua Gange <joshua.gange@boem.gov>; David MacDuffee <david.macduffee@boem.gov>
Subject: Re: Information Requested for NY OSW Master Plan

Hi Kris,

Thank you for reaching out and requesting information to inform your cumulative analysis study effort. BOEM is happy to assist and we have put together several responses to your questions based on our three program areas with jurisdiction within the Offshore Study Area (OSA).

Office of Renewable Energy Programs

BOEM does not have a 'Comprehensive Plan' but the [2016 National Offshore Wind Strategy](#), developed as a joint document between the Department of the Interior and the Department of Energy may be useful to review.

For maps, or GIS files pertaining to the items discussed below, please refer to <https://marinecadastre.gov/nationalviewer/> and the BOEM Wind Planning Areas layer.

Offshore projects planned or in the vicinity of the Offshore Study Area

[Commercial Lease OCS-A 0512 \(Statoil Wind US\)](#)

On December 15-16, 2016, BOEM held a lease sale (i.e., auction) for an area offshore New York, referred to as the "New York lease area." The auction lasted 33 rounds. Statoil Wind US LLC, which bid \$42,469,725 was the winner of lease area OCS-A 0512. Per the terms of the lease, Statoil has a Site Assessment Plan due to BOEM on April 1, 2018.

[Unsolicited Lease Request Offshore New York](#)

On December 30, 2016, PNE Wind USA, Inc. submitted an unsolicited lease request for 40,920 acres offshore New York. If BOEM decides to move

[Commercial Wind Leases \(OCS-A 0498 and OCS-A 0499\) Offshore New Jersey](#)

OCS-A 0498 (Ocean Wind)

BOEM executed Ocean Wind's lease on February 4, 2016. On March 1, 2017, BOEM approved Ocean Wind's request for a one-year extension of their preliminary lease term. Ocean Wind is currently preparing a SAP for BOEM submission.

OCS-A 0499 (US Wind)

On February 4, 2016, BOEM executed US Wind's lease. On June 10, 2016, BOEM approved US Wind's preliminary lease term extension request to March 1, 2018. Per the lease terms, US Wind must submit a Site Assessment Plan to BOEM on March 1, 2019.

[Commercial Wind Leases \(OCS-A 0500 and OCS-A 0501\) Offshore Massachusetts](#)

OCS-A 0500 (Bay State Wind)

On June 29, 2017, The Bureau of Ocean Energy Management approved the Site Assessment Plan (SAP) for Lease OCS-A 0500 (Bay State Wind). The SAP approval allows for the installation of two floating light and detection ranging buoys (FLIDARs) and one metocean/current buoy. For additional information, please find the approved SAP [here](#).

OCS-A 0501 (Vineyard Wind)

Offshore MW requested a 1-year extension for submitting its SAP, which BOEM approved. The SAP was filed in March 2017. BOEM is currently reviewing the submission and will approve, disapprove, or approve with modifications the proposed site assessment activities.

[Commercial Wind Lease for the Wind Energy Area Offshore Rhode Island and Massachusetts](#)

OCS-A 0486 & 0487 (Deepwater Wind)

North Lease Area. BOEM received a Site Assessment Plan (SAP) for commercial lease OCS-A 0486 (North lease area) from Deepwater Wind New England LLC (Deepwater Wind) on April 1, 2016. Upon completion of the environmental and technical review, BOEM may approve, disapprove, or approve the SAP with modifications. The 5-year site assessment term of the lease would begin upon approval of the SAP, and a Construction and Operations Plan (COP) would then be due within 4 ½ years.

South Lease Area. In April 2014, Deepwater Wind informed BOEM that they do not intend to conduct site assessment activities (e.g., installation of a meteorological tower or meteorological buoy) for commercial lease OCS-A 0487 (South lease area). The 5-year site assessment term for the South lease began on July 1, 2014. A COP for commercial lease OCS-A 0487 is due January 1, 2019.

Oil and Gas Program

BOEM currently has no planned offshore oil and gas development projects or leases within 5 nm of the offshore study area (OSA). The OSA is part of BOEM's North Atlantic oil and gas Planning Area. No lease sales are scheduled in this planning area under BOEM's current 2017-2022 Outer Continental Shelf (OCS) Oil and Gas Program. However, BOEM is beginning the process of developing a new National OCS Oil and Gas Program. As part of this process, BOEM considers all OCS planning areas. BOEM is currently analyzing comments received in response to an initial Request for Information (RFI), which was issued in July 2017. BOEM anticipates releasing the first draft of a proposed leasing schedule, the Draft Proposed Program (DPP), in late 2017. More information on the program development process is available at: <https://www.boem.gov/Five-Year-Program/>.

Marine Minerals Program

BOEM has not issued a negotiated agreement (or lease) for OCS sand for beach nourishment or coastal restoration in New York state to date. However, based on BOEM conversations with the US Army Corps of Engineers, New York District, there may be a need for OCS sand in the next several years (< 5 years). BOEM has funded a cooperative agreement with the New York State Department of State to evaluate sand resources offshore New York (<https://www.boem.gov/NY-Summary-Report/>). The cooperative agreement was executed in June 2014 and ends in September 2018. In addition to this effort, BOEM collected geophysical and geological data in areas of the OCS offshore NY as part of its Atlantic Sand Assessment project (<https://www.boem.gov/Marine-Minerals-Program-offshore-sand-resources/>).

Attached graphic of NY sediment resources.

The GIS dataset is still in development in terms of how we define those areas. Our current approach for describing sand resources areas are modified from "A geological investigation of the offshore areas along Florida's central east coast" study 1999, Freedenberg and Hoenstine and based on a level of confidence.

We have not "published" this dataset.

Categories:

there is competitive interest in bidding for the area.

Possible – features identified as a result of bathymetry delineation of a supposed shoal. No additional physical data exists to support these areas as a resource

Potential – resource areas hypothesized to exist on the basis of indirect evidence such as acoustic subsurface profile (seismic) character or sidescan sonar character. The presence of sand through direct sampling methods has not yet been confirmed.

Probable – resource areas whose existence has been established through the use of vibracores, push cores and/or grab samples. Thickness and/or lateral extent has not been fully determined. These are reserves that could be viable if additional coring is done

Proven – resource areas whose thickness and lateral extent have been fully determined through the use of vibracore and/or push cores. Generally reserved for shoals that have already been authorized as part of a lease.

Unusable – resource areas that as a result of additional surveys, prior dredging activity, or infrastructure development are not (or no longer) suitable for future dredging.

Please feel free to reach out should you have any questions.

Best,

Luke Feinberg
Energy Program Specialist
U.S. Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs
45600 Woodland Road
Sterling, Virginia 20166
Cell (571) 474-7616
Office (703) 787-1705
luke.feinberg@boem.gov

On Sun, Aug 6, 2017 at 2:26 PM, Ohleth, Kris <KOhleth@ene.com> wrote:

Dear Luke,

Ecology and Environment, Inc (E&E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan that supports the state's mandate to meet 100 percent of its electricity needs from renewable sources by 2030. The Master Plan will be a comprehensive planning document for developing offshore wind resources in New York State, and will include recommendations on the best solutions and practices for developing offshore wind in the most responsible and cost-effective manner possible.

