Site Assessment Plan

Maryland Offshore Wind Project

Rev.2

PREPARED FOR:
US Wind, Inc.
1 North Charles Street, Suite 2310
Baltimore MD 21201

PREPARED BY:
ESS Group, Inc.
10 Hemingway Drive, 2nd Floor
East Providence, RI 02915

ESS Project No. U167

April 7, 2016

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Submitted to:

The Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, VA 20166

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TABLE OF CONTENTS

SECTION **PAGE**

TABLES

FIGURES

APPENDICES

Appendix M	BOEM Approval of USW Survey Plan
Appendix N	Marine G&G Survey Report for Site Assessment Plan
Appendix O	Geotechnical Results Report
Appendix P	Data Integration and Engineering Report
Appendix Q	Benthic Assessment Report
Appendix R	Marine Archeological Resources Assessment
Appendix S	Final PSO Report
Appendix T	Air Emissions Summary
Appendix U	Fisheries Overview Report
Appendix V	Commercial and Recreational Fishing Outreach Plan
Appendix W	Safety Management Systems

EXECUTIVE SUMMARY

As the main precept of this Site Assessment Plan (SAP), US Wind Inc. intends to design, fabricate, install, and operate a Meteorological Tower (MET tower) within the Maryland WEA. Along with the MET tower, a sea-bed mounted oceanographic measurement platform will be installed. The main purpose for this MET tower is to measure and record observed environmental data such as wind speed, wind direction, temperature, etc. The seabed platform will measure currents and wave data via an acoustic Doppler current profiler (ADCP) sensor along with a standard Conductivity, Temperature & Depth (CTD) sensor.

Personnel safety is of the utmost concern when conducting operations in the offshore environment. US Wind intends to manage the construction and operations tasks described in this SAP in a safe & competent fashion. The methodologies described herein are based on proven, industry standard procedures.

US Wind has gathered site-specific environmental data from the proposed MET tower site through its extensive Geophysical & Geotechnical (G&G) surveys. The data gathered has shown that this site is quite benign in nature with a somewhat featureless seabed comprised mostly of sand and gravel with some interspersed clay. This information will allow US Wind to design a construction and operations program that will minimize any potential effects on natural resources (fauna and flora) and habitat, as well as reduce any interference with existing human endeavors such as fishing, navigation, tourism etc.

US Wind is pleased to complete this milestone in their OCS lease obligations and looks forward to gaining approval of this SAP from BOEM.

1.0 PROJECT INFORMATION (585.610)

This section describes basic project information.

1.1 Contact Information of Authorized Representative (585.610(a)(1))

Mr. Paul Rich
Director, Project Development
US Wind, Inc.
1 North Charles Street, Suite 2310
Baltimore MD 21201
Tel: 410-727-4020
Cell: 207-319-5131
e-mail: prich@uswindmaryland.com

1.2 Lease Stipulations and Compliance (585.610(a)(1))

Copies of the leases issued to US Wind for the Maryland Wind Energy Areas are posted on the BOEM website at: http://www.boem.gov/OCS-A-0489/ and http://www.boem.gov/OCS-A-0490/. US Wind has and will continue to comply with the stipulations in these leases as they relate to the development and approval of this Site Assessment Plan (SAP) and SAP activities.

Specifically, US Wind completed SAP survey activities as described in Section 2.4 in accordance with a pre-survey meeting and SAP Survey Plan approved by BOEM. US Wind also conducted a tribal pre-survey meeting, as specified in the leases prior to conducting SAP survey activities, and consulted with United States Fleet Forces (USFF) N46 and the Fleet Forces Atlantic Exercise Coordination Center (FFAECC), which coordinates all regional military/other agency activities (both sea and air) for the Virginia Capes operating area (VACAPES OPAREA) and ensures events are de-conflicted.

US Wind will conduct the activities described this SAP only as approved by BOEM. US Wind proposes to conduct SAP activities in a manner that will not unreasonably interfere with or endanger other approved activities, will not cause any undue harm or damage to the environment, will not create hazardous or unsafe conditions, and will not adversely affect resources of historic, cultural or archeological significance. Measures that will be implemented to avoid, minimize, and or mitigate potential impacts associated with SAP activities, as required by the leases, are described in Section 3 of the SAP.

1.3 Permitting Plan (585.610(a)(13))

US Wind will apply for approvals and/or authorizations as shown in Table 1.3-1 to conduct site assessments activities (MET tower and ADCP buoy installation, operation, and decommissioning):

Table 1.3-1 US Wind SAP Permitting Plan - Maryland Offshore Wind Farm

Agency	Permit / Approval	Expected Filing Date
Bureau of Offshore Energy Management (BOEM)	Site Assessment Plan (SAP) • National Environmental Policy Act (NEPA) • MD CZM Consistency • National Historic Preservation Act Review & State Historic Preservation Act Consultation • Determination of No Hazard (beyond Federal Aviation Administration (FAA) jurisdiction)	November 2015
US Army Corps of Engineers (USACE)	Section 10/404 Permit via Nationwide Permit 5	February 2016
NOAA National Marine Fisheries Service (NMFS)	Incidental Harassment Authorization, will not be required based on mitigation proposed	February 2016
US Coast Guard (USCG)	Private Aid to Navigation Local Notice to Mariners	February 2016
US Environmental Protection Agency (EPA) as delegated to: Maryland Department of Environment (MD DER)	OCS Air Permit	February 2016
DOD Fleet Forces Command / Virginia Capes Operating Area (VCAPES OREA)	Department of Defense Consultation	Consultation ongoing; initiated October 2015

1.3.1 Completed and Anticipated Agency Correspondence (585.610 (a) (14))

US Wind has conducted outreach with the following local, state, and federal agencies via meetings and/or correspondence. This outreach addressed planned site assessment and development activities for the Maryland Offshore Wind Project, including the MET tower, as well as the overall wind farm project. These agencies include:

- BOEM
- NMFS
- MD Energy Administration's Director
- MD PSC Staff
- PJM Interconnection Staff
- USACE US Army Corps of Engineers
- USCG, District Commander
- DE Energy Office, Director

- DE DNR
- MD DNR
- MD DNR – Office of Power Plant Design
- MD SHPO
- DE SHPO
- US Navy – Sub. Cable Co-ordination office
- US Navy – VA Capes Command (VCAPES)

US Wind will continue to provide notifications as required (i.e. to BOEM, NMFS, USCG, VCAPES) during construction and operation of the MET tower, and prior to decommissioning.

1.3.2 State and Local Government

US Wind has met/corresponded with state and local government leaders and staffs regarding SAP activities and the overall plan for wind farm development. These leaders and staffs include:

- MD State Legislators: Sen. Manno; Sen. Salling; Sen Hershey; Sen. Mathias; Rep. Mary Beth Carozza; Rep. Impallaria
- U.S. Federal Delegations:
  - MD: Staff of Sen. Mikulski & Cardin; Rep. Sarbanes; Rep. Harris;
  - DE: Sen. Carper: Rep Carney
- Baltimore Mayor's Staff
- Baltimore County Economic Development Staff
- MD Governor’s Cabinet-level Staff
- MD Governor's Chief of Staff & Dep COS
- MD Governor's Office of Minority Affairs
- Ocean City – Municipal Engineer

1.3.3 Public Interest Groups and Stakeholders

US Wind has met/corresponded with numerous project stakeholders regarding SAP activities and the overall plan for wind farm development. These groups include:

- Mariners Advisory Committee (MAC), including representatives from American Waterways Operators
- Greater Baltimore Committee
- Ocean City Commercial and Recreational Fishing Community
- Delmarva Power, President
- DE Municipal Electric Corporation
- Worcester County Economic Development Corporation
- MD League of Conservation Voters
- MD Climate Change Coalition
- MD Offshore Biz Network
- MD Black Caucus Renewable Energy Conference
- MD Hispanic Renewable Energy Conference

- North American Submarine Cable Association (NASCA)
- National Wildlife Federation

US Wind will continue to conduct outreach to the fishing community during SAP activities via a communications plan, as described in Section 3.13 and will use communications channels such as the USCG Local Notice to Mariners to keep other stakeholders informed during MET tower construction and operations.

1.3.4 Tribal Notification

US Wind held a tribal pre-survey meeting with the Narragansett Indian Tribe, the Shinnecock Indian Nation, and the Lenape Tribe of Delaware as required by and in accordance with the stipulations in its Leases at Addendum C, 4.2.3. This meeting was held following submittal of the SAP Survey Plan on March 19, 2015. The purpose of the meeting was for US Wind and the QMA to discuss the proposed survey plan with tribal representatives and consider requests to monitor portions of the archaeological survey and the geotechnical sampling activities, including the visual logging and analysis of geotechnical samples.

1.3.5 Consistency Certification (585.611(b)(9)

BOEM has performed a consistency review and issued a Regional Consistency Determination (CD) finding that SAP activities anticipated for the Maryland WEAs, including the installation, operation and decommissioning of MET towers and buoys, are consistent with the provisions of the Coastal Management Program of Maryland. The State of Maryland concurred in a letter to BOEM on September 23, 2011. The SAP activities proposed by US Wind are consistent with the activities anticipated in BOEM consistency review; therefore no further consistency review certification should be required.

1.4 Financial Assurance Information (585.610(a)(14))

In compliance with BOEM regulations (30 CFR 585.610(a)(15)), before the commencement of the installation of any facility, US Wind, Inc. will provide a Surety Bond, as per the BOEM Bond Form (Appendix A), issued by a primary financial institution, or other approved security, as required in (30 CFR 585.515) and (30 CFR 585.516) in order to guarantee the commissioning obligation.

1.5 Other

In accordance with Title 30 CFR Part 585.706 US Wind hereby nominates Hawk Technical Support, LLC to act as CVA for Design, Fabrication, and Installation of the MET tower project. Hawk Technical Support, LLC principal reviewer, Mr. T. T. "Tommy" Laurendine, P.E., see attached resume, will be the registered professional engineer responsible for all three phases of the CVA work.

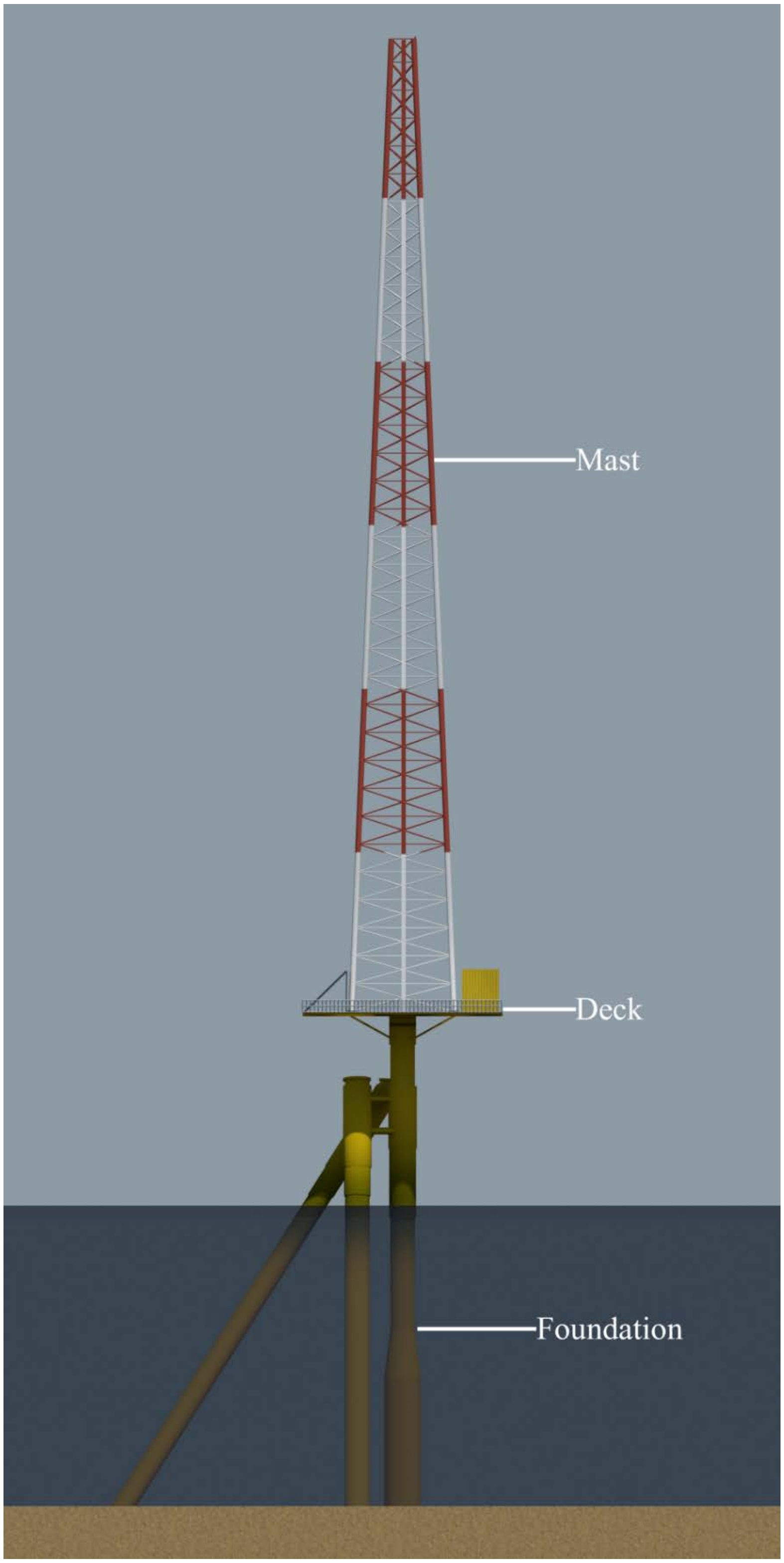
T. T. "Tommy" Laurendine, P.E.
Hawk Technical Support, LLC
4844 W Napoleon Ave
Metairie LA 70001
504-888-7259 landline
tommylaurendine@hawktechnicalsupport.com
See resume attached as Appendix B.

2.0 DESCRIPTION OF PROPOSED ACTIVITY (585.610(a)(2))

The proposed activity is to install and maintain a Meteorological (MET) tower located in 88.6 feet (27M) water depth at position Lat: 38.352747°N Lon: 74.753546°W (see location plat at Section 2.2.1.1) within the Maryland Wind Energy Area (WEA) of the Atlantic Ocean, as designated by BOEM and leased to US Wind, offshore Ocean City, MD. The MET tower will consist of a galvanized steel, lattice framework mast fixed to a steel deck atop a steel Braced Caisson style foundation. This configuration of mast and foundation is shown in Figure 2.0-1. In addition to the MET tower, a bottom-mounted instrumentation package will be installed to gather offshore oceanographic data. This bottom-mounted package will include an Acoustic Doppler Current Profiler (ADCP) system to measure currents, wave heights and other oceanographic data. The package will be tethered to a foundation pile with an offset of approximately 10 feet (3 meters). For the purposes of this document the installation, operation, and decommissioning of the MET tower and ADCP buoy will be referred to as the Project.

The overall height of the MET tower structure (mast & foundation) will be approximately 328 feet (~100 m) above the mean sea level. The platform deck supporting the mast will be approximately 3,000 square feet (279 square meters) with the upper access platform located at a Top of Grating (TOG) of approximately 70 feet (21.3 meters). The Bottom of Steel (BOS) will be located at approximately 68 feet (20.7 meters) in order to clear the 1,000 year crest elevation. Both the mast and the platform deck will be equipped with the proper safety lighting, markings and signal equipment per Federal Aviation Administration (FAA) and United States Coast Guard (USCG) Private Aids to Navigation (PATON) requirements (coordination with these agencies is presently underway). The mast will be outfitted with scientific instruments such as anemometers, vanes, barometers, temperature sensors, precipitation sensors, bat monitors etc. for recording empirical environmental conditions in situ. In addition to the analog wind resource, measurement devices on the mast a vertical Lidar system will be installed on the platform deck. See Appendix C for a description of the Lidar system. The empirical environmental data gathered by sensors on the MET tower will be stored electronically on board the MET tower via a local Data-Logger system. A Local Area Network (LAN) will be established on board whereby the stored data can be down loaded via a Wi-Fi connection from a maintenance vessel in close proximity to the MET tower. In addition, a high-speed radio and/or Microwave link will transmit real-time data from the MET tower to a reception station located on an existing radio mast ashore located in Ocean City MD. See Section 2.2.1.4 for the details on the proposed MET tower O&M processes. A CCTV video system shall also be installed on the MET tower. The video data from the camera will be stored on the Network Attached Storage (NAS) device with sufficient capacity to store the video data for up to six months. The purpose of this platform is the collection of scientific data needed for the design and construction of a wind farm. The empirical wind measurements will be used to quantify the local wind resource, calculate the energy yield, and develop an annual energy production report.

Figure 2.0-1 Mast and Foundation



2.1 Objectives (585.610(a)(2))

The objective of establishing the Project is to measure and collect site-specific data in the Maryland WEA that is necessary for the effective and efficient design and construction of an offshore wind farm. The empirical wind measurements will be used to quantify the local wind resource, calculate the energy yield, and develop an annual energy production report.

2.1.1 Instrument and Data Collection

A typical instrumentation package and data collection system that will be installed on the MET tower is attached at Appendix D.

2.2 Proposed Activity

US Wind proposes to install, operate, and maintain a MET tower at the northern boundary of Lease OCS-A-0490 in OCS Block 6725. Adjacent to and tethered to the MET tower, a sea-bed mounted package including an ADCP system and standard CTD equipment will be installed.

2.2.1 Meteorological Tower & Oceanographic Package

The MET tower foundation will be a Braced Caisson design consisting of a main Caisson steel pile and two bracing piles.

The main Caisson will be a 1.8 m (72 inch) diameter pile that tapers to 1.5 m (60 inch) diameter above the mudline. The pile will be driven approximately 53.3 m (175 ft) into the seabed.

The two bracing piles will be 1.5 m (60 inch) diameter each. These piles will be driven approximately 50.6 m (166 ft) into the seabed, with a true batter of 1 in 3 (length of approximately 53.3 m [175 ft] mudline to BOS.

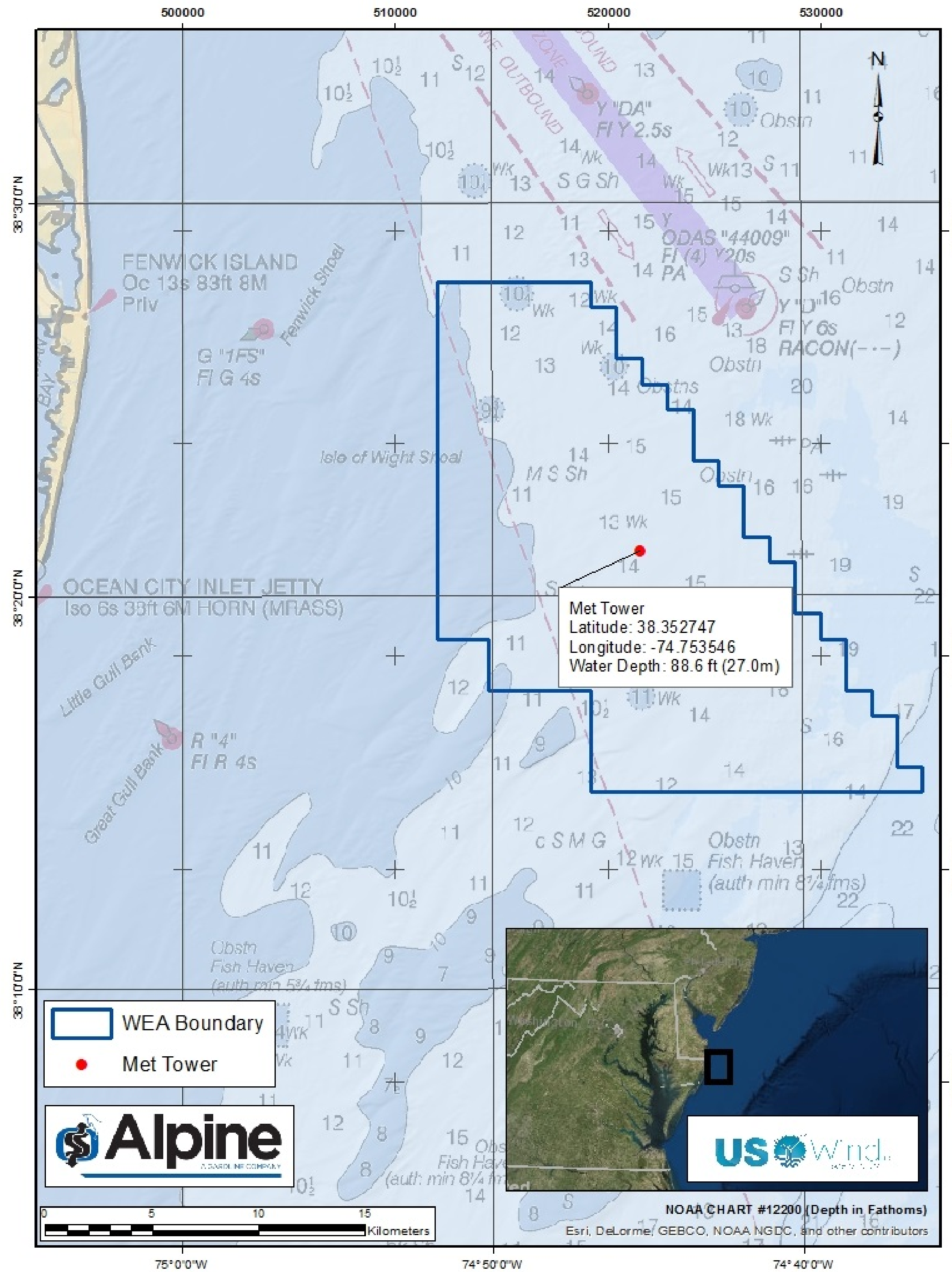
A steel grillage deck will be fixed onto the installed piles. A galvanized steel lattice mast will be erected onto the deck. Multiple measurement sensors will be placed on cross-arms at various levels on the mast.

The sea-bed mounted oceanographic data gathering package will be housed in an industry standard trawl resistant bottom mount with a bottom APE of approximately 58” long x 58” wide x 21” deep (147 cm x 147 cm x 53 cm). See Appendix E for a system description/specification of a typical oceanographic package. The package will be tethered to a foundation pile with an offset of approximately 10 feet (3 meters).

2.2.1.1 Location Plat (585.610(a)(5))

See Figure 2.2-1.

Figure 2.2-1 SAP Location Plat



2.2.1.2 General Structure and Project Design (585.610(a)(6) and 585.610 (a)(7))

The MET Tower Design Basis Report and Ancillary Reports are provided as Appendix F. The MET Tower Design Summary is provided as Appendix G.

The preliminary engineering design for the galvanized steel MET mast structure has begun. The final design should be completed in March 2016. The preliminary design is provided as Appendix H.

2.2.1.3 Fabrication and Installation of Proposed MET Tower (585.610(a)(6) and 585.610(a)(7))

It is currently planned to fabricate the MET tower steel foundation and the galvanized steel mast in existing, built-for-purpose yards in Baltimore MD. The foundation and the mast will be transported to the WEA site by barge from Baltimore. A narrative describing typical fabrication and installation procedures is attached as Appendix I.

2.2.1.4 Operational Activities

In order to assimilate the data from the MET tower US Wind will set up a high-speed Micro-Wave communications link between the MET tower and existing antennae located on the roof of an existing hotel in Ocean City MD. This antenna is currently used by a Maryland Radio station and US Wind will rent space on the antennae. Appendix J “Telemetry Link Data” shows the proposed configuration of the communications link and the site data for the receiving antennae. The data received at the Ocean City receiving station can be accessed by US Wind via a secure web based link.

A planned operations and maintenance (O&M) visit out to the MET tower by the US Wind Baltimore based O&M contractor is proposed once a month for 2 days duration out of Ocean City MD. The vessel being proposed for this O&M visit schedule is shown in Appendix K. Various technical parameters of the MET tower operation will be monitored via the communications link, events such as loss of data or loss of primary power may require an unscheduled trip to the MET tower by the O&M vessel. We feel these should be kept to a minimum.

The oceanographic package will require 2 visits by the O&M vessel once each quarter for a 1-year period.

2.2.1.5 Decommissioning and Site Clearance Procedures (585.610(a)(11))

The process of decommissioning gives the developer a series of basic choices once the MET tower reaches its useful life in connection with the wind farm operation. These choices are as follows:

1. Decommission in accordance with BOEM regulations and transport to an on-shore licensed disposal site. A narrative describing this operation is attached as Appendix L.

2. Decommission in accordance with BOEM regulations and transport to an offshore artificial reef site in agreement with the MD DNR or DE NREC artificial reef program.

3. Decommission by abandoning in place and transferring ownership for a nominal sum to a scientific/educational institute such as UMD or UDEL for in-situ research.

The communications equipment ashore will be removed from the rented antennae space.

2.2.1.6 Non-routine Events

The primary non-routine events and hazards are: (1) collisions between the structure or associated vessels with other marine vessels; and (2) spills from collisions. These events and hazards are summarized below.

Allisions and Collisions

A MET tower located in the in the OCS could pose a risk to navigation. An allision between a ship and a meteorological structure could result in the loss of the entire facility and/or the vessel, as well as loss of life and spill of diesel fuel. Vessels associated with installation, operation, and decommissioning could collide with other vessels and experience accidental capsizing or result in a diesel spill.

Collisions and allisions are considered unlikely since vessel traffic is controlled by multiple routing measures, such as safety fairways, TSSs, and anchorages. These higher traffic areas were excluded from the WEAs, as described in Chapter 1 of the EA (2012). Risk of allisions with the MET tower would be further reduced by USCG-required marking and lighting.

Historical data supports that allisions and collisions resulting in major damage to property and equipment would be unlikely. Allision and collision incident data were reviewed for the years 1996 through 2010 (USDOI, BOEMRE, 2011a), for the Gulf of Mexico and Pacific regions, which contain many fixed structures on the OCS like the meteorological facilities that would be installed. These facilities would need operations and maintenance over the five and a half year period of site assessment just as the fixed structures in the Gulf of Mexico and Pacific regions do. Over a 15-year period with over 4,000 structures present at any one time, 236 allisions with platforms or associated OCS structures and collisions between vessels were reported in the Gulf of Mexico or Pacific regions. While only allisions and collisions that result in property or equipment damage greater than $25,000 must be reported, this number includes reports of minor damage (< $25,000). The most commonly reported causes of the allisions and collisions included human error, weather-related causes, equipment failure on the vessels, and navigational aids not working on the structures. In many cases, the allisions resulted in major damage (> $25,000) to the platforms and/or impacting vessels.

Spills

A diesel spill could occur as a result of collisions, accidents, or natural events. If a vessel collision occurs and if the collision leads to major hull damage a diesel spill could occur. The amount of diesel fuel that could be released by a marine vessel involved in a collision would depend on the type of vessel and severity of the collision. From 1985 to 2014, the average spill size for vessels other than tank ships and tank barges was 92.98 gallons (USDOT 2015) and should MET activities result in a spill, it is anticipated that the average volume would be the same.

Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. All equipment on the MET tower will be powered by batteries charged by small wind turbines and solar panels.

Impacts would depend greatly on the material spilled (diesel fuel in the related vessel types); the size and location of a spill, the meteorological conditions at the time, and the speed with which cleanup plans and equipment could be employed. Diesel fuel is a refined petroleum product that is lighter than water. It may float on the water's surface or be dispersed into the water column by waves. Diesel is a distillate of crude oil and does not contain the heavier components that contribute to crude oil's longer persistence in the environment. If a 5051 diesel spill were to occur, it would be expected to dissipate very rapidly and would then evaporate and biodegrade within a few days (USDOI, MMS, 2007).

2.2.1.7 Safety Measures

Personnel safety is of the utmost concern when conducting operations in the offshore environment. US Wind intends to manage the construction and operations tasks described in this SAP in a safe and competent fashion.

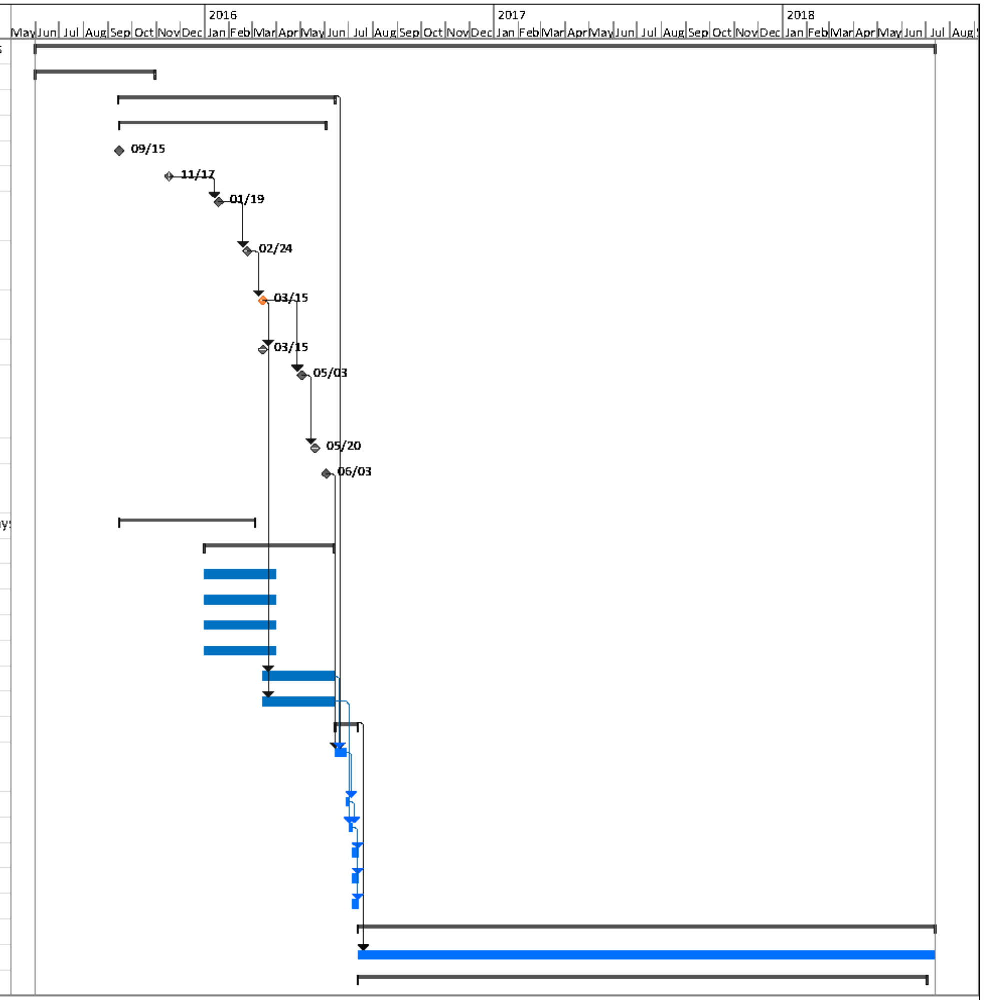
A list of health and safety regulations applicable to Project operations and an outline of industry standard procedures that will be implemented to comply with these regulations is provided as Appendix W – Safety Management System.

2.3 Proposed Schedule (585.610(a)(2))

See Figure 2.3-1.

Figure 2.3-1 SAP Schedule

ID	Task Name	Start	Finish	Duration
1	SAP/MET TOWER PHASE	06/01/15	07/13/18	1138 days
2	G&G activities	06/01/15	10/30/15	151 days
9	Met Tower Permitting	09/14/15	06/14/16	274 days
16	SAP compilation	09/15/15	06/03/16	262 days
17	Pre-SAP meeting with BOEM	09/15/15	09/15/15	0 days
18	SAP Submission	11/17/15	11/17/15	0 days
19	BOEM makes complex/significant determination	01/19/16	01/19/16	0 days
20	BOEM receives revised SAP from US Wind, addressing comments	02/24/16	02/24/16	0 days
21	BOEM makes determination on whether SAP is complete and sufficient	03/15/16	03/15/16	0 days
22	Design and Fabrication approval	03/15/16	03/15/16	0 days
23	BOEM communicates amount of decommissioning financial assurance required	05/03/16	05/03/16	0 days
24	USW provides required financial assurance	05/20/16	05/20/16	0 days
25	BOEM communicates decision regarding approval of SAP	06/03/16	06/03/16	0 days
26	Met Tower Design	09/15/15	03/04/16	171.71 days
46	Met Tower Procurement	01/01/16	06/13/16	164 days
47	Instrumentation procurement	01/01/16	03/31/16	90 days
48	Lidar procurement	01/01/16	03/31/16	90 days
49	Communications procurement	01/01/16	03/31/16	90 days
50	On Board Power System procurement	01/01/16	03/31/16	90 days
51	Foundation fabrication	03/15/16	06/13/16	90 days
52	Met mast fabrication	03/15/16	06/13/16	90 days
53	Met Tower Installation	06/14/16	07/13/16	29 days
54	Installation vessel mobilization (cost includes demob)	06/14/16	06/28/16	14 days
55	Foundation installation	06/28/16	07/02/16	4 days
56	Met mast installation	07/02/16	07/06/16	4 days
57	Instrumentation installation	07/06/16	07/13/16	7 days
58	Communications installation	07/06/16	07/13/16	7 days
59	On Board Power system installation	07/06/16	07/13/16	7 days
60	Data collection	07/13/16	07/13/18	730 days
61	Wind resource data management	07/13/16	07/13/18	730 days
62	Operations & Maintenance	07/13/16	07/03/18	720 days



US Wind - Maryland SAP Process Schedule - Page 1

2.4 Completed Activities

The following sections describe the completed site activities to date.

2.4.1 Site Characterization

US Wind completed a geophysical and geotechnical survey of the MET tower site in the June/July 2015 time frame. These surveys were based on the BOEM approval of the US Wind Survey Plan in June 2015 (Appendix M).

2.4.1.1 Geological (585.610(b)(1) and 585.610(b)(4))

See attached Appendix N "Marine G&G Survey Report for Site Assessment Plan"

Note: Digital G&G survey data has been provided to BOEM via USB flash drive This digital data includes Sub-Bottom Profiler data from the MD MEA G&G Survey conducted in 2013 for the USW MET tower Site.

2.4.1.2 Geotechnical Survey (585.610(b)(1) and 585.610(b)(4))

See Appendix O "Geotechnical Results Report"

2.4.1.3 Shallow Hazards (585.611(b)(1))

See Appendix P "Data Integration and Engineering Report"

Note: This report is included in the G&G survey report but is called out here separately for clarity.

2.4.2 Benthic Surveys (585.610(b)(5)

See Appendix Q "Benthic Assessment Report"

2.4.3 Archeological Survey (585.610(b)(3))

See Appendix R "Marine Archeological Resources Assessment"

2.4.4 PSO Survey

See Appendix S "Final PSO Report"

Note: This Appendix is composed of two separate reports, one from each survey vessel used during the G&G investigation. This report answers the questions that BOEM requested after receiving the PSO Interim Report.

3.0 AFFECTED ENVIRONMENT, ENVIRONMENTAL IMPACTS, AND MITIGATION MEASURES

3.1 Geology and Shallow Hazards (585.611(b)(1))

3.1.1 Environmental Baseline

In order to characterize seabed conditions at the MET tower position and within the adjacent APE, empirical G&G data was gathered in the June/July 2015 timeframe. This data included the results of Bathymetry, Side Scan Sonar, Chirp, and Magnetometer surveys. A basic description of the sea floor environment at the proposed MET tower site based on review of this data follows. Details are provided in Appendices N, O, and P.

Bathymetry data in the MET tower area show the seafloor to be characterized by limited relief, with water depths ranging between 26.3-27.1 m. Surface sediments in the area are composed of fine to coarse-grained sand, with trace amounts of gravel. Small sand ripples are present throughout the area, with average wavelengths of less than 1m, and crest heights less than 0.5 m. Shallow Sub-surface sediments are dominated by sands, with occasional interlayers of clay and gravel. A shallow reflector was observed throughout the area, occurring 0.5-1.5 m below the seafloor and is interpreted to represent an erosional surface remnant from the last sea level transgression. This surface is interpreted as the boundary between late Pleistocene and early Holocene sediments. Three main sub-surface units were identified. Unit 1 represents recent Holocene sandy sediments ranging in thickness between 0.5 m and 2.5 m across the SAP area. Unit 2 represents a channel complex directly underlying Unit 1. Unit 3 represents a thick sequence of subparallel layered sediments dominated by silt and clay. A deep boring was also performed to 10 m below the proposed depth of installation and sediments were analyzed for geotechnical characteristics.