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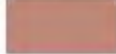
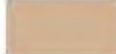


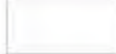

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Best,
Kris









Kris Ohleth
201 8 0 36 0
kohleth@ene.com <kohleth@ene.com>

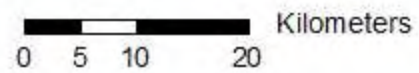
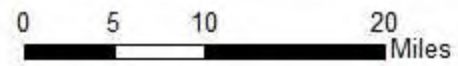
Sand Resources

-  Proven
-  Probable
-  Potential
-  Possible
-  Unusable
-  Submerged Lands Act Boundary

Bathymetric Contours

Depth

-  10, 20, 30, 40, 50 m
-  60, 70, 80, 90 m
-  100, 150 m
-  200 m
-  400 m
-  600 m



Agency Consultation:

New York State Department of Environmental Conservation

August 1, 2017

Sherryll Huber-Jones
NYDEC
205 Belle Mead Road, Suite 1
East Setauket, NY 11733

Re: Offshore Wind Master Plan
New York State Energy Research and Development Authority
Information Request

Dear Ms. Huber-Jones:

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan to help meet the state's Clean Energy Standard renewable energy mandate and to ensure that offshore wind in New York is developed in the most responsible and cost-effective manner possible. The Master Plan will identify potential offshore wind sites within the Offshore Study Area (OSA) [Attachment A] that meet the State's siting standards and take into consideration environmental, maritime, social, economic, and indigenous issues.

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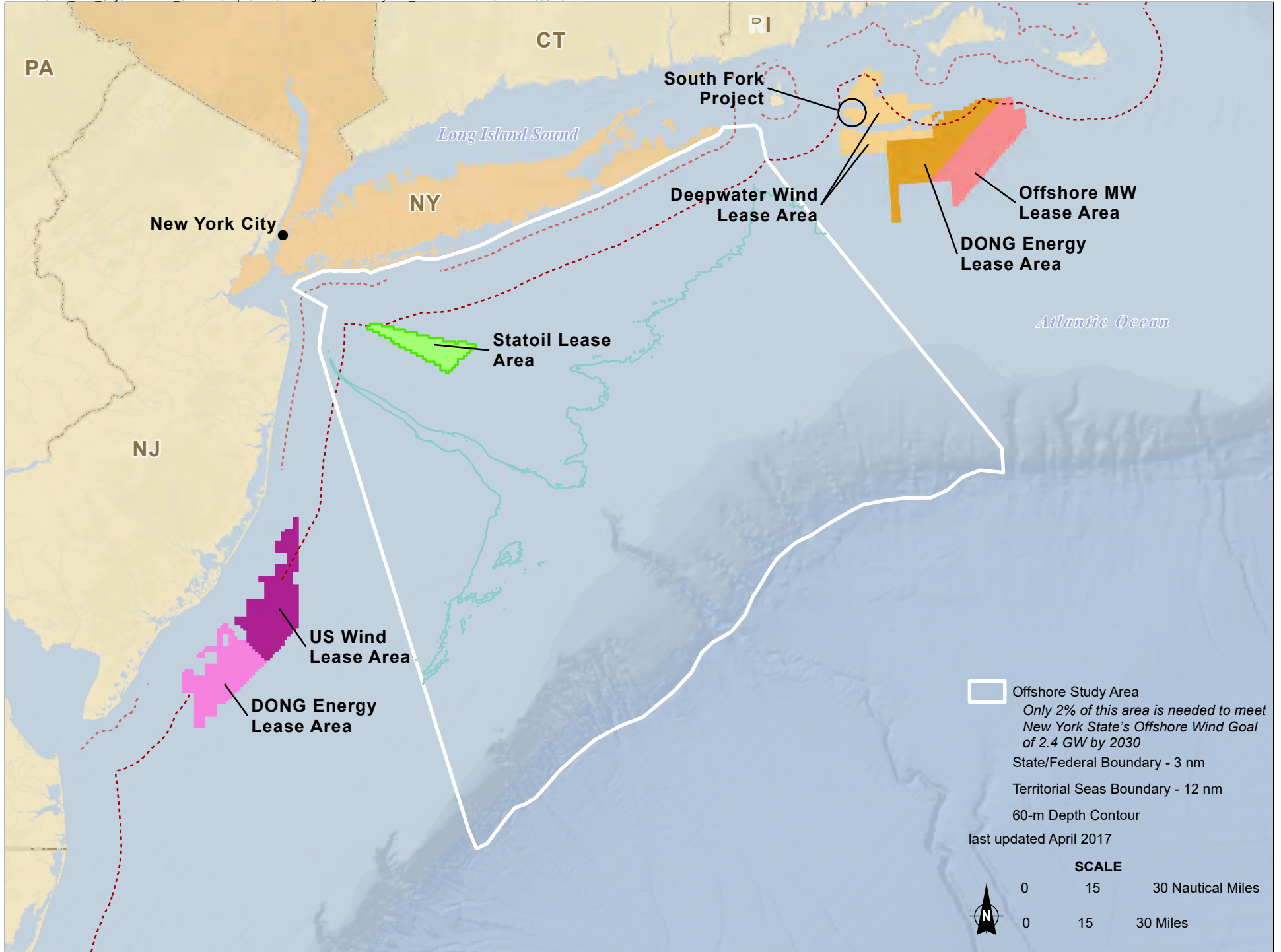
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Kris Ohleth
Project Manager

ECOLOGY & ENVIRONMENT, INC.

Attachment: Attachment A - New York Offshore Study Area

Attachment A
Offshore Wind Planning Area and Potential Project Area





From: Jones, Sherryll K (DEC) [mailto:Sherryll.Jones@dec.ny.gov]
Sent: Friday, August 25, 2017 4:32 PM
To: Ohleth, Kris <KOhleth@ene.com>
Cc: Chytalo, Karen (DEC) <karen.chytalo@dec.ny.gov>
Subject: RE: Information Requested for NY OSW Master Plan

Hi Kris:

Please find the attached response letter that describes current and planned NYSDEC activities in the OSA. We appreciate the opportunity to inform the cumulative impacts study being conducted by NYSERDA and E&E.

If you have any questions, please let us know. I will be on vacation until Labor Day, but Karen will be around to clarify any points that need explanation. Have a great weekend,

Sherryll Huber Jones

New York State Ocean Coordinator
Atlantic States Marine Fisheries Commission
NYSDEC Division of Marine Resources
sherryll.jones@dec.ny.gov
(631) 444-0448

[New York State Ocean Program](#)

From: Ohleth, Kris [mailto:KOhleth@ene.com]
Sent: Sunday, August 06, 2017 9:49 PM
To: Jones, Sherryll K (DEC) <Sherryll.Jones@dec.ny.gov>
Subject: Information Requested for NY OSW Master Plan

ATTENTION: This email came from an external source. Do not open attachments or click on links from unknown senders or unexpected emails.

Hi Sherryll,

Nice talking with you on Friday. As we discussed, Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan that supports the state's mandate to meet 50 percent of its electricity needs from renewable sources by 2030. The Master Plan will be a comprehensive planning document for developing offshore wind resources in New York State, and will include recommendations on the best solutions and practices for developing offshore wind in the most responsible and cost-effective manner possible.

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Best,
Kris



Kris Ohleth
201-850-3690
kohleth@ene.com • www.ene.com

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Marine Resources

205 North Belle Mead Road, Suite 1, East Setauket, NY 11733
P: (631) 444-0430 | F: (631) 444-0434 | FW.Marine@dec.ny.gov
www.dec.ny.gov

Ecology and Environment, Inc.
90 Broad Street 1906
New York, NY 10004

RE: Offshore Wind Master Plan, New York State Energy Research and Development Authority
Information Request

August 24, 2017

Dear Kris Ohleth:

Thank you for your request to the New York State Department of Environmental Conservation (NYSDEC) for more information on planned activities and/or development projects in and around the Atlantic Offshore Study Area (OSA). As you know, the NYSDEC, in cooperation with the New York State Department of State (NYSDOS), released the New York Ocean Action Plan (OAP) in January 2017. Through a ten-year, sixty-one-point action plan, this coordinated effort provides a framework for implementing an integrated, adaptive approach to managing, restoring, and conserving ocean resources. The OAP identifies the most urgent actions needed to achieve environmental and socio-economic goals for New York's ocean ecosystem by coordinating state and federal agencies, municipalities, academic institutions, non-governmental organizations, community partners, and other ocean stakeholders in all aspects of coastal and offshore management and planning activities. Through this effort, the OAP objectives include:

- Ensuring the ecological integrity of the ocean ecosystem.
- Promoting economic growth, coastal development and human use of the ocean in a manner sustainable and consistent with maintaining ecosystem integrity
- Increasing the resilience of ocean resources to impacts associated with climate change
- Empowering the public to actively participate in decision making and ocean stewardship

The full-version of the New York State OAP is available on the NYSDEC website <http://www.dec.ny.gov/lands/84428.html> as well as an OAP Matrix of associated actions and identified collaborating partners.

The NYSDEC offers the following list of planned offshore activities and monitoring projects that are affiliated with the OSA. For specific details on coastal development projects or federal permitting for projects within federal waters (3nm to the continental shelf), the NYSDEC recommends contacting the NYSDOS or appropriate federal agency.

Offshore Development and Monitoring Projects (NYSDEC led):

1. - The DEC Reef Program will be proposing the expansion of three existing reef sites and one new site in its application for new permits. The expansions are located within New York State waters. The new site is located in Federal waters and permitting is being requested to the US Army Corps of Engineers. Attached is a figure indicating the location of existing artificial reefs and the proposed reef.

Timeline and Permitting: The current DEC reef permits expire in August 2018. It is anticipated that new permits will be secured before that expiration.

Reef expansions: -

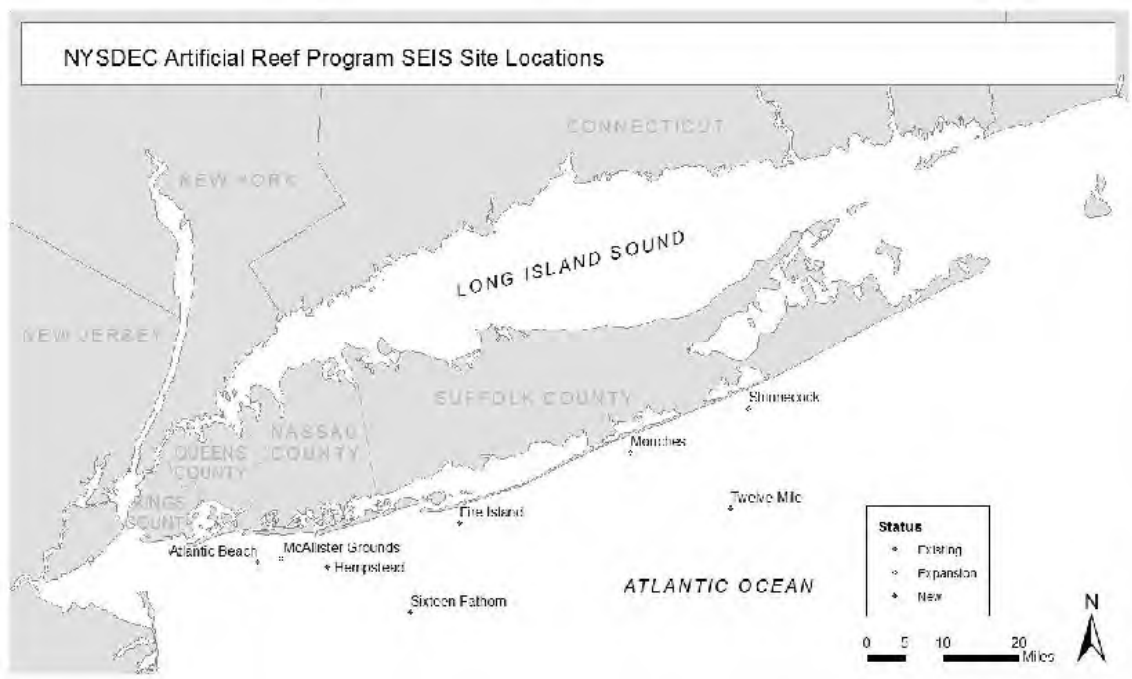
McAllister Grounds: 115 acres to 425 acres -