3.1.1.1 Geologic Setting

The Maryland Wind Energy Area lies offshore from the Delmarva Peninsula and is part of the Atlantic Coastal Plain Province of the eastern United States. The Atlantic coast is a passive margin and therefore a tectonically quiet area with dominant processes related to weathering and erosion. This creates a low relief landscape with thick accumulations of sedimentary deposits. The peninsula overlies a seaward thickening wedge of unconsolidated sediments dating back to Cretaceous time (> 65 million years ago), which are over 2,400m thick near Ocean City, MD. Tertiary age (Paleocene-Eocene, 34 – 65 million year ago) marine sediments overlie the Cretaceous deposits. A disconformity is present between the Eocene sediments and overlying marine Miocene sands, silts and clays. The top of the Miocene (5 million years old) generally lies between 27m – 43m below the Maryland coast.

The Tertiary aged sediments of the Delmarva Peninsula and coastal areas are disconformably overlain by younger Quaternary aged sediments consisting of fluvial sands and gravels, littoral and shallow marine clay, silt, and sand. Fluvial deposits comprise the majority of the Pleistocene age sediments (10,000 - 1.8 million years ago), with upper Pleistocene deposits consisting of barrier, back-barrier and foreshelf origin.

Holocene sediments are typically fine to coarse-grained sands ranging in thickness from 10m to less than 1m, are generally deposited in coastal and marsh environments, and are similar to the Pleistocene littoral and shallow marine sediments.

Medium penetration seismic data collected by CP&E during the MEA survey campaign was reviewed in the proximity of the MET tower area, and compared with the geotechnical data collected during this more recent SAP survey campaign (Figure 3.1-1). During this review of the geophysical data, three primary geophysical units were identified and mapped, and are summarized in Table 3.1-1 below. Geophysical & Geotechnical Unit 1 are Holocene superficial sediments consisting of a thin layer of poorly graded sand and gravel. Geophysical Unit 2 (Channel Complex) is divided into two separate Geotechnical Units, together almost 20m thick, and consisting mostly of dense to compact poorly graded sand, with some silt, clay, and gravel laminations. This correlates to the Pleistocene sediments described above. Geophysical Unit 3 (Subparallel Beds) is subdivided into several different Geotechnical Units, and contains interbedded silts and clays. This unit corresponds to the Tertiary aged Coastal Plain sediments described above, and represents the deepest strata able to be resolved with the medium penetration seismic system.

Figure 3.1-1 Correlation of Geophysical and Geotechnical Data at the MET Tower Site

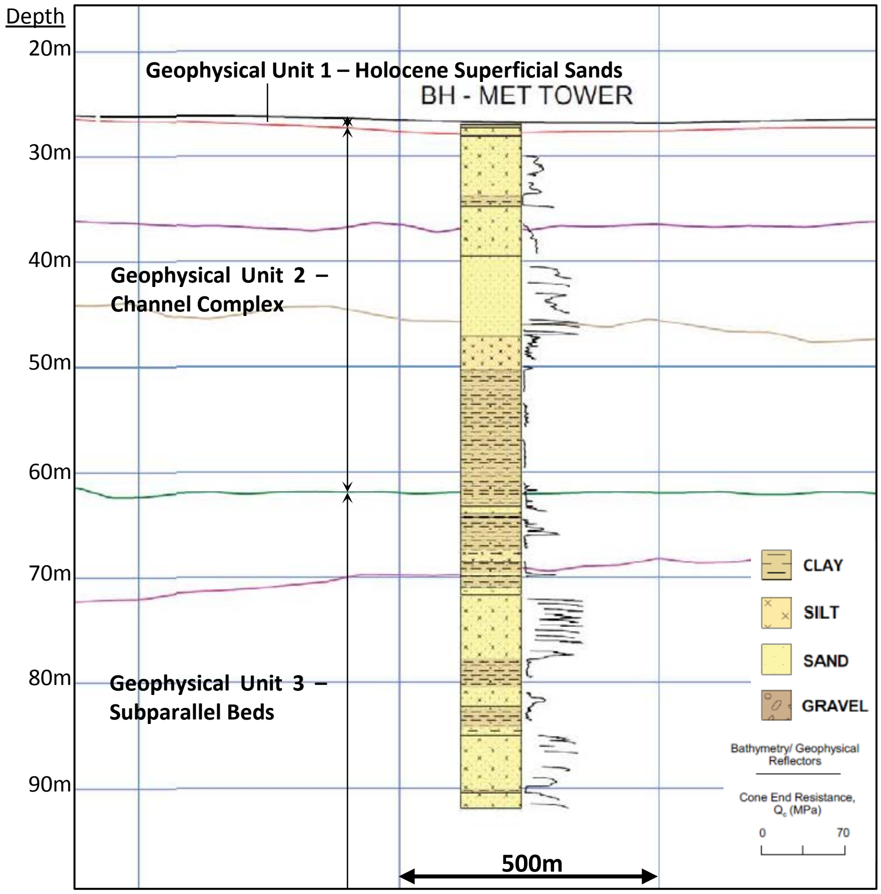


Table 3.1-1 Correlation of Geophysical and Geotechnical Data at the MET Tower Site

Geophysical Unit	Geotechnical Unit	Depths (m)		Soil Description
		Top	Base	
Unit 1- Holocene Superficial Sediments	Unit 1	0.00	0.10	Poorly graded SAND with gravel.
Unit 2 – Channel Complex	Unit 2	0.10	12.50	Poorly graded SAND with silt. Dense to compact. Few stratifications of GRAVEL, Few pockets of clayey SAND. Few laminations of black organic staining. Micaceous.
	Unit 3	12.50	20.16	Poorly graded SAND. Very dense to compact. Few laminations of black organic staining. Micaceous.
Unit 3 – Sub-parallel beds	Unit 4	20.16	23.23	Sandy SILT. Medium dense to dense locally loose.
	Unit 5	23.30	26.50	CLAY with sand. Sand is fine. Very stiff to hard, dark olive grey. Dry. Some laminations and lenses of silt. Micaceous.
	Unit 6	26.50	44.01	Sandy CLAY. Very hard to hard. Some laminations and lenses of sand and silt. Micaceous with trace organics.
	Unit 7	44.01	50.77	Poorly graded SAND with silt. Compact.
	Unit 8	50.77	57.30	Sandy CLAY. Hard.
	Unit 9	57.30	64.94	Clayey SAND becoming SAND with silt.

3.1.1.2 Hazards Assessment

The data sets were reviewed for the presence of any natural or man-made hazards which could impact development of the site. Upon review of the shallow penetration and medium penetration sub-surface data, there was no evidence of (i) Shallow faults; (ii) Gas seeps or shallow gas; (iii) Slump blocks or slump sediments; (iv) Hydrates; or (v) Ice scour of seabed.

No man-made hazards were identified, no sonar contacts were observed, and only 9 small magnetic anomalies were detected. None of the anomalies exceeded 21 nT in amplitude and are not expected to impact installation or operation of the MET tower.

Shallow faults, gas, sediment slumps, hydrates and ice scour are not a common feature in the Quaternary and upper Tertiary (Coastal Plain) sediments on the Outer Continental Shelf offshore

Maryland. Typically, if present, these features would be recognizable in the medium penetration seismic data, and other HRG data.

Shallow faults are identified as sharp vertical offsets, or steps, in the detected seismic reflectors, however no such features were identified in the medium or shallow penetration seismic data in the SAP area. The episode of faulting along the Atlantic margin dates back to Cretaceous time during continental rifting and the opening of the Atlantic Ocean.

Shallow gas is easily distinguishable in the seismic record as areas of "acoustic wipeout," where the upper surface of gas-rich sediments inhibits acoustic wave propagation into the subsurface, thereby preventing the ability to resolve deeper reflectors. Shallow gas is more commonly found in river deltas, estuaries, harbors, but can be found in deeper water continental shelf areas characterized by rapidly deposited muddy sediment with high organic content. Shallow gas was not identified in the SAP area. Gas seeps can be detected with side scan sonar or multibeam swath bathymetry systems, where plumes can be observed from the gas is escaping the seafloor sediments. These features were not observed and are known to occur in deeper waters, similar to hydrates as discussed below.

Sediment slumps or slump blocks are slope failures, and can be identified on seismic records by slump scars and downslope rotated blocks, typically occurring where significant bottom slopes occur. Slumps were not observed as bottom slopes are very minimal in the SAP area (< 0.5˚). Sediment slumps in the surficial sands and gravels would not be expected in this area, but if they were to occur it would be in over-steepened areas (i.e. edges of significant sand ridges).

Hydrates are known to form at temperature and pressure conditions found in much deeper waters than occurs in the Wind Energy Area, typically in waters deeper than 500m, and were not observed in the data sets.

Ice scouring typically occurs in polar oceans near calving glaciers and large masses of floating sea ice. This is not the current environment of the Maryland continental shelf. Ice scouring may have occurred during the last glacial maximum when the continental ice sheets extended further into mid-latitudes, however it is not expected to represent a hazard to the SAP area in modern time.

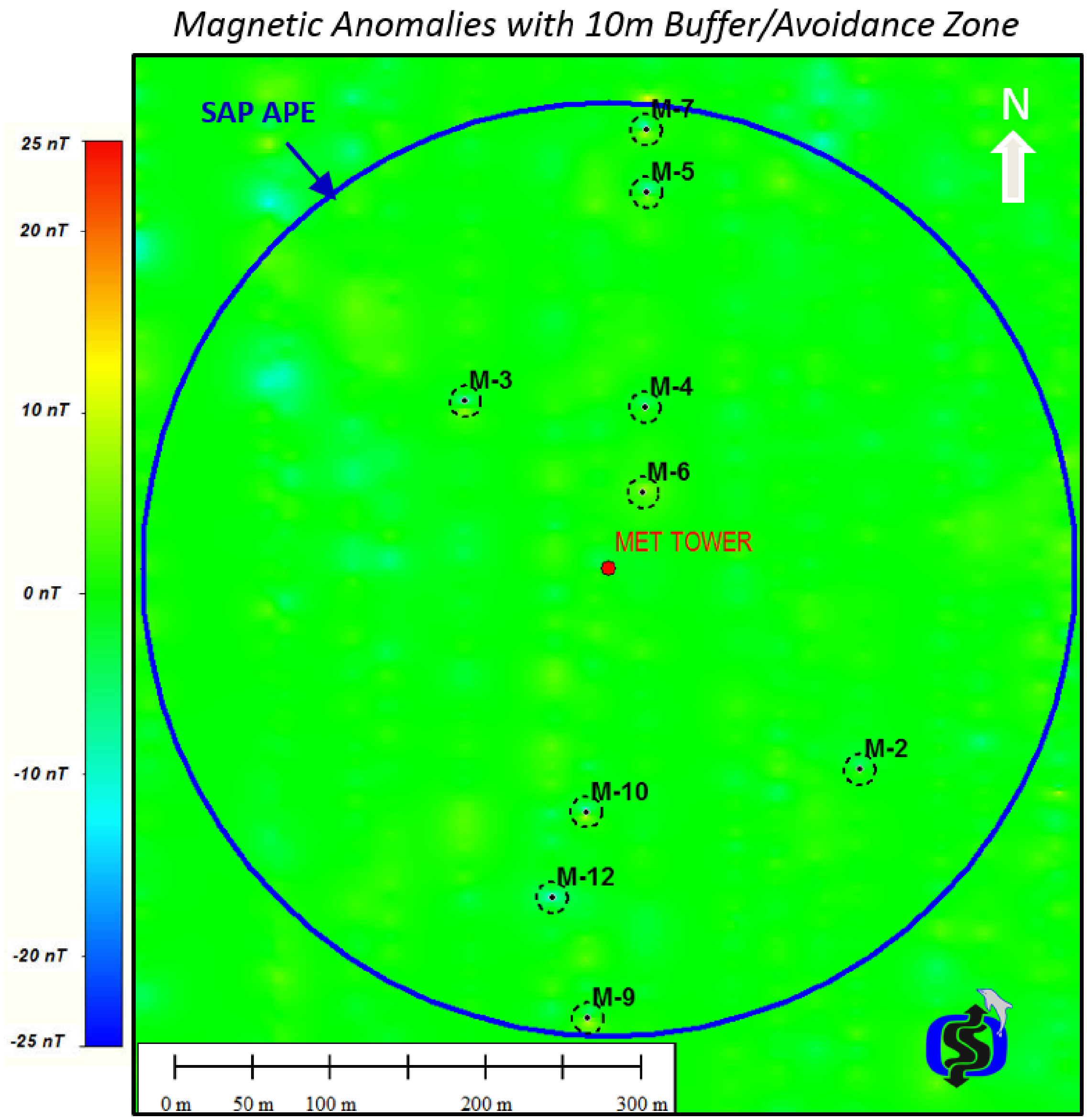
3.1.2 Potential Impacts

It is anticipated that bottom disturbance associated with site assessment activities (the installation/operation/decommissioning of the MET tower and sensor platform) would affect the seafloor only within a maximum radius of 300 m around the MET tower including all anchorages and appurtenances of the support vessels. Some of this seabed disturbance will be temporary, localized surface impact associated with anchors and installation vessels. Deep disturbance will be limited to the area occupied the MET tower foundation piles (approximately 6.27 m^2 [67.8 ft^2]), which will be driven to a depth of 54 m (177 ft)). Therefore, the Project will not result in any significant impact to the local geology.

Similarly, the seabed conditions identified at the site are suitable for the proposed MET tower design and installation methods.

Nine small magnetic anomalies were detected within the MET tower APE. While there is no evidence that these features represent unexploded ordnance (UXO), these areas will be avoided during bottom-disturbing activities (Figure 3.1-2).

Figure 3.1-2 Magnetic Anomalies with 10m Buffer/Avoidance Zone



3.1.3 Mitigation Measures (585.610(a)(8))

No significant impacts to local geology are anticipated as a result of the Project. The seabed conditions are suitable for proposed Project activities and there are no naturally occurring shallow hazards that would impact Project construction or operation. To avoid any potential for disturbance of man-made features, the areas in which small magnetic anomalies were detected will be avoided during bottom disturbing activities (Figure 3.1-2).

3.2 Coastal Habitats & Terrestrial Mammals

3.2.1 Environmental Baseline

The mid-Atlantic coastline adjacent to the Project is characterized by a nearly continuous line of barrier islands and beaches and two large embayments – the Delaware and Chesapeake Bay estuaries (Figure 3.2-1). The main barrier islands off the eastern coast of Maryland are Fenwick and Assateague. Tidal exchange with the back bays behind these islands and beaches is limited to the inlet at Ocean City, dividing Fenwick and Assateague Islands, and another inlet in Virginia, south of Chincoteague Island (Maryland Department of Natural Resources, 2004). To the north along the coast of Delaware are Bethany Beach, Dewey Beach, and Rehoboth Beach with an inlet at Indian River. The closest shoreline is approximately 27 km (16.8 miles) away from the MET Tower location.

Coastal habitats types found along these shorelines are shown in Figure 3.2-1. These habitats include beaches, tidal flats, salt and brackish water marshes, swamps, and scrub-shrub wetlands

Coastal habitats provide food, shelter, and nesting resources for birds and terrestrial mammals. They also serve as an important habitat to migratory shorebirds (Section 3.7) and serve as a recreational destination for locals and tourists (Section 3.14).

3.2.2 Potential Impacts

Construction, operation, and decommissioning activities at the MET tower location will have no direct impact to coastal habitats due to the site’s distance from shore. Offsite activities that support MET tower construction, operation, and decommissioning will use existing ports and/or industrial areas in Maryland. No expansion of existing facilities that could have the potential to directly impact coastal habitats will be required.

Increased vessel traffic associated with MET tower activities could impact coastal habitats due to wake erosion and associated sediment disturbance. However; given the existing high volume and commercial/industrial nature of existing vessel traffic in the Project area, only a negligible increase, if any, to wake induced erosion may occur around smaller, non-armored, waterways used by project vessels. Should an accidental diesel fuel spill occur as a result of MET tower activities, any potential impacts to coastal habitats would be negligible, localized, and temporary.

Terrestrial mammals that use coastal habitats during breeding, feeding, and wintering would not be directly impacted by offshore MET tower activities and would be only negligibly impacted by indirect impacts to coastal habitats due to increased vessel activity and/or accidental spills. Potential noise and light impacts associated with offshore MET tower activities during construction, operation, and decommissioning will be negligible for terrestrial mammals due to the distance of the site from shore.

3.2.3 Mitigation Measures (585.610(a)(8))

The Project will implement best practices and comply with all applicable regulations to eliminate or minimize the potential for adverse environmental impacts during MET tower construction, operation, and decommissioning. This will include measures to avoid and prevent accidental events such as spills. These measures will ensure that any unavoidable impacts to coastal habitats and terrestrial mammals are negligible.

3.3 Water Quality (585.611(b) (2))

3.3.1 Environmental Baseline

The affected environment is divided into coastal and marine waters for the purposes of the following discussion. Coastal waters include all the ports/harbors, rivers, bays and estuaries that could be affected by Project activities (e.g., traversed by vessels during MET tower installation, operation, decommissioning; and/or non-routine events). Marine waters include waters of the OCS, in which the Lease Area is located, as well as waters offshore that are state territory (within three nm of shore) and those of the OCS in the path to and from the WEA from shore.

Water quality is controlled primarily by the anthropogenic inputs of land runoff, land point source discharges, and atmospheric deposition. With increasing distance from shore, oceanic circulation patterns play an increasingly larger role in dispersing and diluting anthropogenic contaminants and determining water quality.

The condition of Atlantic Coast estuaries, as measured by the water quality index, is fair to poor. The combination of decreased dissolved oxygen concentrations and elevated chlorophyll a concentrations facilitates the high eutrophic conditions (prolonged phytoplankton blooms) observed in the estuary areas of the mid-Atlantic (USEPA 2005).

Offshore water quality in the mid-Atlantic region is generally good, as the region generally exhibits low water column stratification, low nutrient concentrations (both nitrogen and phosphorus concentrations), low chlorophyll populations, and good water quality measurements (USEPA 1998; 2001). The 2006 mid-Atlantic Bight assessment found there were no major indications of poor sediment or water quality and that the dissolved oxygen, sediment contaminants, and sediment TOC component indicators were rated good throughout the survey area (USEPA 2012).

Concentrations of suspended matter (turbidity) are typically low in mid-Atlantic marine waters, though they increase naturally during storm events and vary locally between surface and bottom waters, different seasons, and in different areas due to differing sources and grain sizes. Detailed studies of total suspended matter concentrations in surface waters of the mid-Atlantic have shown general concentrations of less than 1 milligram/liter (mg/L) throughout the region (Louis Berger Group, Inc., 1999).