Moriches Reef: 14 acres to 425 acres -

Shinnecock Reef: 35 acres to 425 acres -

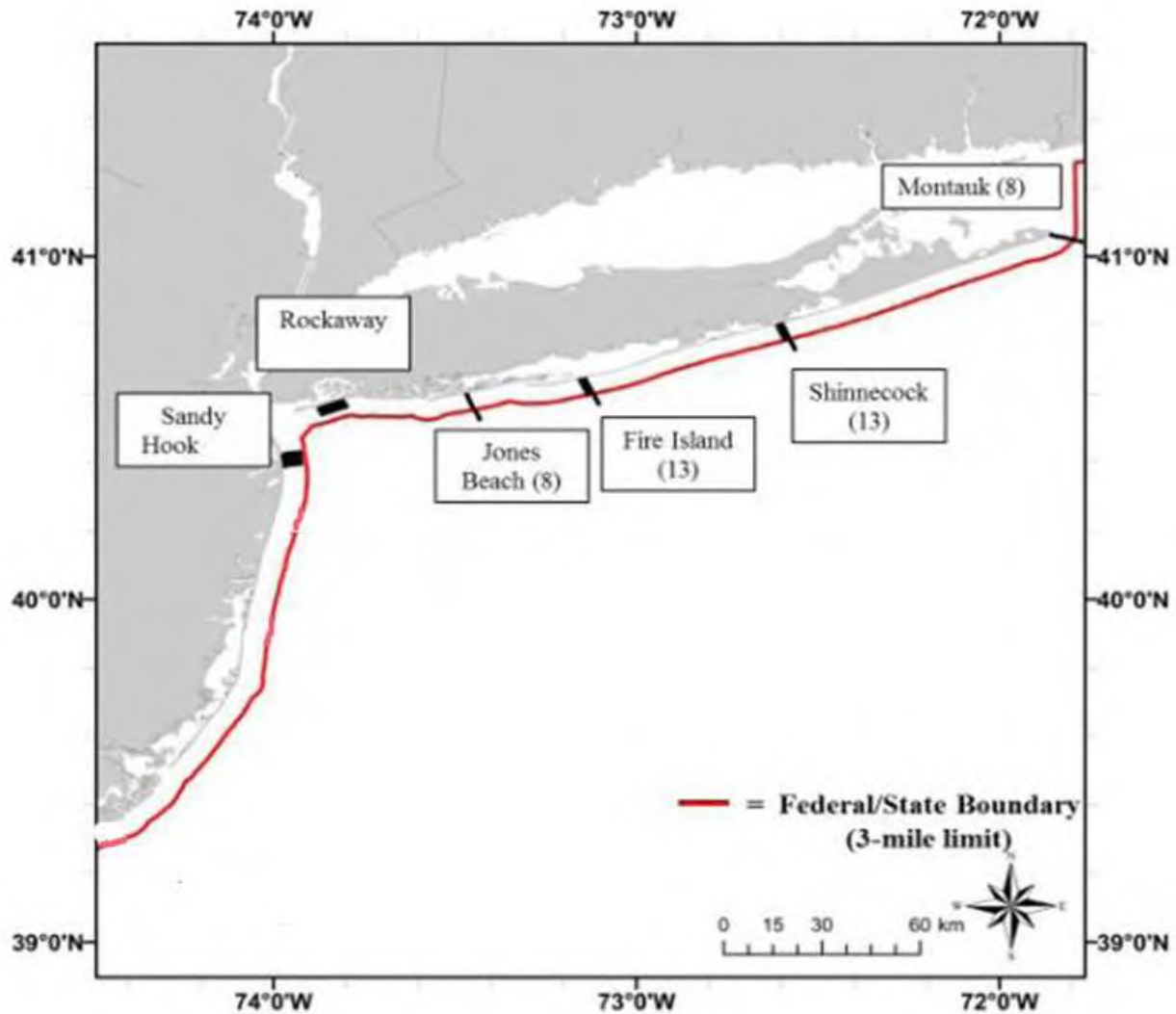
New site: -

Sixteen Fathom Reef: 850 acres. -



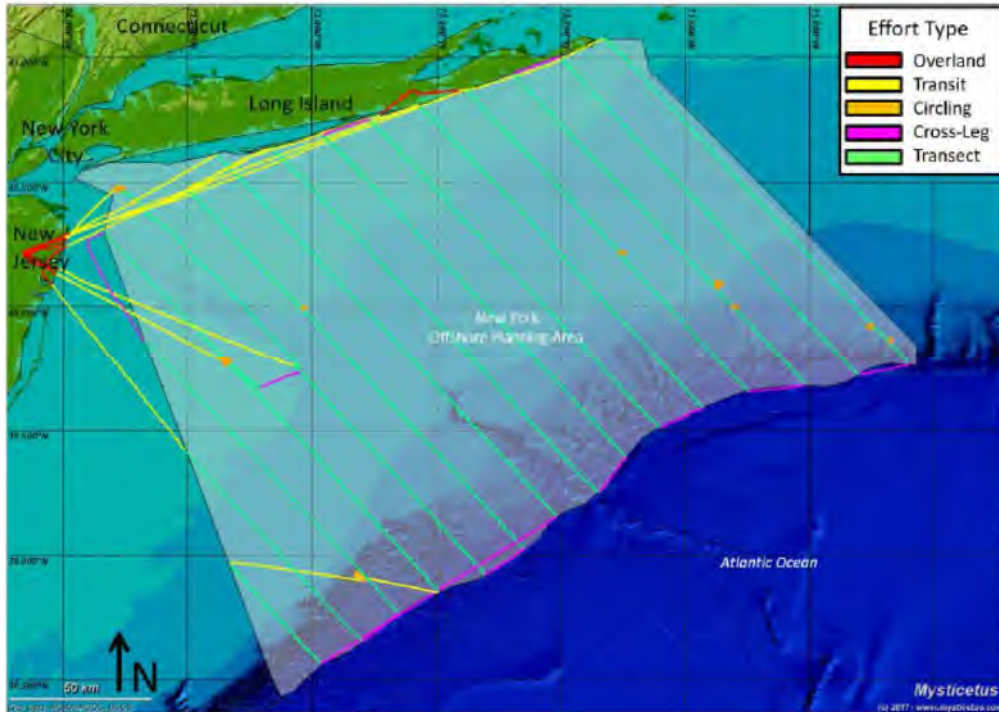
2. - State University of New York (SUNY) Stony Brook University led by Dr. Mike Frisk has several research projects with Vemco acoustic telemetry receivers placed near various ocean inlets along the south shore of Long Island and in the Statoil Wind Energy Area to understand the migration and use of habitat of various finfish, large pelagics, sharks, and Atlantic Sturgeon along the New York Bight's coastline. Attached is a figure indicating the location of receivers off the south shore of Long Island.

Timeline and permitting: This research is by Memorandum of Understanding between NYSDEC and SUNY. All permits are held by SUNY researchers. This project is funded until 2019 and will be expanded to include more shark and sturgeon individuals in the coming year.



3. Monthly Whale aerial surveys are being conducted by TetraTech under contract by the NYSDEC and coordinated with the NYSERDA seasonal aerial wildlife surveys.

Timeline and permitting: Permits are held by the contractor. This work will continue through 2017 and will be expanded in subsequent years based on recommendations by whale experts during a forum to be held in December 2017.



- 4. - Additional large whale monitoring by passive acoustic buoys will be conducted near the navigation shipping lanes into New York Harbor by contract with researchers from Cornell University.

Timeline and permitting: The configuration is still being determined for fifteen buoys being deployed in Fall 2017. All permits are held by Cornell University researchers.

**(Please note the Wildlife Conservation Society/Woods Hole deployed an acoustic buoy in 2016 to monitor the types of large marine mammals in the offshore area. This website includes a map of the buoy site and contact information for the project):*

<http://dcs.whoi.edu/nyb0616/nyb0616.shtml>

- 5. - Offshore Monitoring and Fisheries Surveying work between the NYSDEC and SUNY SBU on the *R/V Seawolf* will be scheduled seasonally and opportunistically to conduct the following Inshore and Offshore monitoring projects:

- New York State Inshore Trawl Monitoring; state, coastal waters from land to 3 nm from shore to inform state fisheries management and population shifts due to a changing ocean environment.
- Atlantic Surfclam Survey; to monitor population and management of the state fishery as stated above.
- Ocean Monitoring Program; Collection of physical and chemical parameters within the OSA to collect data on oceanic conditions within the New York Bight in assessing water quality concerns and ocean acidification.

Timeline and permitting: Cruises will begin in Fall 2017 and are planned to continue long-term for a 10-year period. All permits are held by SUNY researchers.

6. - Ocean Outfall Sewage Treatment Plant Monitoring. Researchers from SUNY SBU will be conducting end-of-pipe monitoring at two current locations in the OSA (NYS waters). The figure below shows the location of the Cedar Beach and SWSD outfalls. Proposed locations of bottom-sampling transects, 2.5 km in length perpendicular to the shore and 10 km alongshore.

Timeline and permitting: Monitoring will occur seasonally over the course of three years by SUNY SBU researchers. All permits are held by SUNY researchers.



7. SEIS and Benthic Mapping of Artificial Reef sites is in progress and will be used as part of the future joint application for the next round of reef permits (see #1 as above).

Timeline and permitting: Benthic surveys will be completed in 2017. Permits are held by contracted survey group.

Proposed Federal Projects with New York State involvement (no NYSDEC permitting):

- Potential Sand Borrow Areas for beach renourishment projects (see USACE, BOEM and DOS)
- Offshore aquaculture proposed by Manna fish farming (federal waters and federal permitting)- NY will be landing the fish if this project is permitted.

Please also note, the NYSDEC will be holding an expert forum in October of 2017 to discuss and design a NYS sponsored Sea Turtle Monitoring Program for the New York Bight in the coming years. When the date and location are announced, we will be extending an invitation to E&E to participate.

If you require additional information about the projects listed here, please contact me via the information found below.

Thank you again for the opportunity of involvement in the development of NYSERDA's Offshore Wind Master Plan.

With regards,

Sherryll Huber Jones

New York State Ocean Coordinator
Atlantic States Marine Fisheries Commission
NYSDEC Division of Marine Resources
sherryll.jones@dec.ny.gov
(631) 444-0448

Cc: Karen Chytalo, Assistant Director, Division of Marine Resources, NYSDEC

Agency Consultation:
New York Independent System Operator



August 3, 2017

Gary Davidson
Regulatory Affairs Principal
NYISO
10 Krey Boulevard
Rensselaer, NY 12144

Re: Offshore Wind Master Plan
New York State Energy Research and Development Authority
Information Request

Dear Mr. Davidson:

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan to help meet the state's Clean Energy Standard renewable energy mandate and to ensure that offshore wind in New York is developed in the most responsible and cost-effective manner possible. The Master Plan will identify potential offshore wind sites within the Offshore Study Area (OSA) [Attachment A] that meet the State's siting standards and take into consideration environmental, maritime, social, economic, and indigenous issues.

As part of the master planning process, NYSERDA is identifying reasonably foreseeable activities occurring in and near the OSA that may have impacts similar to construction and operation of offshore wind farms. E & E is requesting the following information:

- A copy of the NYISO Comprehensive Plan, as applicable;
- A list of planned offshore NYISO development projects within 5 miles of the OSA;
- For each planned offshore development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;
- A list of planned coastal development projects in the vicinity of the OSA;
- For each planned coastal development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;

We recognize that we are requesting information that may come from multiple departments, divisions, or offices, and are therefore willing to coordinate directly with the appropriate contact person. If there are other persons within that would have this information, please provide their contact information. We can also provide shapefiles to use in geographic information system (GIS) programs or a KMZ file to use in GoogleEarth via email upon request, if that would assist your review.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me at (201) 850-3690, or via email at kohleth@ene.com. We appreciate your assistance and thank you for your attention to this request.

Sincerely,

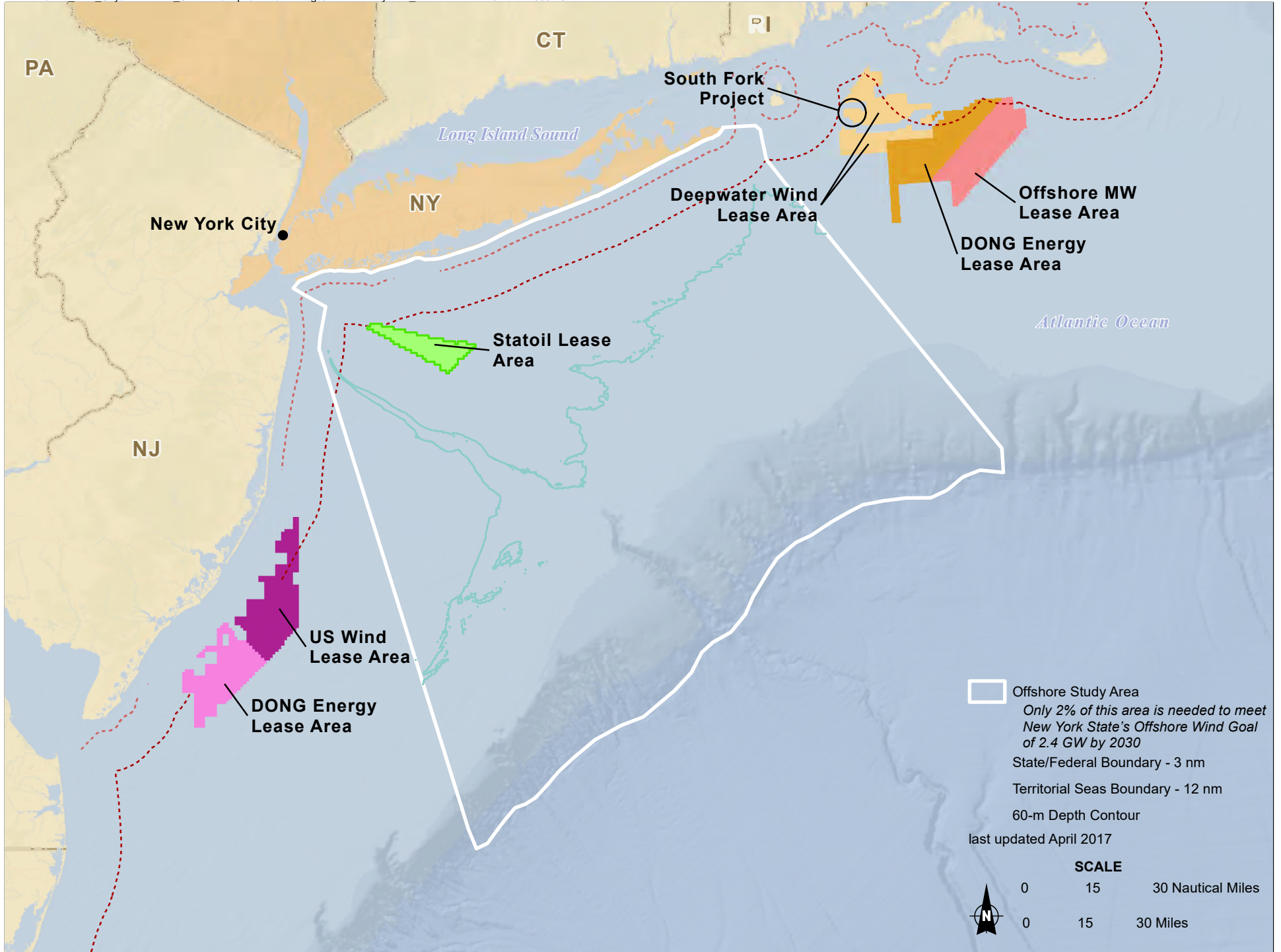
A handwritten signature in blue ink, appearing to read "K. Ohleth", is centered below the text "Sincerely,".