The MD WEA is characterized by sand ridges and troughs that are oriented along a generally southwest to northeast axis (CB&I 2014). The sand ridges have a complex morphology that is superimposed with smaller scale bedforms (sand waves). This is suggestive of active sediment transport with frequent sediment mobilization, resuspension, and deposition occurring due to tides, currents, and storm activity. Wave action may also affect sediment transport in water depths shallower than approximately 20 m. During these periods of naturally induced sediment transport, short-term increases in turbidity affecting water quality may occur. In the SAP APE, evidence of naturally occurring sediment transport events is present in the form of sand ripples.

Based on data collected from within the MD WEA, including NEFSC historical data (NOAA NEFSC Oceanography Branch 2014) from numerous survey and research cruises taken over the past ten years: 1) Bottom water was quite uniform throughout its spatial extent in any given season; 2) Summer bottom temperatures were the most consistent during and across years; 3) Turnover events in September appeared to result in a sudden rise in bottom temperature, and winter bottom temperatures were usually substantially colder than summer and fall bottom temperatures; 4) Surface temperatures were similar to bottom temperatures in winter, indicating a consistent well-mixed water column condition; 5) Salinities varied little throughout the year, particularly on the bottom (<0.3 psu variation); and 6) Surface to bottom gradients were consistently small (<2 psu) throughout all seasons (Table 3.3-1).

Table 3.3-1 Ten Years (2003 – 2012) of NEFSC CTD Data from the Maryland WEA Summarized By Seasonal Periods

Period	Layer	Temperature (deg C)			Salinity (psu)		
		Median	Min	Max	Median	Min	Max
Jun 1 – Aug 31	Surface	21.99	17.04	24.24	31.17	29.49	32.01
	Bottom	10.92	9.39	17.88	32.73	31.72	32.90
Sep 1 – Oct 31	Surface	22.01	20.35	23.72	31.21	30.14	32.06
	Bottom	19.76	11.57	23.42	21.58	30.19	32.76
Jan 1 – Mar 31	Surface	5.27	3.41	10.12	31.81	30.05	32.25
	Bottom	5.03	3.40	10.38	31.91	31.00	32.47

Data source: NOAA, NEFSC Oceanography Branch 2014. Source: (NOAA, NEFSC 2014).

Additional CTD data were collected during benthic surveys conducted within the MD WEA in July 2013. The results from these surveys found there is a strongly-stratified water column with warm (>21° C) water in a thin surface layer, underlain by a strong thermocline and a thick bottom layer of cool water (~10° C) with a salinity about 1.5 psu higher than the surface. The decline in temperature from the surface to the bottom water layers was paralleled by a decline in dissolved oxygen (D.O.) from supersaturated (>100% saturation) at the surface layer to ~80% saturation in the bottom layer. There was little difference in bottom temperature, salinity, and D.O. from place to place, showing no evidence of horizontal frontal structures. There were, however, north to south differences in the depths of the layers, which is indicative of sloping surfaces of water masses that generate currents (Guida et al. 2015).

National Data Buoy Station 44009 is located approximately 7.25 NM from the center of the Maryland WEA and approximately 3 NM from the closest border to the lease area. Data collected from the Buoy Station between 1984 and 2014 are summarized in Table 3.3-2.

Table 3.3-2 Summary of Data Collected at National Data Buoy Station 44009

Parameter	Annual Average	Annual Minimum	Annual Maximum
Wind direction (degrees)	192	163	217
Wind speed (m/s)	6.1	4.2	7.7
Peak wind gust (m/s)	7.4	5	9.5
Significant wave height (m)	1.2	0.9	1.7
Dominant wave period (m)	7.5	6.8	8.4
Average wave period (sec)	5.2	4.6	5.8

Mean wave direct (degrees)	123	0	150
Sea level pressure (hPA)	1076	1017	1298
Air temperature (degrees C)	13.4	1.8	17.2
Sea surface temperature (degrees C)	14.3	4.6	18.3
Dewpoint (degrees C)	9.4	0	12.7

3.3.2 Potential Impacts

MET tower activities that have the potential to impact coastal and marine water quality include vessel discharges (including bilge and ballast water and sanitary waste), and structure installation and removal.

Vessel Discharges

Vessel discharges associated with MET tower activities may affect water quality when vessels are traveling to and from the WEA. Vessel discharges include bilge and ballast water, and sanitary waste. The discharge of bilge and ballast water is regulated under 33 CFR 151.10; which limits the discharge of water mixtures in waters less than 12 nm from shore. In coastal waters, bilge and ballast water may be discharged with an oil content of 15 ppm or less; however, discharges may occur in waters greater than 12 nm from shore if the oil concentration is less than 100 ppm. In addition, ballast water may be subject to the USCG Ballast Water Management Program to prevent the spread of aquatic nuisance species. Based on a study of wastewater discharges from support vessels (i.e. tugboats and supply boats) conducted by USEPA (2010b), it was determined that vessels discharging to a relatively large water body such as the WEA, were not likely to cause an exceedance of National Recommended Water Quality Criteria. However, there was the potential for these discharges to impact water quality locally and temporarily within the WEA. Vessels traversing those portions of the WEAs which are outside the 12 nm boundary potentially would release bilge water and ballast water into the ocean. However, oceanic circulation and the volume of water increasingly serves to disperse, dilute, and biodegrade anthropogenic contaminants. Therefore, the discharges may affect the water quality locally and temporarily, but the potential impacts from these vessels, if any, would be minor.

A marine sanitation device (MSD) is required under 33 CFR 159 to treat sanitary waste generated on service vessels so that surrounding waters are not impacted by possible bacteria or viruses in the waste. All vessels with toilet facilities must have a MSD that complies with 40 CFR 140 and 149. Vessels complying with 33 CFR 159 are not subject to State and local MSD requirements. The MSD Type III device, where wastewater is tanked aboard ship until pumped out onshore, is the most common type of sewerage treatment system aboard vessels. These systems are designed to retain or treat the waste until it can be disposed of at the proper shoreside facilities. Because the discharge of sanitary waste will be regulated, no impacts to water quality are likely to occur.

Discharge of gray water from vessels is not regulated outside state waters, and vessel operators may dump gray water outside state waters. Since the WEA is located outside state waters it would be likely that vessels would discharge grey water while operating on the OCS. However, oceanic circulation and the volume of water increasingly serves to disperse, dilute, and biodegrade anthropogenic contaminants. Therefore, while the small amount of discharge associated with these vessels into such a large water body may affect the water quality locally and temporarily, the potential impacts to water quality in the open ocean, if any, would be minor.

The discharge of trash and debris is prohibited in the sea or into the navigable waters of the United States (33 CFR 151.51-77). All trash and debris must be returned to shore for proper disposal with municipal and solid waste. Because the discharge of trash is prohibited, no impacts to water quality are likely to occur as a result of trash discharge, even if some trash or debris is discharged accidentally.

MET Tower Installation & Decommissioning

Impacts to water quality resulting from the construction and installation of the MET tower would consist of sediment dispersal, resuspension, and subsequent sedimentation from pile-driving and anchoring. Water quality impacts would occur during decommissioning activities from material dislodged during pile removal, and sediment resuspension and resedimentation during the removal of the tower, and foundation.

Anchor placement and removal would cause intermittent disturbance of the seafloor, with movement of sediment into the water column followed by sedimentation. However, the surficial sediments that may be disturbed by anchor placement and removal are composed of fine- to coarse-grained sand, with trace amounts of gravel (Section 3.1.1). Sand is also the dominant soil type identified from 0 to 20.16 m below the sediment-water interface at the MET tower borehole location (Appendix P). Therefore, most of the disturbed sediment is expected to settle quickly.

Some fine-grained sediments present at depths below 20 m (Section 3.1.1) would also be disturbed by installation and decommissioning activities that penetrate deeper into the seafloor (liftboat jacking, barge spudding, pile driving, and installation and removal of the tower and foundation).

However, each of these activities are of short duration and sediments disturbed and introduced into the water column by these activities would cause only short-term impacts to water quality, including turbidity and water clarity, which are expected to be localized and minor.

Non-Routine Events

Vessels and equipment being used during construction, operation and decommissioning of the MET tower will have various sources of diesel fuel present. Spills could occur during refueling or as the result of an allision or collision. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. If a spill were to occur, the estimated spill size would be small and expected to dissipate and biodegrade quickly. As a result, the impacts to water quality that could result from an oil spill, should one occur, are expected to be both minor and temporary.

Conclusion

Sediment disturbance caused by construction activities may result in a short-tem, localized increase in total suspended solids, which may temporarily impact local turbidity and water clarity.

Impacts to coastal and marine waters from vessel discharges associated with MET installation, operation, and decommissioning would be of short duration and minimal, if detectable. Given the existing high volume and commercial/industrial nature of existing vessel traffic in the Project area, any impacts to water quality from discharges associated with additional vessel activities related to the MET tower would be minor, localized, and temporary

Due to adherence with safe navigation practices, the risk of a vessel collision would be small. In the unlikely event of a collision that results in a fuel spill, impacts to water quality would be minor and of short duration.

3.3.3 Mitigation Measures (585.610(a)(8))

Vessels engaged in Project activities during construction, operation, and decommissioning will be required to follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste. They will be required to maintain up-to-date oil spill response plans and NPDES permits, as appropriate. Vessels will also be expected to maintain good maintenance and housekeeping procedures to prevent the discharge of trash and debris

Vessels engaged in Project activities during construction, operation, and decommissioning will be required to adhere to USCG guidelines for safe navigation; this will minimize the potential for collisions and any resulting spills of oil or fuel.

3.4 Benthic Resources (585.611(b)(3-5))

This section describes the benthic resources present near the proposed MET tower location. Additionally, it identifies and assesses potential impacts to those resources from the proposed activities.

3.4.1 Affected Environment

Benthic habitat in the Maryland WEA is generally characterized by sandy substrates on gentle slopes with evidence of at least moderate levels of mobility (CB&I 2014, Guida et al. 2015). Shell hash frequently accompanies mineral substrates in the WEA and the resultant variations in sediment type and slope are minor. Sand dominates sediment type but gravel is common as a minor component, particularly to the north. Muddy sands are also present in areas protected from strong currents, such as portions of the central WEA. Gravel- and cobble-dominated substrates are rare in the WEA while bedrock, boulder, and live-bottom benthic habitats have not been documented. Submerged aquatic vegetation (SAV) beds have also not been documented in the WEA. A review of data collected during geophysical surveys of the SAP APE and data from benthic field surveys (see discussion below) indicated no evidence of potentially sensitive or unique benthic habitat types, such as hard bottom, live bottom, and SAV, in the SAP area.

Physical oceanographic conditions vary only minimally over the WEA with no strong lateral gradients or fronts observed (Guida et al. 2015). Seasonal variations in bottom water temperature are consistent across the WEA with warmest conditions occurring during autumn turnover, when temperatures may approach or exceed 20°C (68°F). Thermal stratification is strongest in summer, with surface temperatures more than 10°C (18°F) higher than bottom temperatures. Although the WEA is entirely euhaline, with salinity typically higher than 30 practical salinity units (psu), vertical salinity gradients are observable in summer when surface salinity is up to 2 psu lower than bottom salinity. A vertically mixed thermal and salinity profile persists from fall through winter.

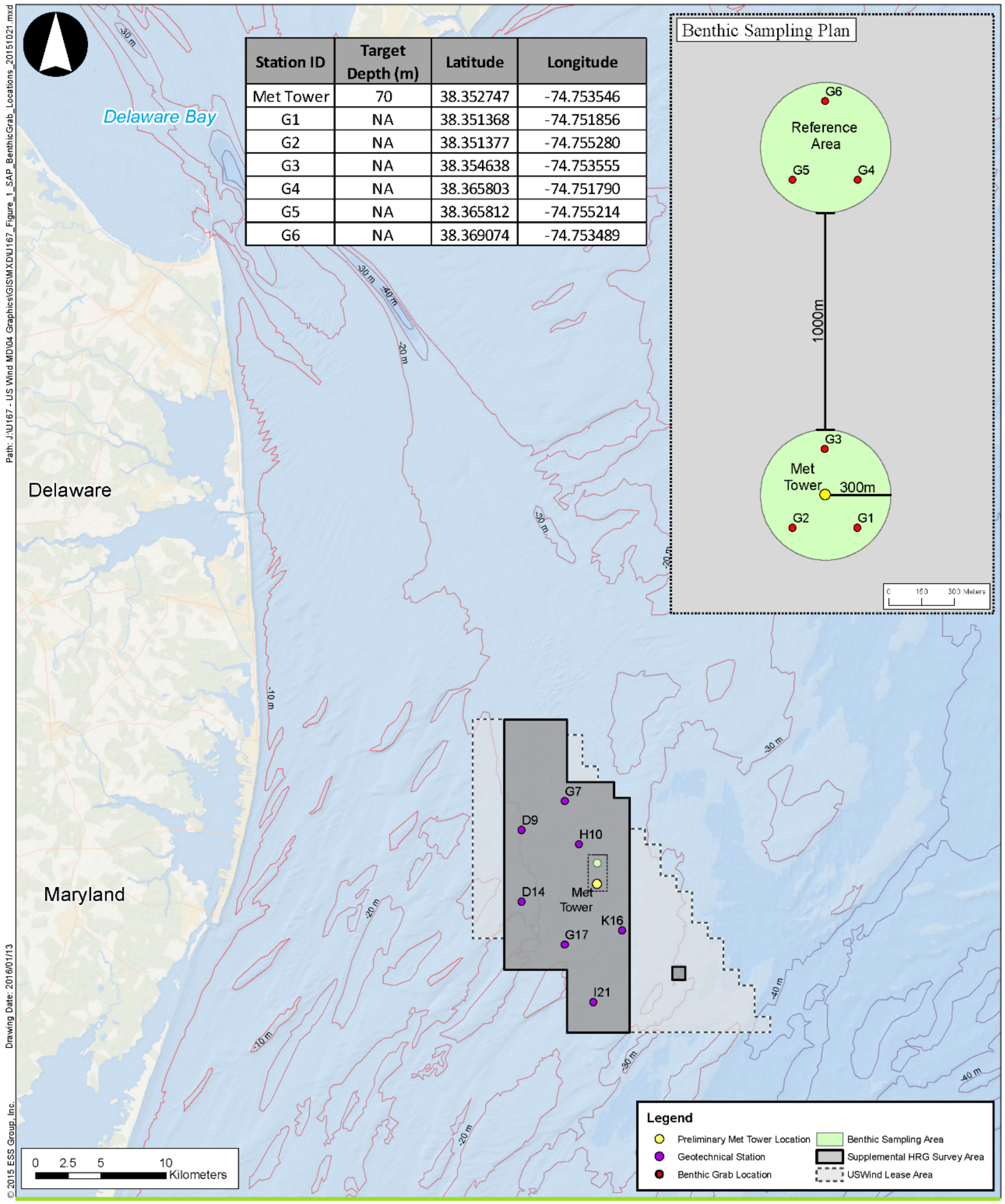
The benthic community in the WEA appears to be dominated by polychaetes, which were the most abundant taxonomic group observed during benthic sampling conducted within the WEA by the NOAA NMFS Northeast Fisheries Science Center in 2013 (Guida et al. 2015). Polychaetes representing 26 distinct taxonomic families contributed more than 50 percent of the total macroinvertebrate abundance. Oligochaete worms were the second-most abundant group observed, followed (in descending order) by mollusks, crustaceans, and other organisms.

Recent video surveys and survey trawls of the WEA suggest that the primary benthic epifaunal taxa include common sand dollar (*Echinarachnius parma*), hermit crab (*Pagurus* spp.), rock crab (*Cancer irroratus*), moon snails (Naticidae), nassa snails (*Ilyanassa* [*Nassarius*] spp.), and sea stars (*Asterias* spp.) (Guida et al. 2015). Penaeid shrimp (Penaeidae), sand shrimp (*Crangon septemspinosa*) and horseshoe crab (*Limulus polyphemus*) were also occasionally recorded in survey trawl data.

Benthic Field Survey

A site-specific field survey of benthic resources was conducted on July 25, 2015. The benthic field survey was composed of two elements, including 1) collection of still images and video of the seafloor and 2) collection of benthic grab samples for laboratory analysis of taxonomic composition. To obtain site-specific information on the benthic community, the benthic field survey focused on three locations near the site of the proposed MET tower (Figure 3.4-1). Three additional benthic samples were collected from an area of comparable habitat located 1,000 m (3,281 ft) north of the SAP area (reference area). Water depth, seabed slope and substrate type in the reference area, as described in Guida et al. (2015), are similar to that encountered near the proposed MET tower. The reference area was selected to represent background conditions as it is well outside the area of anticipated impact from the installation, operation and decommissioning of the proposed MET tower.

Figure 3.4-1 Benthic Sampling Locations



Station ID	Target Depth (m)	Latitude	Longitude
Met Tower	70	38.352747	-74.753546
G1	NA	38.351368	-74.751856
G2	NA	38.351377	-74.755280
G3	NA	38.354638	-74.753555
G4	NA	38.365803	-74.751790
G5	NA	38.365812	-74.755214
G6	NA	38.369074	-74.753489

US Wind Maryland
Offshore Maryland

Benthic Sampling Locations

1 inch = 10 kilometers

Source: 1) ESRI-NOAA-NGDC, Online Coastal Basemap
2) BOEM, OCS Atlantic Aliquots, 2012
3) NOAA-CRM, Bathymetric Contours

Figure 3.4-1

Qualitative analysis of the benthic imagery obtained indicated the presence of at least seven macrofaunal taxa overall, including six in the SAP area (Table 3.4-1). Most of the observed taxa were primarily epifaunal species. Hermit crabs and sand dollars were the most frequently observed taxa.

Table 3.4-1 Summary of Macroinvertebrate Taxa Observed in Benthic Imagery

Common Name	Scientific Name	SAP Area	Reference Area
Hermit crabs	Paguridae	X	X
Sand dollars	Clypeasteroida	X	X
Sea stars	Asteroidea	X	X
Segmented worms	Annelida	X	X
Moon snails (includes egg collars)	Naticidae	X	X
Crabs	Decapoda	X	X
Hydrozoans	Hydrozoa		X

The benthic grab samples provided additional information on the benthic community, especially infaunal taxa. Overall, 19 species of benthic fauna were observed from the six grab samples. The taxa richness, density, and community composition of the samples collected from the SAP area were very similar to the reference area (Table 3.4-2).

Taxa richness in the SAP area and reference area were comparable, with an average of nine taxa observed from each sample (Table 3.4-2). Polychaete worms were the most taxonomically rich group, contributing as much as 50 percent of the taxa richness in the study area. Mollusks were less taxonomically rich, with just a handful of taxa encountered. Crustaceans, oligochaete worms, and other taxonomic groups contributed one or two taxa each.

Overall benthic density was comparable between the SAP area and the reference area (Table 3.4-2). Nematode worms were the most abundant organism encountered in the site-specific benthic grab sampling program, although they made up a larger portion of the benthic community near the MET tower than in the reference area. Polychaete worms were the second-most abundant benthic organism observed, followed by oligochaete worms, crustaceans, and mollusks.

Table 3.4-2 Summary of Key Statistics from the Benthic Community Study

Statistic	SAP Area	Reference Area
Number of Samples	3	3
Mean Density per Square Meter (±1 SD)	3,567 ± 666	3,300 ± 361
Mean Taxa Richness (±1 SD)	9 ± 1	9 ± 2
Total Number of Taxa	16	14
Number of Taxa Observed by Taxonomic Group		
Mollusks	4	3
Oligochaetes	1	1
Polychaetes	8	6
Crustaceans	1	2
Other	2	1
Percent of Total Abundance by Taxonomic Group		
Mollusks	4.7	3.0
Oligochaetes	8.4	11.1

Statistic	SAP Area	Reference Area
Polychaetes	33.6	37.4
Crustaceans	6.5	12.1
Other	46.7	36.4

Most of the benthic macrofaunal taxa observed in the site-specific benthic grab samples were small burrowing or tube-building taxa. The most commonly observed polychaete taxa include *Polygordius* sp. and *Lumbrinerides acuta* (Table 3.4-3), both typical of sandy shelf habitats (Solis-Weiss 1995, Ramey 2008). The most abundant crustacean (the tanaid *Tanaissus psammophilus*) and mollusk (the razor clam *Ensis directus*) are also shallow burrowers (Weiss 1995). Although not abundant, surf clam (*Spisula solidissima*) juveniles were present in samples collected from stations G3 (SAP area) and G6 (reference area). No other shellfish of commercial importance were observed in the site-specific benthic grab samples.

Table 3.4-3 Relative Abundance of Taxa Observed in Site-Specific Benthic Grabs

	Percent Relative Abundance		
Taxon	**Overall**	**SAP Area**	**Reference Area**
Nematoda	37.38	38.32	36.36
Polygordius sp.	15.53	6.54	25.25
Tubificidae	9.71	8.41	11.11
Lumbrinerides acuta	7.77	8.41	7.07
Tanaissus psammophilus	7.77	6.54	9.09
Glycinde solitaria	6.31	12.15	0.00
Turbellaria	4.37	8.41	0.00
Paraonis sp.	2.43	2.80	2.02
Ensis directus	1.46	1.87	1.01
Trichophoxus epistomus	1.46	0.00	3.03
Capitellidae	0.97	1.87	0.00
Sigalion arenicola	0.97	0.93	1.01
Spisula solidissima	0.97	0.93	1.01
Astarte castanea	0.49	0.00	1.01
Cirratulidae	0.49	0.93	0.00
Exogone hebes	0.49	0.00	1.01
Ilyanassa trivittata	0.49	0.93	0.00
Orbiniidae	0.49	0.00	1.01
Tellinidae	0.49	0.93	0.00

Larger nematode worms (longer than 500 microns) were included in the site-specific data analysis. However, nematodes are often treated entirely as meiofauna and not included in analyses of the benthic macroinvertebrate community (e.g., Guida et al. 2015).

When nematodes are removed from the site-specific dataset, polychaete worms become the dominant taxonomic group, contributing 54.5 percent and 58.7 percent of the total benthic abundance, respectively. These community composition results are consistent with previous grab sampling of the benthic community near the proposed MET tower (Site F in Guida et al. 2015).

More detailed methodology and results of the benthic field survey are presented in Appendix Q.

Taxonomic Classification of Benthic Habitat in the SAP Area

Benthic habitat within the area for the proposed MET tower is typical of habitat throughout the WEA, consisting primarily of sand with shell hash.). The proposed MET tower is located in one of the flattest portions of the WEA (CB&I 2014, Guida et al. 2015) and bedforms are generally muted. Water depths are between 26 m and just over 27 m (85 ft and 89 ft; Chart 2 of Appendix N).

Based on Guida et al. (2015) and site-specific investigations, benthic habitat in the SAP area has been classified to the lowest achievable taxonomic level under the Coastal and Marine Ecological Classification System (CMECS). (Table 3.4-4)

Table 3.4-4 Taxonomic Classification of Benthic Habitat in the SAP Area

Biogeographic Setting:
Realm: Temperate North Atlantic
Province: Cold Temperate Northwest Atlantic
Ecoregion: Virginian
Aquatic Setting:
System: Marine
Subsystem: Marine Nearshore
Tidal Zone: Marine Subtidal
Water Column Component:
Water Column Layer: Marine Nearshore Lower Water Column
Salinity Regime: Euhaline Water
Temperature Regime: Moderate Water (Seasonal Variation from Cold to Warm)
Geoform Component:
Tectonic Setting: Passive Continental Margin
Physiographic Setting: Continental Shelf
Geoform Origin: Geologic
Level 1 Geoform: Sediment Wave Field
Substrate Component:
Substrate Origin: Geologic Substrate
Substrate Class: Unconsolidated Mineral Substrate
Substrate Subclass: Fine Unconsolidated Substrate
Substrate Group: Sand
Co-occurring Element: Substrate Subclass: Shell Hash
Biotic Component
Biotic Setting: Benthic Biota
Biotic Class: Faunal Bed
Biotic Subclass: Soft Sediment Fauna
Biotic Group: Small Surface-Burrowing Fauna
Co-occurring Element: Biotic Group: Small Tube-Building Fauna
Co-occurring Element: Biotic Group: Mobile Crustaceans on Soft Sediments

Co-occurring Element: Biotic Group: Sand Dollar Bed

3.4.2 Potential Impacts to Benthic Resources

Potential impacts to benthic resources are anticipated to be minor. The primary impact anticipated to benthic organisms is injury or mortality due to direct contact from construction of the MET tower, installation of the ADCP, and decommissioning activities. Indirect impacts from suspended sediments and sediment deposition are possible but expected to be negligible. Surficial sediments that may be disturbed are composed of fine- to coarse-grained sand, with trace amounts of gravel (Section 3.1.1). Sand is also the dominant soil type identified in the upper three units of the MET tower borehole location (Appendix P). These units extend from 0 m to 20.16 m below the sediment-water interface. Most of this disturbed sediment is expected to settle quickly.

Some fine-grained sediments present at depths below 20 m (65 ft) (Figure 3.1-1) could be disturbed by installation and decommissioning activities that penetrate deeper into the seafloor; however, these activities will short-term and localized.

Organisms with limited mobility and inability to avoid the impacted area may experience injury or mortality. However, these impacts are anticipated to be temporary and highly localized. Additionally, the small area of direct and indirect impacts compared to the large source area of surrounding undisturbed habitat is expected to result in rapid recolonization following disturbance (e.g., Guerra-García et al. 2003, Schaffner 2010).

It is anticipated that the area of seabed occupied by the MET tower and ADCP will be 8.44 m^2 (90.9 ft^2). Once constructed, the MET tower will eliminate soft substrate in these areas and introduce hard substrate (submerged portion of the MET tower, its foundation and the ADCP instrumentation package and buoy) into an area currently consisting of unconsolidated sands. Benthic epifauna adapted to hard bottom habitats would be anticipated to colonize these new areas of hard substrate. The loss of soft substrate would be negligible. Additionally, scour of the seabed around the MET tower piles may result in disturbance to the benthic community in the immediate vicinity. However, this impact is anticipated to be highly localized and, therefore, negligible.

3.4.3 Mitigation Measures (585.610(a)(8))

Mitigation primarily consists of avoiding sensitive habitat types, such as hard bottom and live bottom habitats. Based on site-specific data collected for the Project, there are no potentially sensitive benthic habitat types present in the SAP area.

Impacts to other benthic habitats and organisms will be localized, and primarily temporary. The negligible impacts associated with the displacement of soft substrate and introduction of hard structure would be reduced or eliminated after decommissioning of the MET tower.

3.5 Fisheries and Essential Fish Habitat (585.611(b)(3-5))

3.5.1 Environmental Baseline

The Maryland WEA is located in the mid-Atlantic Bight (MAB) of the Northeast Continental Shelf Large Marine Ecosystem. The MAB has very diverse and abundant fishery resources, consisting of both northern (temperate) and southern (tropical-subtropical) species that undergo extensive migrations as they follow temperature isotherms (Olney and Bilkovic 1998). In an Ocean/Wind Power Ecological Baseline Study conducted from 2008 through 2009, over 250 species of fish were identified in the mid-Atlantic, with 15% identified as temperate species and 75% as tropical-subtropical species (NJDEP, 2010).

Many habitat and spatial factors affect the distribution of fish within the waters of the MAB (Helfman et al. 2009), including temperature, salinity, pH, currents, and physical habitat. Fish assemblages along the Atlantic Coast are generally categorized according to life habits or preferred habitat associations, such as pelagic, demersal, and highly migratory. NEFSC bottom trawl survey results from within the Maryland WEA demonstrate a large seasonal shift in benthic/demersal species. Larger catches were made in fall (Sept. –Oct.) than in spring (March), both in terms of numbers of individuals caught (mean fall catch = 1,709 per trawl vs. 76 per trawl in spring) and numbers of species (39 in fall vs. 15 in spring) (Guida et al. 2015). Fall catches were dominated by seasonally migratory species such as Atlantic croaker, weakfish, spot, and northern sea robin, whereas the smaller spring catches were dominated by little skate, smallmouth flounder, and spotted hake. It was also noted that the spring catch species represent a year-round resident fauna.

A list of major fish assemblages is presented in Table 3.5-1 and described in more detail below. There are also important shellfish that may be found in the area of the MAB. Important managed shellfish on the mid-Atlantic continental shelf include scallops, horseshoe crabs, surfclams, and ocean quahogs. Of these, surfclams were the only managed shellfish species directly observed in the SAP APE (Section 3.4, Benthic Resources). The economic importance of managed shellfish species in the Maryland WEA is further discussed in Section 3.13, Commercial and Recreational Fishing.

Pelagic Fishes

Pelagic species spend most of their lives swimming in the water column, rather than occurring on or near the bottom. Some coastal pelagic species in the Atlantic region, including important schooling forage fish such as menhaden (*Brevoortia tyrannus*) and predatory species such as red drum (*Sciaenops ocellatus*), are found primarily in shallower waters. Many coastal pelagic species rely on coastal wetlands, seagrass habitats, and estuaries to provide habitat for specific life stages and many of these species migrate north and south along the Atlantic Coast during some periods of the year. Some pelagic species are distributed from the shore to the continental shelf edge. A number of these species are schooling fish that are sought by both recreational and commercial fisheries. Included in this assemblage are smaller forage species, such as Atlantic herring (*Clupea harengus*), and larger predatory fishes, including bluefish (*Pomatomus saltatrix*). In general, these fish use the highly productive coastal waters within the Atlantic region during the summer months and migrate to deeper and/or more distant waters during the rest of the year.

Demersal Fishes

Demersal fish (groundfish) are those fish that spend at least a portion of their life cycle in association with the ocean bottom. Demersal fish are often found in mixed species aggregations that differ depending upon the specific area and time of year. Many demersal fish species have pelagic eggs or larvae that are sometimes carried long distances by oceanic surface currents. Common demersal species in the MAB include the following: Family *Pleronectidae* (flounder), Family *Gadidae* (hake), and Family *Serranidae* (sea basses and groupers).

Highly Migratory Fishes

Highly migratory fish often migrate from southern portions of the South Atlantic to as far north as the Gulf of Maine. Examples of these species include Atlantic bluefin tuna (*Thunnus thynnus*), albacore (*Thunnus alalunga*), and yellowfin tuna (*Thunnus albacares*). Other than some tuna species (family *Scombridae*), which exhibit schooling behavior, many of the highly migratory species occur either singly or in pairs.

A wide variety of highly migratory pelagic shark species also occur in waters of the Atlantic region. Many of these are also sought by commercial and recreational anglers. Examples of such sharks include thresher shark (*Alopias vulpinus*), porbeagle (*Lamna nasus*), and shortfin mako (*Isurus oxyrinchus*).

Table 3.5-1 Major Fish Species Potentially Occurring in the Project Area

Species	EFH	Ecological Importance	Commercial / Recreational Importance	Seasonality	Habitat Association
Atlantic croaker *(Micropogonias undulates)*		●		Fall	Demersal
Black sea bass *(Centropristis striata)*	●		●	Spring-Fall	Demersal
Atlantic butterfish *(Peprilus triacanthus)*	●		●	Year round	Demersal / Pelagic (May-October)
Clearnose skate *(Raja eglanteria)*	●	●		Year round	Demersal
Little skate *(Leucoraja erinacea)*	●	●		Year round	Demersal
Northern searobim *(Prionotus carolinus)*		●		Spring-Fall	Demersal
Red hake *(Urophycis chuss)*	●		●	Winter-Spring	Demersal
Scup *(Stenotomus chrysops)*	●	●	●	Year round	Demersal (fall) / Pelagic
Summer flounder *(Paralichthys dentatus)*	●		●	Year round	Demersal
Spot *(Leiostomus xanthurus)*		●		Fall	Demersal
Spotted hake *(Urophycis regia)*		●		Year round	Demersal
Smooth dogfish *(Mustelus canis)*	●			Year round	Demersal
Spiny dogfish *(Squalus acanthias)*	●		●	Year round	Demersal
Snappers-Groupers		●	●	Year round	Demersal / Pelagic
Weakfish *(Cynoscion regalis)*		●		Fall	Demersal
White hake *(Urophycis tenuis)*			●	Spring	Demersal
Atlantic cod *(Gadus morhua)*	●	●	●	Winter-Spring	Pelagic

Species	EFH	Ecological Importance	Commercial / Recreational Importance	Seasonality	Habitat Association
Atlantic bluefin tuna *(Thunnus thynnus)*	●	●	●	June–October	Pelagic
Atlantic herring *(Clupea harengus)*	●		●	Year round	Pelagic
Atlantic mackerel *(Scomber scombrus)*	●		●	May–September	Pelagic
Albacore tuna *(Thunnus alalunga)*	●	●		Winter	Pelagic
Atlantic angel shark X *(Squantina dumeril)*	●	●		Fall-Winter	Pelagic
Atlantic bigeye tuna *(Thunnus obesus)*		●	●	Summer-Fall	Pelagic
Atlantic skipjack *(Katsuwonus pelamis)*	●	●		Year round	Pelagic
Atlantic yellowfin tuna *(Thunnus albacares)*	●	●	●	Year round	Pelagic
Bluefish *(Pomatomus saltatrix)*	●	●	●	May-November	Pelagic
Dusky shark *(Carcharhinus obscurus)*	●	●	●	June-November	Pelagic
Great hammerhead shark *(Sphyrna mokarran)*	●	●		Summer	Pelagic
Porbeagle shark *(Lamna nasus)*		●	●	Winter	Pelagic
Porgies *(Sparidae)*		●	●	Year round	Pelagic
Sand tiger shark *(Carcharias taurus)*	●	●	●	Summer	Pelagic
Sandbar shark *(Carcharhinus plumbeus)*	●	●	●	Summer	Pelagic
Scalloped hammerhead *(Sphyrna lewini)*	●	●		Summer	Pelagic
Shortfin mako *(Isurus oxyrinchus)*	●	●	●	June-December	Pelagic
Silky shark *(Carcharhinus falciformis)*			●	Year round	Pelagic
Smooth dogfish *(Mustelus canis)*			●	Year round	Pelagic
Thresher shark *(Alopias vulpinus)*			●	June-December	Pelagic
Tiger shark *(Galeocerdo cuvier)*	●	●		Summer	Pelagic
Wahoo *(Acanthocybium solandri)*		●	●	Summer	Pelagic
White shark *(Carcharodon carcharias)*		●		Summer	Pelagic
Windowpane flounder *(Scopthalmus aquosus)*	●	●		Year round	Demersal
Winter skate *(Leucoraja ocellata)*	●	●		Year round	Demersal
Yellowtail flounder *(limanda ferruginea)*	●	●		Year round	Demersal

Ichthyoplankton

Fish eggs and larvae found in the MAB come from warm temperate, cold temperate, and boreal regions and are generally distributed in an onshore/offshore pattern (Doyle et al., 1993; Hare et al., 2001). In general, the most abundant fish eggs and larvae found during winter months are those of cold temperate species originating in more northerly waters. During spring, summer, and fall months, ichthyoplankton is dominated by warm temperate species originating from more southerly waters.

3.5.1.1 Threatened or Endangered Fish

There are three fish species that are listed as endangered that may occur off the mid-Atlantic coast, including the shortnose sturgeon, Atlantic sturgeon, and Atlantic salmon (Table 3.5-2). All three species are anadromous species, meaning they spawn in rivers and spend their adult lives in the open ocean. Additional species of concern include two shark species: the porbeagle shark and the sand tiger shark; two herring: the alewife and blueback herring, Atlantic bluefin tuna and the rainbow smelt.

Table 3.5-2 List of Threatened and Endangered Species and Species of Special Concern

Species (Scientific Name)	Relative Occurrence in WEA	ESA Status
Shortnose sturgeon (*Acipenser brevirostrum*)	Rare	Endangered
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)	Likely	Endangered
Atlantic salmon (*Salmo salar)*	Rare	Endangered
Porbeagle shark (*Lamna nasus*)	Likely	Species of Concern
Sand tiger shark (*Carcharias taurus*)	Likely	Species of Concern
Alewife (*Alosa pseudoharengus*)	Unlikely	Species of Concern
Blueback herring (*Alosa aestivalis*)	Unlikely	Species of Concern
Atlantic Bluefin (*Thunnus thynnus*)	Likely	Species of Concern
Rainbow smelt (*Osmerus mordax*)	Unlikely	Species of Concern

Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

The Atlantic sturgeon is an anadromous species that may be found in rivers and nearshore habitats throughout the mid-Atlantic with reproductive/spawning populations identified in the Delaware River (New Jersey and Delaware) and the James and York Rivers (Virginia). Migratory Atlantic sturgeon commonly aggregate in the New York Bight, Delaware Bay, Chesapeake Bay, and waters off of North Carolina from the Virginia/North Carolina border to Cape Hatteras at depths up to 24 m (BOEM 2013). Primary threats to Atlantic sturgeon include habitat degradation and loss, ship strikes, and general depletion from historical fishing. Federally listed as endangered in 2012 the Atlantic sturgeon was historically distributed along the east coast and inhabited 38 coastal rivers from the St. Johns River, Florida, to Hamilton Inlet, Labrador. Today they inhabit 32 coastal rivers over a reduced geographic range, with the center of abundance being the New York Bight (Atlantic Sturgeon Status Review Team, 2007; Dunton et al., 2010). Spawning populations are known to occur in 20 of the 32 east coast rivers that support Atlantic sturgeon (NOAA Fisheries, 2015a).