Kris Ohleth
Project Manager

ECOLOGY & ENVIRONMENT, INC.

Attachment: Attachment A - New York Offshore Study Area

Attachment A
Offshore Wind Planning Area and Potential Project Area



From: Davidson, Gary S [mailto:GDavidson@nyiso.com]
Sent: Monday, August 07, 2017 9:46 AM
To: Ohleth, Kris <KOhleth@ene.com>
Subject: RE: Information Requested for NY OSW Master Plan

Hi, Kris.

Thanks for forwarding this request. Based on the nature of the information you're looking for, I don't believe the NYISO can be of much assistance. The NYISO is not a developer of energy projects. Our involvement with development projects is largely limited to the interconnection study process. There is currently only one offshore wind project that has applied for interconnection to the grid - Deepwater Wind's South Fork project. We do not study or maintain data on environmental impacts associated with any of these projects. Our effort is geared toward informing developers as to what they must do to reliably interconnect their projects to the grid.

Please give me a call at the number below if you'd like to discuss this further.



People Who Power New York

r on | e u t o r r

The New York Independent System Operator

resemble

ensselaer | New York

Tel: 518 356-7346 Mobile: 518 944-6083 www.nyiso.com

From: Ohleth, Kris [mailto:Ohleth@ene.com]
Sent: Sunday, August 06, 2017 4:47 PM
To: Davidson, Gary S
Subject: RE: Information Requested for NY OSW Master Plan

EXTERNAL email. Please be cautious and evaluate before you click on links or open attachments or provide credentials.

Dear Gary,

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan that supports the state's mandate to meet 50 percent of its electricity needs from renewable sources by 2030. The Master Plan will be a comprehensive planning document for developing offshore wind resources in New York State, and will include recommendations on the best solutions and practices for developing offshore wind in the most responsible and cost-effective manner possible.

As part of the master planning process, NYSERDA is conducting a cumulative analysis that will identify potential cumulative effects on key resources associated with the development of offshore wind energy sites within the Offshore Study Area (OSA) of the Master Plan. In order to develop a robust and thorough analysis of the potential cumulative effects, we would like your assistance in obtaining information on planned offshore and coastal development projects within the vicinity of the OSA. The attached letter describes the analysis in greater detail, the information that we are requesting from your agency, and the location of the study area.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me. We appreciate your assistance by responding to the attached by Friday August 25, and thank you for your attention to this request.

Best,
Kris



Kris Ohleth
201-850-3690
kohleth@ene.com • www.ene.com

The information in this email is confidential and may be legally privileged against disclosure other than to the intended recipient. It is intended solely for the addressee. Access to this email by anyone else is unauthorized. If you are not the intended recipient, any disclosure, copying, distribution or any action taken or omitted to be taken in reliance on it, is prohibited and may be unlawful. Please immediately delete this message and inform the sender of this error.

Agency Consultation:

New Jersey Department of Environmental Protection



August 1, 2017

Kevin Hassell
NJDEP
Mail Code 401-07B, PO Box 420
401 East State Street, 7th floor
Trenton, NJ 08625-0420

Re: Offshore Wind Master Plan
New York State Energy Research and Development Authority
Information Request

Dear Mr. Hassell:

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan to help meet the state's Clean Energy Standard renewable energy mandate and to ensure that offshore wind in New York is developed in the most responsible and cost-effective manner possible. The Master Plan will identify potential offshore wind sites within the Offshore Study Area (OSA) [Attachment A] that meet the State's siting standards and take into consideration environmental, maritime, social, economic, and indigenous issues.

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- A copy of the NJDEP Comprehensive Plan, as applicable;
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- For each planned offshore development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;
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- For each planned coastal development project, the status of permitting (i.e., whether approved or under review by the local municipality), the timeframe for development and start of construction;

We recognize that we are requesting information that may come from multiple departments, divisions, or offices, and are therefore willing to coordinate directly with the appropriate contact person. If there are other persons within that would have this information, please provide their contact information. We can also provide shapefiles to use in geographic information system (GIS) programs or a KMZ file to use in GoogleEarth via email upon request, if that would assist your review.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me at (201) 850-3690, or via email at kohleth@ene.com. We appreciate your assistance and thank you for your attention to this request.