The Atlantic sturgeon resides for much of each year in estuarine and marine waters, but ascends coastal rivers in spring to spawn in flowing freshwater. Atlantic sturgeon are generally slow growing and late maturing, with spawning occurring every 1-5 years. Depending on their size, mature females produce between 400,000 and 8 million eggs. The eggs are adhesive and attach to gravel or other hard substrata. Larvae develop as they move downstream to the estuarine portion of the spawning river, where they reside as juveniles for years. Subadults will move into coastal ocean waters where they may undergo extensive movements usually confined to shelly or gravelly bottoms in 10 to 50 m (33 to 164 ft) water depths. Fish distribution varies seasonally within this depth range. Fish are primarily found in shallower depths of 10-20 m (33-66 ft) during the summer months (May to September) and move into deeper waters (20-50 m [66-165 ft]) in winter and early spring (December to March). Shelf areas less than18 m (59 ft) deep and approximately 15 to 37.5 km (9.3 to 23.3 mi) from the shore of Virginia and the sandy shoals of Oregon Inlet, North Carolina, appear to be areas of greater concentration during summer months. During the winter, they can be found further offshore to about 112.5 km (70 mi)). Adults grow to lengths of 4.3 m (14 ft) and weights of 363 kg (800 lb) and live for up to 60 years (BOEM 2013).

Studies indicate that tagged Atlantic sturgeon juveniles leaving the Delaware River estuary during the fall were recaptured in nearshore waters along the Atlantic coast as far south as Cape Hatteras, North Carolina from November through early March. In the spring, a portion of the tagged fish reentered the Delaware River estuary; however, many fish continued a northerly coastal migration through the Mid-Atlantic as well as into southern New England waters where they were recovered throughout the summer months. A southerly coastal migration was also apparent from tag returns reported in the fall. The majority of these tag returns were reported from relatively shallow near shore fisheries with few fish reported from waters in excess of 25 m (BOEM 2013). More recently, telemetered Atlantic sturgeon were detected in nearshore coastal waters along the Delmarva Peninsula (Oliver et al. 2013). Atlantic sturgeon were observed in shallow, well-mixed, relatively warm freshwater near the 25 m isobath and appear to be associated with the a water mass tied to Delaware Bay.

On October 6, 2010, NMFS published two rules proposing to list five Distinct Population Segments (DPS) of Atlantic sturgeon, including the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs, as endangered, and one DPS of Atlantic sturgeon as threatened (Gulf of Maine DPS). Atlantic sturgeon are known to occur in the waters off the U.S. Mid-Atlantic in water depths of less than 40 meters. While adult Atlantic sturgeon have the potential to be present in the area of the MD WEA, particularly during the winter and early spring, they are more commonly found in shallower waters and bottom habitat consisting of shells and gravel. However, once a species is proposed for listing, as either endangered or threatened, BOEM is required to confer with NMFS on any action which is likely to jeopardize the continued existence of the proposed species or result in the destruction or adverse modification of proposed critical habitat.

Shortnose Sturgeon (*Acipenser brevirostrum*)

The shortnose sturgeon is an anadromous species found in larger rivers and estuaries of the North America eastern seaboard from the St. Johns River in Florida to the St. Johns River in Canada. In the northern portion of the range, shortnose sturgeon are found in the Chesapeake Bay system; Delaware River; the Hudson River; the Connecticut River; the lower Merrimack River; and Kennebec River to the St. John River in New Brunswick, Canada. The shortnose sturgeon was listed as endangered in 1967 because USFWS concluded that the fish had been eliminated from the rivers in its historic range (except the Hudson River) and was in danger of extinction because of pollution, loss of access to spawning habitats, and overfishing, both directly and incidentally in the commercial fishery for Atlantic sturgeon (USDOC, NOAA, NMFS, 2010b;

NOAA Fisheries, 2015b). Distinct Population Segments (DPS) are currently identified in North Carolina, South Carolina, Georgia, and northern Florida river systems (USDOC, NMFS, 2010b)

Shortnose sturgeon occur primarily in fresh and estuarine waters and occasionally enter the coastal ocean. Adults ascend rivers to spawn from February to April; eggs are deposited over hard bottom, in shallow, fast-moving water (Dadswell et al., 1984; Murdy et al., 1997). Fecundity ranges from 27,000-208,000 eggs per female (Murdy et al., 1997). Growth is relatively slow, with females reaching maturity in 6-7 years, whereas males mature in 3-5 years. Females generally spawn every three years, although males may spawn every year. Shortnose sturgeon can live to be over 67 years, with an average life span of 30-40 years.

While shortnose sturgeon have the potential to be present in the area of the MD WEA, they have rarely been found in coastal or shelf waters (Dadswell et al., 1984; Moser and Ross, 1995; Collins and Smith, 1997).

Atlantic Salmon (*Salmo salar*)

Atlantic salmon is an anadromous species that historically ranged from northern Quebec southeast to Newfoundland and southwest to Long Island Sound (NOAA Fisheries, 2015c). The abundance of Atlantic salmon has declined significantly in the southern half of its range. The total adult run of Atlantic salmon to U.S. rivers had declined from hundreds of thousands of fish in the early part of the previous century to a probable range of 500 to 2,000 fish, mostly in rivers in eastern Maine (Baum and Jordan 1982, Beland et al. 1982, Fletcher et al. 1982, Fletcher and Meister 1982, Meister 1982, Baum 1983, Dube 1983).The Gulf of Maine Distinct Population Segment (DPS) of the Atlantic salmon that spawns within eight coastal watersheds within Maine is federally listed as endangered (65 FR 69459). In 2009 the DPS was expanded to include all areas of the Gulf of Maine between the Androscoggin River and the Dennys River.

Atlantic salmon are anadromous and have a relatively complex life history that extends from spawning and juvenile rearing in freshwater rivers to extensive feeding migrations in the open ocean. In the United States, adult Atlantic salmon ascend the rivers of New England to spawn during the spring to fall seasons. Juvenile salmon remain in the rivers for 1-3 years before migrating to the ocean. The Atlantic salmon is highly migratory and will undertake long marine migrations between the mouths of U.S. rivers and the northwest Atlantic Ocean where they are widely distributed seasonally over much of the region. Typically most Atlantic salmon spend two winters in the ocean before returning to freshwater to spawn. Suitable spawning habitat consists of gravel or rubble in areas of moving water (NOAA Fisheries, 2015c). The marine stage of Atlantic salmon life history is the least understood. Post-smolts leaving Maine rivers in spring migrate northeasterly, reaching Newfoundland and Labrador by mid-summer. They spend their first winter at sea in the area of the Labrador Sea south of Greenland (NMFS & USFWS 2005). Their diet consists of small fish. Atlantic salmon can grow to be an average of 28-30 inches in length and an average of 8-12 pounds in weight.

It is possible, although unlikely, that adult Atlantic salmon may occur off the mid-Atlantic coast while migrating to New England Rivers, to spawn.

Other Species of Concern

Three shark species, including the dusky shark, the porbeagle shark, and the sand tiger shark, are considered species of concern and may be found in the mid-Atlantic. The dusky shark may be found in the mid-Atlantic, occurring from the surf zone to well offshore, and from surface waters to depths of 39.6 m (130 ft). The dusky shark is not commonly found in estuaries due to a lack of tolerance for low salinities. The species migrates northward in summer and southward in fall. Sand tiger sharks may also be found in the mid-Atlantic. They are generally a coastal species, usually found from the surf zone to depths of about 22.9 m (75 ft). They are, however, sometimes found at depths of 182.9 m (600 ft). Porbeagle sharks are pelagic and rarely enter shallow coastal waters. They are distributed in the water column from the surface down to depths of up to 1,000 ft. On the Atlantic OCS the species range from Maine to New Jersey with the primary concentration the Gulf of Maine and Georges Bank.

Atlantic bluefin tuna (*Thunnus thynnus*) is a highly migratory, pelagic species that is found from the Gulf of Mexico to Newfoundland in coastal and open ocean environments. Spawning is principally in the Gulf of Mexico and in the Florida Straits (USDOC, NOAA, NMFS, 2011).

Herrings and smelts are generally found throughout the mid-Atlantic in nearshore waters, coastal bays and estuaries up to spawning grounds in upstream riverine habitats. Their decline has generally been attributed to loss of upstream habitat due to man-made impediments (i.e., dams) and fishing pressure.

American eel (*Anguilla rostrata*) are found in fresh, brackish, and coastal waters from the southern tip of Greenland to northeastern South America. American eels begin their lives as eggs hatching in the Sargasso Sea. They take years to reach freshwater streams where they mature, and then they return to their Sargasso Sea birth waters to spawn and die. Threats to American eel include habitat loss, including riverine impediments, pollution and nearshore habitat destruction; and fishing pressure (Greene et al., 2009).

<u>3.5.1.2 Commercially and Recreationally-important Fish and Shellfish</u>

Many of the fish species found in the MAB are important due to their value as commercial and/or recreational fisheries. U.S. fisheries landings data from 2013 indicate that the following species were the top valued fisheries in Maryland: striped bass, white perch, menhaden, channel catfish, menhaden, black seabass, summer flounder, bigeye tuna, Atlantic croaker, and American eel. Fishing effort within the Maryland WEA varies seasonally, but peak vessel trips typically occur from May to October (NOAA 2015d).

The most common gear types used in the vicinity of the WEA are crab pots and traps, lines trot with baits, pound nets, gill nets, and clam dredges, ranked in order by value landed (Sea Risk Solutions 2015). Commercial fisheries target pelagic fish species using gears, such as trawls, longlines, and purse seines. Demersal fish are usually taken by using trawling gear, although a great number are also caught with other gear such as gill nets, traps, and longlines.

There are a number of fishery management plans in place for regulating and managing pelagic fisheries in the Atlantic region, including plans for Atlantic salmon, Atlantic herring, bluefish, dolphin, and wahoo. Fisheries for demersal fishes in the Atlantic region are managed by multispecies groundfish fishery management plans as well as a number of single-species management plans.

A detailed description of fishing activities and the economic value of fisheries is provided in Section 3.13, Commercial and Recreational Fishing Activities.

3.5.1.3 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires fishery management councils to: (1) describe and identify EFH in their respective regions; (2) specify actions to conserve and enhance that EFH; and (3) minimize the adverse effects of fishing on EFH. The Magnuson-Stevens Act requires Federal agencies to consult on activities that may adversely affect EFH designated in fishery management plans. Additionally, fishery management councils identify habitat areas of particular concern (HAPCs) within fishery management plans. HAPCs are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. There is no HAPC identified for any listed finfish species within the Maryland WEA.

EFH has been designated for the following species for one or more life stages near the Project Area.

New England Fishery Management Plan Species

- Atlantic herring
- Atlantic cod
- Clearnose skate
- Little skate
- Red hake
- Winter skate
- Yellowtail flounder
- Windowpane flounder

Mid-Atlantic Fishery Management Plan Species

- Atlantic mackerel
- Black sea bass
- Bluefish
- Butterfish
- Scup
- Surfclam
- Smooth dogfish
- Spiny dogfish
- Summer flounder
- Loligo squid

Atlantic Highly Migratory Species Fishery Management Plan Species

- Albacore tuna
- Atlantic angel shark
- Atlantic bluefin tuna
- Atlantic skipjack
- Atlantic yellowfin tuna
- Dusky shark
- Great hammerhead shark
- Sand tiger shark
- Sandbar shark
- Scalloped hammerhead
- Shortfin mako
- Thresher shark
- Tiger shark
- White shark

3.5.2 Potential Impacts

Fish resources could be impacted by MET Tower installation, operation, and decommissioning; discharges of waste materials; and non-routine events, such as collisions/allisions and spills.

MET Tower Installation

Impacts to fish resources from MET Tower Installation activities are expected to result primarily from acoustic effects and disturbance to the benthic environment.

Acoustic Effects

The auditory thresholds of marine fish that could occur in the Lease Area are not well studied. A fishes' inner ear and the lateral line overlap in the frequency range to which they respond. The lateral line appears to be most responsive to signals ranging from below one Hz to between 150 and 200 Hz (Coombs et al., 1992), while the ear responds to frequencies from about 20 Hz to several thousand Hz in some species (Popper and Fay, 1993; Popper et al., 2003). The region of best hearing in the majority of fish for which there are data available is from 100 to 200 Hz up to 800 Hz.

MET tower construction noise could disturb normal behaviors of marine fish, including Atlantic sturgeon. Depending upon several factors, including the sound source and physical oceanographic features, behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range (Madsen et al., 2006). Pile driving affects fish through underwater noise and pressure, which can cause effects to hearing and air containing organs, such as the swim bladder: Effects to fish can range from temporary avoidance of an area to death due to injury of internal organs. The type and size of pile, type of installation method (i.e., vibratory vs. hammer), type and size of fish (smaller fish are more often impacted), and distance from the sound source (i.e., sound dissipates over distance so noise levels are greater closer to the source) all contribute to the likelihood of effects to an individual fish. Those fish that do not flee the immediate action area during the pile driving activity could be exposed to lethal sound pressure levels.

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

While no studies have been conducted on the effects of pile driving on Atlantic sturgeon, some studies have been conducted on the effects of blasting on shortnose sturgeon, which are biologically similar to Atlantic sturgeon (Moser 1999; Collins and Post 2001). These studies indicate that at sound levels between 196-229 dB, some shortnose sturgeon were temporarily stunned; however, mortality of shortnose sturgeon only occurred when recorded sound levels were 234 dB. The results of these studies are consistent with the recommendations by Popper et al. 2006 that exposure to sound levels below 187dB is unlikely to result in effects to this species.

Sound levels resulting from the pile driving associated with the proposed action may be higher than this threshold at the source; however, noise levels are expected to dissipate below 180dB within 500-1,000 meters from the source. Given the large area over which Atlantic sturgeon are found, the limited number of piles to be driven, and the short duration of pile driving activities (3-8 hours per pile), it is unlikely that any Atlantic sturgeon would be in proximity of any pile while it is being driven. Given this, it is unlikely that any Atlantic sturgeon would be exposed to pile driving noise that would result in injury or mortality.

Because all impacts of the proposed action on Atlantic sturgeon are likely to be insignificant and discountable and the proposed action is not likely to result in the injury or mortality of any Atlantic sturgeon, the action is not likely to appreciably reduce the survival, jeopardize the continued existence or recovery of any DPS of Atlantic sturgeon. As such, there is no incidental take of Atlantic sturgeon anticipated and no additional consultation is necessary (NMFS 2011).

Benthic Effects

The construction of the MET tower would cause some sediment to become suspended around deployed anchoring systems, the lift boat, and foundation piles. This sediment would be dispersed and settle on the surrounding seafloor. However, due to the small footprint of disturbance relative to the overall resource, the temporary nature of the action, and availability of similar benthic habitat adjacent to the Project Area, it is expected that the Project would have negligible benthic effects that could impact fish resources.

MET Tower Operation

The installation of the MET tower would introduce an artificial hard substrate that opportunistic benthic species could colonize. Certain fish species (e.g., tautog, black sea bass, Atlantic striped bass) would also likely be attracted to the newly formed hard substrate, and fish population numbers in the immediate vicinity of the foundation are likely to be higher than in surrounding waters away from the structure.

MET Tower Decommissioning

Fish may be affected by noise and benthic habitat disturbance during MET tower decommissioning, similar in nature to those described for MET tower construction and installation. Fish could be affected by noise produced by pile cutting equipment, although cutting produces less intense noise than pile driving. Only fish in the immediate vicinity of the site would be expected to be affected during tower removal and pile cutting. Disturbance of fish during decommissioning is expected to be minor resulting in negligible impacts to fish.

Discharges

Fish could be exposed to operational vessel discharges and accidental releases of fuel or solid debris from construction, operational and/or decommissioning vessels.

Because of the limited duration and area of vessel traffic associated with construction, operation, and decommissioning activities, the release of liquid wastes would occur infrequently and would be rapidly diluted and dispersed. Thus, waste discharges from construction vessels would not be expected to directly affect fish or their habitat.

Spills could occur during vessel refueling. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. If a spill were to occur, the estimated spill size would be small and expected to dissipate and biodegrade quickly. As a result, the impacts to water quality that could result from an oil spill, should one occur, are expected to be both minor and temporary.

Fish can be adversely impacted by the ingestion of, or entanglement with, solid debris. The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEM and the USCG. Thus, entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations.

Overall, impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels during MET tower installation, operation, and decommissioning activities are expected to be minor.

Non-Routine Events

Collisions and allisions are considered unlikely. However in the unlikely event that a vessel allision or collision were to occur, and result in a diesel spill, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days. It is expected that pelagic fish and larval fish that can be found high in the water column would be negatively impacted by such a spill. These impacts are expected to be minor, temporary, and localized and not result in population level effects.

Conclusion

Impacts from MET tower construction and decommissioning noise on fish and essential fish habitat would be limited to behavioral reactions such as avoidance of, or flight from, the sound source. Fish that do not flee the immediate area during pile driving or cutting procedures could be exposed to lethal sound pressure levels. However, given the large area over which fish are found, the limited number of piles to be driven, and the short duration of pile driving activities (3-8 hours per pile), it is unlikely that any fish would be in proximity of any pile while it is being driven. Thus, potential population-level impacts on fish are expected to be **negligible**.

Impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor. Thus, potential population-level impacts on fish are expected to be **negligible**.

3.5.3 Mitigation Measures (585.610(a)(8))

Although impacts of the proposed action on fish resources, including Atlantic sturgeon, are likely to be insignificant; adherence to BOEM and NMFS Project Design Criteria (PDC) for marine mammal and sea turtles (NMFS 2011), which are intended to reduce or eliminate the potential for adverse impacts to marine mammals and sea turtles, will also benefit fish, including Atlantic sturgeon. During the “soft start” procedure, it is anticipated that the majority of fish would flee the area during the period of disturbance and return to normal activity in the area post-construction. Implementation of a “soft start” procedure will also further minimize the possibility of exposure to lethal sound levels.