Sincerely,

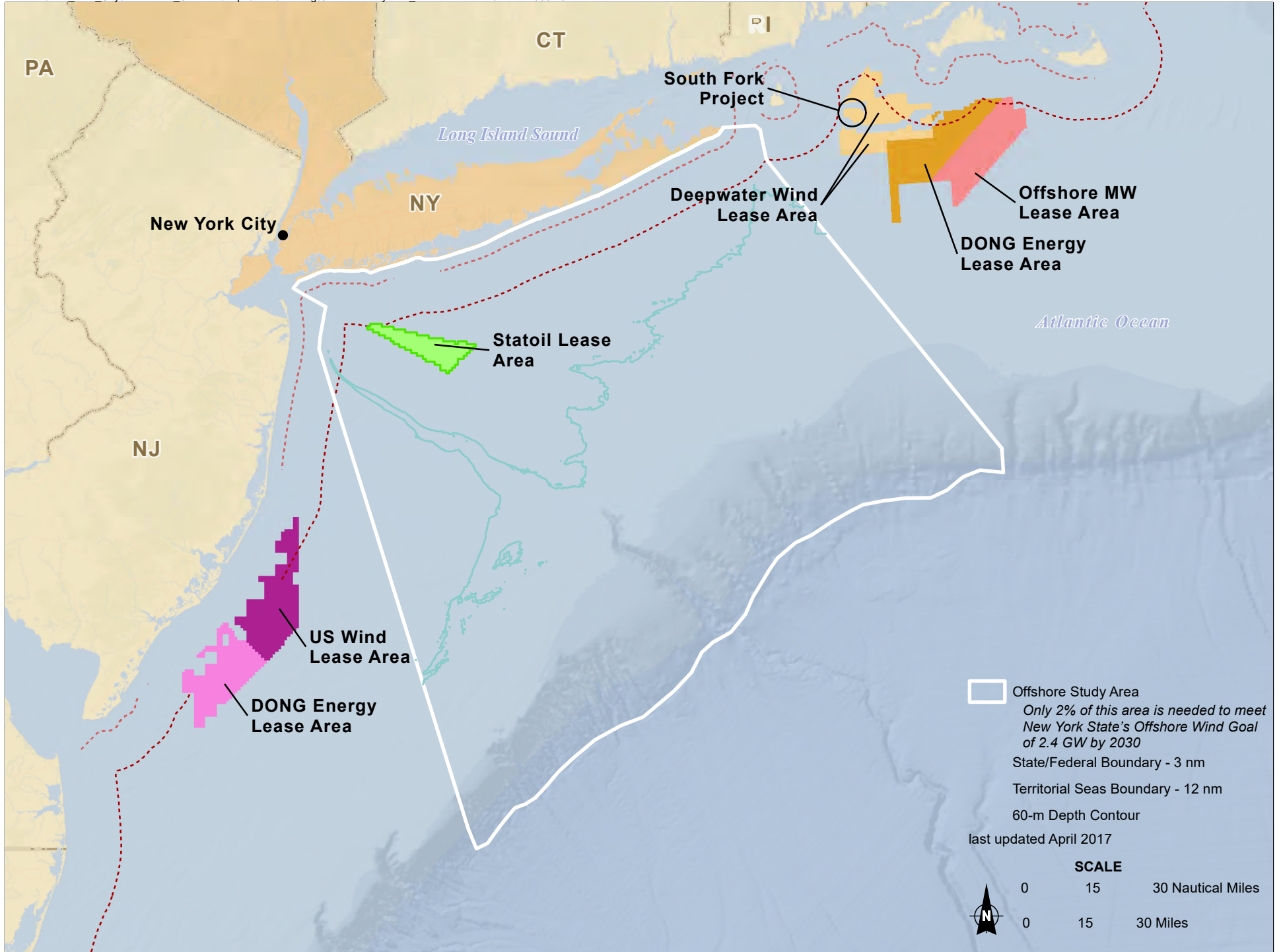
A handwritten signature in blue ink, appearing to read "Kohleth", is centered below the text "Sincerely,".

Kris Ohleth
Project Manager

ECOLOGY & ENVIRONMENT, INC.

Attachment: Attachment A - New York Offshore Study Area

Attachment A
Offshore Wind Planning Area and Potential Project Area



Archived: Wednesday, September 13, 2017 2:33: 7 PM
From: [Ohleth, Kris](#)
Sent: Sat, 1 Aug 2017 14: 3:22
To: [assell, Kevin](#)
Cc: [Whitken, Janine](#)
Subject: RE: Information Requested for NY OSW Master Plan
Importance: Normal

Thanks Kevin. This is very helpful. We appreciate any projects of which you aware whether they be ones NJDEP are doing planning (additional artificial reefs) or ones in the permitting process by developers, etc. We will keep our eyes and ears out for anything else from your folks.

Thanks again
Kris

From: Hassell, Kevin [<mailto:Kevin.Hassell@dep.nj.gov>]
Sent: Thursday, August 17, 2017 10:21 AM
To: Ohleth, Kris <KOhleth@ene.com>
Subject: RE: Information Requested for NY OSW Master Plan

Kris,
I apologize for not getting back to you sooner. Things have been hectic around here lately. Looking at the request I assume you're interested in offshore projects in the permitting pipeline, not things New Jersey is doing itself, correct. We do not have any type of comprehensive ocean plan like NY is developing, we're focusing our effort through the Mid Atlantic Planning Body and the Ocean Action Plan. I will forward your request to our permitting group and our group working on renewable energy, but I am unaware of any projects that aren't current well know publicly and already highlighted through BOEMs processes, be it a wind developer or the offshore cable idea. Other issues, like sand management, are far more complex currently and more difficult to nail down. The MARCO data portal team has been actively engaged in developing data sets around sand issues, but that data is not currently available. This has been a multiyear effort and until that process moves along, it is doubtful there is any better way to obtain that type of data, whether it be ACOE or BOEM. Hope you are well.

Kevin

From: Ohleth, Kris [<mailto:KOhleth@ene.com>]
Sent: Sunday, August 6, 2017 9:33 PM
To: Hassell, Kevin <Kevin.Hassell@dep.nj.gov>
Subject: Information Requested for NY OSW Master Plan

Dear Kevin,

Hope all is well and left you a message on Friday.

Ecology and Environment, Inc. (E & E) is supporting New York State Energy Research and Development Authority (NYSERDA) in its development of an Offshore Wind Master Plan that supports the state's mandate to meet 50 percent of its electricity needs from renewable sources by 2030. The Master Plan will be a comprehensive planning document for developing offshore wind resources in New York State, and will include recommendations on the best solutions and practices for developing offshore wind in the most responsible and cost-effective manner possible.

As part of the master planning process, NYSERDA is conducting a cumulative analysis that will identify potential cumulative effects on key resources associated with the development of offshore wind energy sites within the Offshore Study Area (OSA) of the Master Plan. In order to develop a robust and thorough analysis of the potential cumulative effects, we would like your assistance in obtaining information on planned offshore and coastal development projects within the vicinity of the OSA. The attached letter describes the analysis in greater detail, the information that we are requesting from your agency, and the location of the study area.

If you have any questions regarding this correspondence and information request, or require additional information, please do not hesitate to contact me. We appreciate your assistance by responding to the attached by Friday August 25, and thank you for your attention to this request.

Best,
Kris



Kris Ohleth
201-850-3690
kohleth@ene.com • www.ene.com

Appendix D. Temporal and Geographic Overlap Model

Table D-1 is an Excel-based model that compares the temporal and distance characteristics of each activity listed with the timeframe and location of the Model Project and the geographic scope of the key resources. “YES” or “NO” indicates the resulting determination of whether an overlap exists for the timeframe for construction or operation, or the location of the activities within the geographic scope.

The model makes the following determinations to evaluate temporal overlap of past and present activities, or unknowns:

- If an activity’s construction start date occurs before the Model Project’s construction start date, then there is no temporal overlap for construction (“NO”).
- If an activity’s construction start date was unknown, then the construction and operation period was assumed to overlap (“YES”).
- If activities are ongoing, currently in operation, or will be in operation in the future (any year identified), then an overlap occurs for operation (“YES”).

The model is conservative in the determination of temporal overlap in that few, if any, conditions result in a conclusion of no temporal overlap. In that case, the activity is considered as part of the existing baseline conditions. The model makes a determination of the geographical overlap if the activity occurs within a resource’s geographic scope of analysis. The table states “YES” for that activity and the resource examined. The top row of the table sums the total number of activities that overlap with the geographic scope for the Model Project and are considered further in the cumulative assessment.