Vessels will follow good maintenance and housekeeping procedures to minimize releases of oil and other chemicals to the sea. They will maintain up-to-date oil spill response plans and NPDES permits, as appropriate. Vessel collisions within the lease area and the resulting spills of oil, fuel, and chemicals can be reduced by adherence to USCG guidelines.

3.6 Marine Mammals and Sea Turtles (585.611(b)(3-5))

3.6.1 Environmental Baseline

The Atlantic Coast’s marine mammals are represented by members of the taxonomic orders Cetacea, Pinnipedia, and Sirenia. The order Cetacea includes the mysticetes (the baleen whales) and the odontocetes (the toothed whales, including the sperm whale, dolphins, and porpoises). Occurrence of cetacean species is generally widespread in Northwest Atlantic waters with many of the large whales and populations of smaller toothed whales undergoing seasonal migrations along the length of the

U.S. Atlantic coast. The order Sirenia is represented by the West Indian manatee, which occurs mainly in the South Atlantic, but individual animals have been documented as far north as New England. The order Carnivora, suborder Pinnipedia, includes four species of seal, which are mainly found in the North Atlantic. Table 3.6-1 lists these species, their general occurrence in the mid-Atlantic (i.e. offshore Maryland) and North Atlantic and their typical habitat based on the EA (2012).

Table 3.6-1 Mid-Atlantic Marine Mammals

Species	Status[a]	General Occurrence[b]	Typical Habitat		
		Mid-Atlantic[c,d]	Coastal	Shelf	Slope/ Deep
Order Cetacea					
Suborder Mysticeti (baleen whales)					
Family Balaenidae					
North Atlantic right whale (*Eubalaena glacialis*)	E/D	O	●	●	●
Family Balaenopteridae					
Blue whale (*Balaenoptera musculus*)	E/D	A		●	●
Bryde's whale (*Balaenoptera edeni*)		O		●	●
Fin whale (*Balaenoptera physalus*)	E/D	UC	●	●	●
Humpback whale (*Megaptera novaeangliae*)	E/D	UC	●	●	●
Minke whale (*Balaenoptera acutorostrata*)		O	●	●	●
Sei whale (*Balaenoptera borealis*)	E/D	O		●	●
Suborder Odontoceti (toothed whales and dolphins)					
Dwarf sperm whale (*Kogia sima*)		O			●
Pygmy sperm whale (*Kogia breviceps*)		UC			●
Sperm whale (*Physeter macrocephalus*)	E/D	UC			●
Family Ziphiidae					
Blainville's beaked whale (*Mesoplodon densirostris*)		O			●
Cuvier's beaked whale (*Ziphius cavirostris*)		O			●
Gervais' beaked whale (*Mesoplodon europaeus*)		O			●
True's beaked whale (*Mesoplodon mirus*)		O			●
Sowerby's beaked whale (*Mesoplodon bidens*)		O			●
Family Delphinidae					
Short-beaked common dolphin (*Delphinus delphis*)		C		●	●
Pantropical spotted dolphin (*Stenella attenuata*)		O			●
Bottlenose dolphin (*Tursiops truncatus*)	D	C	●	●	●
Clymene dolphin (*Stenella clymene*)		O			●
False killer whale (*Pseudorca crassidens*)		O			●
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)		EX		●	●
White-beaked dolphin (*Lagenorhynchus albirostris*)		A		●	
Killer whale (*Orcinus orca*)		O		●	●
Melon-headed whale (*Peponocephala electra*)		O			●
Atlantic spotted dolphin (*Stenella frontalis*)		C			●

Species	Status[a]	General Occurrence[b] Mid-Atlantic[c,d]	Typical Habitat Coastal	Shelf	Slope/ Deep
Short-finned pilot whale (*Globicephala macrorhynchus*)		C		●	●
Long-finned pilot whale (*Globicephala melas*)		UC		●	●
Risso's dolphin (*Grampus griseus*)		C			●
Spinner dolphin (*Stenella longirostris*)		O			●
Striped dolphin (*Stenella coeruleoalba*)		C			●
Harbor porpoise (*Phocoena phocoena*)		O	●	●	
Order Sirenia, Family Trichechidae					
West Indian manatee (*Trichechus manatus*)	E	O	●		
Order Carnivora, Suborder Fissipeda, Family Phocidae					
Harbor seal (*Phoca vitulina*)		UC	●	●	
Gray seal (*Halichoerus grypus*)		O	●	●	
Harp seal (*Pagophilus groenlandicus*)		EX	●	●	
Hooded seal (*Cystophora cristata*)		EX		●	●

Source: EA (2012), Waring et al. (2015).
[a] E = Endangered under the Endangered Species Act; D = Depleted under the MMPA.
[b] The indicated occurrence does not reflect the distribution and occurrence of individual stocks of marine mammals within localized geographic areas, but rather the broad distribution of the species within the larger categories of OCS waters.
[c] Mid-Atlantic includes OCS waters from the South Carolina-North Carolina border to the Delaware-New Jersey border.

[d] A = Absent – not recorded from the area; C = Common – regularly observed throughout the year; EX = Extralimital - known only on the basis of a few records that probably resulted from unusual wanderings of animals into the region; O = Occasional – relatively few observations throughout the year, but some species may be more frequently observed in some locations or during certain times (e.g., during migration); UC = Uncommon – infrequently observed throughout the year, but some species may be more common in some locations or during certain times of the year (e.g., during migration or when on summer calving grounds or wintering grounds).

The Atlantic Coast also supports six species of sea turtles that can be found offshore the U.S. Four of these species potentially utilize the mid-Atlantic, all of which are listed as endangered or threatened under the ESA. These species include the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles (Table 3.6-2).

Table 3.6-2 Sea Turtles Potentially Occurring in the Lease Area

Order Testudines (turtles)	Relative Occurrence in WEAs[1]	ESA Status
Family Cheloniidae (hardshell sea turtles)		
Loggerhead sea turtle (*Caretta caretta*)	Common	Threatened
Green sea turtle (*Chelonia mydas*)	Uncommon	Threatened
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	Uncommon	Endangered
Family Dermochelyidae (leatherback sea turtle)		
Leatherback sea turtle (*Dermochelys coriacea*)	Common	Endangered

[1]The occurrence category is based upon NMFS survey data as present in the The Nature Conservancy Northwest Atlantic Marine Ecoregional Assessment geodatabase for sightings with the mid-Atlantic WEAs and previous endangered species consultations with NMFS.

The following description of the affected environment for marine mammals and sea turtles draws upon recent studies and literature focused on offshore areas that include the mid-Atlantic WEAs and areas around the WEAs that could be affected by the Project. These studies include the NMFS marine mammal stock assessment reports, New Jersey's *Ocean/Wind Power Ecological Baseline Studies Final Report: January 2008 – December 2009* (NJDEP, 2010), and the Nature Conservancy's comprehensive Northwest Atlantic Marine Ecoregional Assessment (NAM ERA) report (TNC, 2010).

For the purposes of this document, the marine mammals addressed in detail are the species shown in Table 3.6-1 that have occurrence data in the mid-Atlantic, typically utilize coastal and shelf habitats, and are protected under the ESA. The sea turtles addressed are those commonly occurring in the Western Atlantic, which are also protected under the ESA (as shown in Table 3.6-2). For detailed information on other species not addressed herein, refer to the G&G PEIS (2013) and the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia – Final Environmental Assessment (EA 2012).

3.6.1.1 Whales, Dolphins, and Porpoises (Cetacea)

There are four species of cetaceans listed as federally endangered under the ESA that have been historically observed and recorded in the mid-Atlantic, and that have the potential to appear within the Project Area. These cetaceans are the North Atlantic Right whale (NARW) (*Eubaelena glacialis*), the Humpback whale (*Megaptera novaeangilae*), the Fin whale (*Balaenoptera physalus*), and the Sei Whale (*Balaenoptera borealis*).

North Atlantic Right Whale (*Eubaelena glacialis*)

The NARW is a strongly migratory species that has been listed as a federally endangered species since 1970. The right whale has seen little to no recovery since it was listed as a protected species (Clapham et al. 1999) and continues to be one of the most endangered large whale species in the world. Caswell et al. (1999) determined that the crude survival rate significantly declined from 0.99 in the 1980s to 0.94 in the early 1990s. Since Caswell et al. (1999) there has been additional research and working groups that have also come to the conclusion of population decline (Best et al. 2001; Clapham 2002). Prior to exploitation via commercial whaling operations the population was thought to be around 1,000 individuals. Current estimates of minimum stock size of the NARW are based on a census of individual whales identified using photo-identification techniques. A review of the photo-ID recapture database as it existed on 29 October 2013 indicated that 465 individually recognized whales in the catalog were known to be alive during 2011 (Waring et al. 2015).

The NARW migrates from high-latitude feeding waters to low-latitude calving and breeding grounds. NARWs are usually observed in groups of less than 12 individuals, and most often as single individuals or pairs. Larger groups may be observed in feeding or breeding areas (Jefferson *et al*. 2008). NARW feed mostly on zooplankton and copepods belonging to the *Calanus* and *Pseudocalanus* genus (Waring *et al.* 2007). NARW are considered grazers as they swim slowly with their mouths open skimming through concentrated patches of prey at or below the surface. They are the slowest swimming whales and can only reach speeds up to 16 km (10 mi) per hour. They can dive at least 305 m (1,000 ft) and stay submerged for typically 10 to 15 minutes, feeding on their prey below the surface (ACSonline 2004).

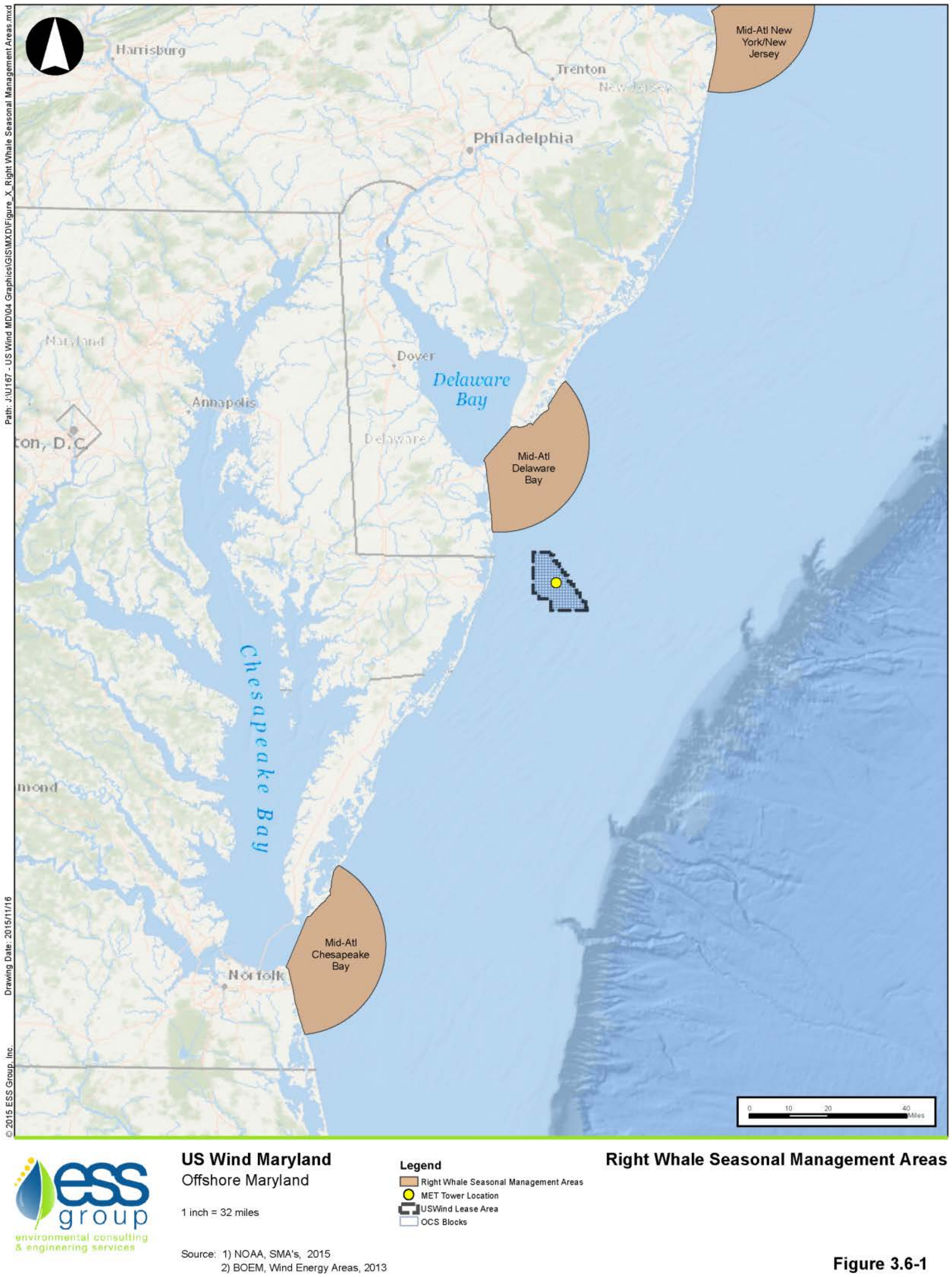
Current research suggests that there are six major habitats or congregation areas for the right whale; the coastal waters of the southeastern United States; the Great South Channel; Georges

Bank/Gulf of Maine including Jordan Basin (Cole *et al.* 2013); Cape Cod and Massachusetts Bays; the Bay of Fundy; and the Scotian Shelf. Due to the migratory nature of the right whale, the area off the mid-Atlantic is a corridor for the extensive movement of the species. Brown and Marx (2000) photographically documented one right whale in Florida waters on the 12 January, then again in Cape Cod Bay just 11 days (23 Jan) later, less than a month later (16 Feb) the same whale was seen off the coast of Georgia and then again in Cape Cod Bay on 23 March. The whale effectively made two round trip migrations to the waters of the southeastern US during the winter. Telemetry data also support the notion that right whales take lengthy and distant excursions, including into deep water off the continental shelf (Mate *et al.* 1997, Baumgartner & Mate 2005). A recently published study of NARW distribution and seasonal occurrence in nearshore waters of the coast of New Jersey (shoreline to approximately 37 km (20 nmi)), concluded that although large concentrations of NARW are not present, individual whales use the waters off New Jersey regularly as a migratory corridor and occasionally for other activities (Whitt *et al*. 2013).

The winter distribution of NARWs is largely unknown, although offshore surveys have reported between one and 13 detections annually in northeastern Florida and southeastern Georgia (Waring *et al.* 2007). NARWs may be found in feeding grounds within New England waters between February and May, with peak abundance in late March (NOAA 2005). NARW primarily utilize mid-Atlantic waters as a migration corridor during seasonal movements north or south between important feeding and breeding grounds (Knowlton et al. 2002; Firestone et al. 2008). Therefore, NARW have a higher probability to occur in and around the Project area during the fall and spring migrations; however, analysis of recordings captured in the EA Study Area (mid-Atlantic) during the EA (2012) baseline study period demonstrated some North Atlantic right whale occurrence throughout the year. Based on data sets compiled by the Nature Conservancy (2010) for the mid-Atlantic Ocean Data Portal (MARCO), the highest Sightings Per Unit Effort (SPUE) for NARW in the MD Lease Areas is 0 per 10 minute grid square; the highest SPUE during all seasons for the entire MARCO study area is 432 per 10 minute grid square, which occurs during the fall in the Bay of Fundy. The highest seasonal density of NARW based on modeled data compiled by the NOAA Cetacean and Sound Mapping Project (CetMap) and represented on the Marine Cadastre (2015) shows 0.000820 animals per sq. km. at the MD Lease Areas from October to April.

Seasonal Management Areas (SMAs) for reducing ship strikes of NARWs have been designated in the U.S. and Canada (Figure 3.6-1). All vessels greater than 19.8 m (65 ft) in overall length must operate at speeds of 10 knots or less within these areas during seasonal time periods. The closest SMA is located approximately 25 km (13.5 nautical miles) from the proposed MET location and becomes active between November 1 and April 30 each year.

Figure 3.6-1 Right Whale Seasonal Management Areas



Humpback Whale (*Megaptera novaeangilae*)

Humpback whales feed on small prey that is often found in large concentrations, including krill and fish such as herring and sand lance (Waring et al. 2007; Kenney & Vigness-Raposa 2009). Humpback whales use unique behaviors such as bubble nets, bubble clouds, and flickering their flukes and flippers, to herd and capture prey (USDOC, NMFS, 1991). They are also one of the few species of baleen whales to utilize cooperative feeding techniques. There are six subpopulations of humpback whales that feed in six different areas during spring, summer, and fall. Humpback whales exhibit consistent fidelity to feeding areas within the northern hemisphere (Stevick *et al*. 2006). These populations can be found in the Gulf of Maine, the Gulf of St. Lawrence, Newfoundland/Labrador, western Greenland, Iceland, and Norway (Waring et al. 2007). Humpback whales migrate from these feeding areas to the West Indies (including the Antilles, the Dominican Republic, the Virgin Islands and Puerto Rico) where they mate and calve their young (NMFS1991; Waring et al. 2007).

The species is listed as Endangered due to the depletion of its population from whaling (NOAA Fisheries 1991). A recovery plan has been written and is currently in effect (NOAA Fisheries 1991). The NMFS has recently estimated the humpback population in the western North Atlantic as 7,698 individuals (4,894 males and 2,804 females) (Waring *et al*., 2015).

Humpback whales utilize the mid-Atlantic as a migration pathway and are known to occur regularly between calving/mating grounds to the south and feeding grounds in the north (Waring *et al.* 2007). An increased number of sightings of humpback whales in the vicinity of the Chesapeake and Delaware Bays occurred in 1992 (Swingle *et al.* 1993). Based on data sets compiled by the Nature Conservancy (2010) for MARCO, the highest SPUE for humpback whale in the MD Lease Areas is 0 per 10-minute grid square; the highest season SPUE for the entire MARCO study area is 234 per 10 minute grid square off the coast of Massachusetts during the spring and fall. The highest seasonal density of humpback whale based on modeled data compiled by the NOAA Cetacean and Sound Mapping Project (CetMap) and represented on the Marine Cadastre (2015) shows 0.001161 animals per sq. km. at the Lease Area during the fall and spring.