Table D-7. Overlap of Activities with Similar Impacts in the Geographic Scope of Key Resources

Activities (or Owner)	Construction Start Date	Temporal Overlap?	Operation Start Date	Temporal Overlap?	Activity Category	Distance from Geographic Scope (miles)	Fish	Marine Mammals and Sea Turtles	Commercial and Recreational Fishing
	Number of Activities That Overlap the Geographic Scope (GS)						9	9	9
Full Build-out of 2.4 GW of Generation Capacity	2020		2030						
Hurricane Sandy Reevaluation	TBD	YES	TBD	YES	Coastal Storm Risk Management	18.95	NO	NO	NO
Fire Island to Montauk Point Reformulation Study	2021	YES	2071	YES	Coastal Storm Risk Management	17.16	NO	NO	NO
Jones Inlet to East Rockaway Inlet Storm Damage Reduction Project	2016	NO	2018	YES	Coastal Storm Risk Management	10.49	NO	NO	NO
Hurricane and Storm Damage Reduction	TBD	YES	TBD	YES	Coastal Storm Risk Management	17.40	NO	NO	NO
Raritan Bay and Sandy Hook Bay at Union Beach	2022	YES	2072	YES	Coastal Storm Risk Management	24.28	NO	NO	NO
Sandy Hook to Barnegat Inlet Beach Erosion Control	2014	NO	TBD	YES	Coastal Storm Risk Management	17.26	NO	NO	NO
Commercial and Recreational Fishing	TBD	YES	TBD	YES	Commercial and Recreational Fishing	0.00	YES	YES	YES
DEC Conservation Reef Program	Ongoing	YES	Ongoing	YES	Commercial and Recreational Fishing	3.20	NO	NO	NO
USACE/BOEM/DOS Aquaculture	Unknown	YES	Unknown	YES	Commercial and Recreational Fishing	8.50	NO	NO	NO
East Rockaway Inlet Maintenance Dredging	Ongoing	YES	Ongoing	YES	Dredging	12.56	NO	NO	NO
Rockaway Inlet Federal Navigation Channel Maintenance Dredging	Ongoing	YES	Ongoing	YES	Dredging	22.75	NO	NO	NO

Table D-1 continued

Activities (or Owner)	Construction Start Date	Temporal Overlap?	Operation Start Date	Temporal Overlap?	Activity Category	Distance from Geographic Scope (miles)	Fish	Marine Mammals and Sea Turtles	Commercial and Recreational Fishing
Shark River Maintenance and Stewardship	Ongoing	YES	Ongoing	YES	Dredging	17.22	NO	NO	NO
USACE/BOEM/DOS Sand Borrow Area	Unknown	YES	Unknown	YES	Dredging	9.40	NO	NO	NO
Neptune Cable	2005	NO	2007	YES	Infrastructure	15.30	NO	NO	NO
Poseidon Transmission Anbaric Development Partners	TBD	YES	2020	YES	Infrastructure	15.25	NO	NO	NO
Rockaway Delivery Lateral	2014	NO	2015	YES	Infrastructure	17.60	NO	NO	NO
Cables, Pipelines, and Other Infrastructure	Ongoing	YES	Ongoing	YES	Infrastructure	0.00	YES	YES	YES
Drift and Floatables Collection	Ongoing	YES	Ongoing	YES	Marine Transportation	12.89	NO	NO	NO
Prevention of Injurious and Obstructive Deposits	Ongoing	YES	Ongoing	YES	Marine Transportation	16.71	NO	NO	NO
Vessel Traffic	Ongoing	YES	Ongoing	YES	Marine Transportation	0.00	YES	YES	YES
Martha's Vineyard Remedial Investigation	Ongoing	YES	Ongoing	YES	Military Use	57.60	NO	NO	NO
USCG Weapons Training Areas	Ongoing	YES	Ongoing	YES	Military Use	0.00	YES	YES	YES
USCG Security Zone	Ongoing	YES	Ongoing	YES	Military Use	3.73	NO	NO	NO

Table D-1 continued

Activities (or Owner)	Construction Start Date	Temporal Overlap?	Operation Start Date	Temporal Overlap?	Activity Category	Distance from Geographic Scope (miles)	Fish	Marine Mammals and Sea Turtles	Commercial and Recreational Fishing
Narragansett Bay Operating Area	Ongoing	YES	Ongoing	YES	Military Use	0.00	YES	YES	YES
Atlantic City Operating Area	Ongoing	YES	Ongoing	YES	Military Use	0.00	YES	YES	YES
Available Ocean Disposal Site for Dredged Materials	Ongoing	YES	Ongoing	YES	Ocean Dredged Material Sites	9.17	YES	YES	YES
Rhode Island Dredged Material Disposal	Ongoing	YES	Ongoing	YES	Ocean Dredged Material Sites	0.00	YES	YES	YES
PNE Wind AG Statoil	TBD	YES	TBD	YES	Offshore wind	27.71	NO	NO	NO
Cape Wind	TBD	YES	TBD	YES	Offshore wind	74.85	NO	NO	NO
Block Island Wind Farm	2015	NO	2016	YES	Offshore wind	13.03	NO	NO	NO
Bay State Wind	TBD	YES	2020	YES	Offshore wind	14.82	NO	NO	NO
South Fork Wind Farm	2021	YES	2022	YES	Offshore wind	22.39	NO	NO	NO
NY4 Excelsior Wind Park	TBD	YES	2027	YES	Offshore wind	0.00	YES	YES	YES
U.S. Wind Inc.	TBD	YES	TBD	YES	Offshore wind	17.30	NO	NO	NO
Ocean Wind	TBD	YES	TBD	YES	Offshore wind	36.01	NO	NO	NO

Table D-1 continued

Activities (or Owner)	Construction Start Date	Temporal Overlap?	Operation Start Date	Temporal Overlap?	Activity Category	Distance from Geographic Scope (miles)	Fish	Marine Mammals and Sea Turtles	Commercial and Recreational Fishing
Vineyard Wind	TBD	YES	2027	YES	Offshore wind	28.95	NO	NO	NO
Deepwater ONE	TBD	YES	TBD	YES	Offshore wind	22.22	NO	NO	NO
Statoil Wind	Unknown	YES	Unknown	YES	Offshore wind	0.00	YES	YES	YES
Revolution Wind Farm and Battery Storage System	TBD	YES	2023	YES	Offshore Wind	22.39	NO	NO	NO

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

To learn more about NYSERDA's programs and funding opportunities, visit nyserdera.ny.gov or follow us on Twitter, Facebook, YouTube, or Instagram.

**New York State
Energy Research and
Development Authority**

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NYSERDA

State of New York
Andrew M. Cuomo, Governor

New York State Energy Research and Development Authority
Richard L. Kauffman, Chair | Alicia Barton, President and CEO