Fin Whale (*Balaenoptera physalus*)

The fin whale was listed as federally endangered in 1970. The fin whales' range in the North Atlantic extends from the Gulf of Mexico, Caribbean Sea, and Mediterranean Sea in the south to Greenland, Iceland, and Norway in the north (Jonsgård 1966; Gambell 1985). Fin whales, much like humpback whales, seem to exhibit habitat fidelity (Waring et al. 2007; Kenney & Vigness-Raposa 2009). However, fin whale habitat use has shifted in the southern Gulf of Maine, most likely due to changes in the abundance of sand lance and herring, both of which are major prey species along with squid, krill, and copepods (Kenney & Vigness-Raposa 2009). While fin whales typically feed in the Gulf of Maine and the waters surrounding New England, mating and calving (and general wintering) areas are largely unknown (Waring et al. 2007). It is likely that fin whales occurring in the U.S. Atlantic Exclusive Economic Zone (EEZ) undergo migrations into Canadian waters, open-ocean areas, and perhaps even subtropical or tropical regions. However, the popular notion that entire fin whale populations make distinct annual migrations like some other mysticetes has questionable support in the data; in the North Pacific, year-round monitoring of fin whale calls found no evidence for large-scale migratory movements (Watkins *et al*. 2000).

While much remains unknown, the magnitude of the ecological role of the fin whale is impressive. In the mid-Atlantic fin whales are the dominant large cetacean species during all seasons, having the largest standing stock, the largest food requirements, and therefore the largest influence on ecosystem processes of any cetacean species (Hain *et al.* 1992; Kenney *et al.* 1997). The best abundance estimate available for the western North Atlantic fin whale stock is 1,618 (Waring *et al.* 2015). This is the estimate derived from the 2011 NOAA shipboard surveys and is considered best because it represents the most current data in spite of the survey not including all of the stock's range. There are insufficient data to determine the population trend for fin whales.

Fin whales are the most commonly sighted large whales in continental shelf waters from the mid-Atlantic coast of the United States to Nova Scotia (Sergeant 1977; Sutcliffe & Brodie 1977; CETAP 1982; Hain *et al.* 1992; Waring *et al.* 2008, Waring *et al*. 2010). Based on data sets compiled by the Nature Conservancy (2010) for MARCO, the highest SPUE for fin whale in the MD Lease Areas is 159 per 10-minute grid square which occurs during the spring. The highest seasonal density of fin whale based on modeled data compiled by the NOAA Cetacean and Sound Mapping Project (CetMap) and represented on the Marine Cadastre (2015) shows 0.000324 animals per sq. km. at the MD Lease Areas year round. Significantly higher densities are observed in the grid squares adjacent to the MD Lease Areas to the south and east.

Sei Whale (*Balaenoptera borealis*)

Sei whales were listed as endangered under the ESA in 1973. The sei whale is a cosmopolitan and highly migratory species (HMS) that is found from temperate to subpolar regions, but it appears to be more restricted to mid-latitude temperate zones than other rorquals (*Balaenoptera sp.* and *Megaptera novaeangliae*) (Reeves *et al.* 2002; Shirihai & Jarrett, 2006; Jefferson *et al.* 2008). The migratory pattern of this species is thought to encompass long distances from high-latitude feeding areas in summer to low-latitude breeding areas in winter; however, the location of winter areas remains largely unknown (Perry et al. 1999). Sei whales are often associated with deeper waters and areas along the continental shelf edge (Hain et al. 1985); however, this general offshore pattern of sei whale distribution is disrupted during occasional incursions into more shallow and inshore waters (Waring *et al.* 2004). Sei whales are largely planktivorous, feeding primarily on euphausiids and copepods, but they will feed on small schooling fishes as well (Jefferson *et al.* 2008; Waring et al. 2010).

There are two classified sei whale stocks within the Atlantic: the Nova Scotia stock and the Labrador Sea stock. The range of the Nova Scotia stock includes the continental shelf waters of the northeastern U.S. and extends northeastward to south of Newfoundland. The summer 2011 abundance estimate of 357 (CV=0.52) is considered the best available for the Nova Scotia stock of sei whales. However, this estimate must be considered conservative because all of the known range of this stock was not surveyed, and because of uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas (Waring *et al.* 2015).

Sei whales can occur in the mid-Atlantic; however, sightings data indicate that these species are limited to areas further offshore east of the mid-Atlantic WEAs (TNC, 2010). Based on data sets compiled by the Nature Conservancy (2010) for MARCO, the highest SPUE for humpback whale in the MD Lease Areas is 0 per 10-minute grid square; the highest season SPUE for the entire MARCO study area is 546 per 10 minute grid square east of George's Bank during spring.

Modeled data compiled by the NOAA Cetacean and Sound Mapping Project (CetMap) and represented on the Marine Cadastre (2015) shows no density information at the MD Lease Areas for sei whale.

3.6.1.2 Manatee (*Sirenia*)

West Indian Manatee (*Trichechus manatus*)

The Florida subspecies of the West Indian manatee is the only sirenian that occurs along the eastern coast of the U.S. Manatees are herbivorous, feeding on a wide array of aquatic (freshwater and marine) plants such as water hyacinths and marine seagrasses. Federally, Florida manatees were originally listed as an endangered species in 1967 under the Endangered Species Preservation Act of 1966. The original listing was subsequently adopted under the Endangered Species Act of 1973 and manatees continue to be identified as a federally endangered species and strategic stock.

Within the northwestern Atlantic, manatees occur in coastal marine, brackish, and freshwater areas from Florida to Virginia, with occasional extralimital sightings as far north as Rhode Island (Jefferson *et al.* 2008). Because manatees are a sub-tropical species with little tolerance for cold, they are generally restricted to the inland and coastal waters of peninsular Florida during the winter, when they shelter in and/or near warm-water springs, industrial effluents, and other warm water sites (Hartman 1979, Lefebvre *et al.* 2001, Stith *et al.* 2007). In warmer months, manatees leave these sites and can disperse great distances. Individuals have been sighted as far north as Massachusetts, as far west as Texas, and in all states in between (Rathbun *et al.* 1982, Schwartz 1995, Fertl *et al.* 2005, USFWS Jacksonville Field Office, unpub. data 2008a). Warm weather sightings are most common in Florida and coastal Georgia.

The best available count of Florida manatees is 3,802 animals, based on a single synoptic survey of warm-water refuges in January 2009 (FWC FWRI Manatee Synoptic Aerial Surveys 2009).

Individual sightings of manatees have occurred in mid-Atlantic region in the summer months, but a regular migration/occurrence has not been established and any potential encounters with manatees would be highly unlikely in the MD WEAs (BOEM, 2012).

3.6.1.3 Sea Turtles (*Dermochelyidae* and *Cheloniidae*)

Loggerhead Sea Turtle (*Caretta caretta*)

Loggerhead sea turtles are listed as threatened under the ESA. Loggerheads are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd 1988). Adult loggerheads are known to make considerable migrations from nesting beaches to foraging grounds (TEWG 1998). In U.S. Atlantic waters, loggerheads commonly occur throughout the inner continental shelf from Florida to Massachusetts and in the Gulf of Mexico from Florida to Texas, although their presence varies with the seasons due to changes in water temperature and depth (Shoop & Kenney 1992, Epperly *et al.* 1995a, 1995b; Braun & Epperly 1996; Braun-McNeill *et al.* 2008). Loggerheads have been observed in waters with surface temperatures of 7˚C to 30˚ C (45˚F to 86˚F), but water temperatures ≥ 11˚C (52˚F) are most favorable (Shoop & Kenney 1992, Epperly *et al.* 1995b).

Aerial surveys of continental shelf waters north of Cape Hatteras, North Carolina indicated that loggerhead sea turtles were most commonly sighted in waters with bottom depths ranging from 22-49 meters deep (Shoop & Kenney 1992). However, more recent survey and satellite tracking data support that they occur in waters from the beach to beyond the continental shelf (Mitchell *et al.* 2003, Braun-McNeill & Epperly 2004, Mansfield 2006; Blumenthal *et al.* 2006, Hawkes *et al.* 2006, 2011; McClellan & Read 2007; Mansfield *et al*. 2009). Loggerhead sea turtles occur year-round in ocean waters off North Carolina, South Carolina, Georgia, and Florida. As coastal water temperatures warm in the spring, loggerheads begin to migrate to inshore waters of the Southeast U.S. (*e.g.*, Pamlico and Core Sounds) and also move up the U.S. Atlantic Coast (Epperly *et al.* 1995a, 1995b, 1995c; Braun-McNeill & Epperly 2004), occurring in Virginia foraging areas as early as April/May and on the most northern foraging grounds in the Gulf of Maine in June (Shoop & Kenney 1992). The trend is reversed in the fall as water temperatures cool.

Loggerhead turtles are more common in mid-Atlantic waters during the summer and fall; however, this species may occur year-round (BOEM, 2012). Based on data sets compiled by the Nature Conservancy (2010) for MARCO the SPUE is not specified; however, it is noted that during the spring and summer, the species data exceeded the average by 2.5 standard deviations for loggerhead turtles. The spatial data provided directly by TNC (2010) shows the highest seasonal SPUE in the MD Lease Areas was observed during the summer of between 100 and 1000 sightings per 10-minute grid square. Modeled data compiled by the NOAA Cetacean and Sound Mapping Project (CetMap) and represented on the Marine Cadastre (2015) shows the highest density to be 0.097 animals per sq. km. during the summer.

Leatherback Sea Turtle (*Demochelys coriacea*)

Leatherbacks are the largest living turtles and range farther than any other sea turtle species. They are listed as endangered under the ESA. Leatherbacks evolved physiological and anatomical adaptations that allow them to exploit cold waters (Frair et al. 1972; Greer *et al.* 1973; NMFS and USFWS 1995). Leatherback sea turtles are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Morreale *et al.* 1994, Eckert 1998, Eckert 1999). In a single year, a leatherback may swim more than 6,213 miles (10,000 km) (Eckert 1998). In the North Atlantic Ocean, leatherback turtles regularly occur in deep waters (>328 ft). An aerial survey in the North Atlantic observed leatherback turtles in continental shelf and pelagic environments with sightings in offshore waters ranging from 7-27˚C (45-81˚F) (CETAP 1982).

Leatherback turtles are more common in mid-Atlantic waters during the summer and fall; however, this species may occur year-round (BOEM, 2012). Based on data sets compiled by the Nature Conservancy (2010) for MARCO, the SPUE is not specified; however, it is noted that during the spring and summer the species data exceeded the average by 2.5 standard deviations for leatherback turtles. The spatial data provided directly by TNC (2010) shows the highest seasonal SPUE in the Lease Area observed during the summer and spring of between 100 and 1000 sightings per 10 minute grid square. Modeled data compiled by the NOAA Cetacean and Sound Mapping Project (CetMap) and represented on the Marine Cadastre (2015) shows the highest density to be 0.033 animals per sq. km. during the summer.

3.6.1.4 G&G 2015 PSO Summary

During the 2015 G&G survey PSOs and Passive Acoustic Monitoring (PAM) was required to mitigate impacts to marine protected species. Survey efforts aboard the HRG vessel resulted in 44 days of PSO watches and 42 days of PAMs between June 2, 2015 and July 25, 2015. Marine mammal and sea turtle observations aboard the HRG vessel identified species including bottlenose dolphins, loggerhead sea turtles, and Atlantic spotted dolphins. Survey efforts aboard the geotechnical survey vessel resulted in 19 days of PSO watches and 16 days of PAMs between June 16, 2015 and July 9, 2015. Marine mammal and sea turtle observations aboard the geotechnical survey vessel identified species including loggerhead sea turtles, bottlenose dolphins, leatherback sea turtle, and humpback whale. A full report of the PSO/PAMs methodologies and results are provided in Appendix S

3.6.2 Potential Impacts

Activities associated with the Project that may affect marine mammals and sea turtles include: (1) installation; (2) vessel traffic; (3) discharges of waste materials and accidental fuel releases; and (4) decommissioning.

Installation Activities

During MET tower construction, marine mammals in the vicinity of the construction site may be temporarily disturbed by noise generated during pile driving. Such noise could disturb normal behaviors (e.g., feeding, social interactions), mask calls from co-species, disrupt echolocation capabilities, and mask sounds generated by predators. Behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range (Madsen et al., 2006). Behavioral reactions may include avoidance of, or flight from, the sound source and its immediate surroundings, disruption of feeding behavior, interruption of vocal activity, and modification of vocal patterns (Watkins and Scheville, 1975; Malme et al., 1984; Bowles et al., 1994; Mate et al., 1994).

Current thresholds established by NMFS for determining impacts to marine mammals typically center around root-mean-square (RMS) received levels of:

- 180 dB re 1µPa (cetaceans) and 190 dB re 1µPa (pinniped) for potential injury
- 160 dB re 1µPa for behavioral disturbance/harassment from a non-continuous noise source
- 120 dB re 1µPa for behavioral disturbance/harassment from a continuous noise source.

Pile driving can be expected to generate sound levels at the source in excess of 200 dB within a relatively broad band ranging from 20 Hz to >20 kHz (Madsen et al. 2006; Thomson et al. 2006). Injurious sound levels may occur within 100 m (328 ft) of pile driving (Bailey et al, 2010); however sound levels are attenuated with distance from the source. Sound attenuation modeling done during construction at Utgrunden Wind Park in the Baltic Sea in 2000 and adopted as the model for the Cape Wind Energy Project (Report 4.1.2-1 (Noise Report) of the Cape Wind FEIS, 2009) indicates that at distances greater than 500 m from the pile being driven noise levels will have dissipated to below 180 dB. At distances greater than 3.4 km (1.8 nm), noise levels will have dissipated to below 160 dB. This model was developed for a 5 m (197 inch) diameter monopole to support a 1.7 MW turbine. Actual measured underwater sound levels during the construction of the Cape Wind MET tower in 2003 ranged from 145-167 dB at 500 m with peak energy at around 500 Hz, for piles 0.9 m (36 in) in diameter.

Additional modeling conducted by Bluewater Wind, LLC for proposed meteorological tower sites offshore New Jersey and Delaware under Interim Policy leases places the 160 dB isopleth at 7.2 km (3.9 nm) for Delaware and 6.6 km (3.6 nm) for New Jersey (USDOC, NOAA, NMFS 2010a), with the 180 dB isopleth modeled at 760 m and 1,000 m respectively. This model was developed for 3 m (118 in) diameter piles; the results have not been field-verified.

It should be noted that the models used to estimate acoustic impacts for these projects included piles with larger diameters. Generally, the larger the diameter of the pile the greater the noise produced from pile driving (Nedwell 2007). They also included higher hammer energies than hammer proposed by US Wind for this project.

A summary of the area of ensonification modeled by other projects for pile driving and estimated for the MET tower based on these modeled results is provided in Table 3.6-3 below.

Table 3.6-3 Modeled and Estimated Pile Driving Areas of Ensonification

Proposed Project	Pile Size	Hammer Strength	180 dB re 1µPa (rms)	160 dB re 1µPa (rms)
Bluewater Wind (Delaware)[1]	3.05 m diameter monopole	900 kJ	760 m	7,230 m
Bluewater Wind (New Jersey)[1]	3.05 m diameter monopole	900 kJ	1,000 m	6,600 m
Cape Wind Energy Project (Nantucket Sound)[1]	5.05 m diameter monopole	1,200 kJ	500 m	3,400 m
US Wind Maryland Offshore Energy Project[2]	1.5-1.8 m diameter main caisson 1.5 m diameter braced caissons	800 kJ	1,000 m	7,000 m

Source: EA (2012)
[1]Modeled
[2]Expected (EA 2012)

Based on the significantly lesser pile size and hammer energies proposed for the Project, relative to the models described above, it is expected that implementation of exclusion zones of 7 km (for 160 dB sound levels) and 1 km (for 180 dB) should be adequate to mitigate the potential adverse impacts of noise on marine mammals during pile driving. These estimates are consistent with those presented by BOEM (EA, 2012) in its estimate of the extent of ensonification during pile driving - 7 km (3.8 nm) for the 160 dB level and 1 km (0.5 nm) for the 180 dB level.

The implementation of mitigation measures consistent with BOEM and NMFS PDCs, which include monitoring of exclusion zones, soft start, and stopping pile driving activity when marine mammals and sea turtles are present (see 3.6.3), will avoid the potential for injury or harassment. There could be minimal impacts on individuals, but no adverse impacts or population-level effects are anticipated.

Some species are expected to quickly leave the area with the arrival of construction vessels, before pile-driving activities are begun, while individuals remaining in the area may flee with the initiation of pile driving (soft start), thereby greatly reducing their exposure to increased sound levels and, to a lesser extent, masking frequencies. Individuals disturbed by or experiencing masking due to construction noise would likely return to normal behavioral patterns after the construction has ceased, or after the animal has left the survey area.

The hearing capabilities of sea turtles are not well understood. In general, however, experiments indicate that sea turtles generally hear best at low frequencies and that the upper frequency limit of their hearing is likely about 1 kHz. As such, sea turtles are capable of hearing in low frequency ranges that overlap with the dominant frequencies of pile driving and vessel noise, therefore, if exposed to construction-related noise these species may be affected by this exposure. Evidence suggests that sound levels between 110-126 dB re 1µPa are required before sea turtles detect sound (Ridgway, 1969) and levels of 166 dB re 1µPa were required to evoke a behavioral reaction (McCauley, 2000). Acoustic harassment thresholds for sea turtles are not as established as they are for marine mammals. Thus, this section utilizes harassment thresholds for marine mammals for discussion purposes since these thresholds are limiting factors for the activities associated with the Project.

Additionally, installation activities would result in small areas of the seafloor being temporarily disturbed during construction (for no more than a few days) and occupied by the MET tower foundation during operation. This activity could conceivably impact marine mammals and sea turtles by removing a small amount of forage area that would otherwise be available to these species. However, due to the small footprint of disturbance, the temporary nature of the action, and likely availability of similar benthic habitat adjacent to the Project Area, it is expected that the Project would have negligible benthic effects that could impact marine mammals and sea turtles.

Vessel Traffic

Vessels associated with construction, maintenance or decommissioning of the MET tower could collide with marine mammals or sea turtles during transit. According to PDC required by BOEM, all vessel operators must abide by "Whale-watching Guidelines," which would limit the likelihood or prevent such collisions. These guidelines contain vessel approach protocols derived from the MMPA. These guidelines identify safe navigational practices based on speed and distance limitations when encountering marine mammals. The frequency of vessel collisions with marine mammals, turtles, or other marine animals probably varies as a function of spatial and temporal distribution patterns of the living resources, the pathways of maritime traffic (coastal traffic is more predictable than offshore traffic), the volume of vessel traffic, and as a function of vessel speed, the number of vessel trips, and the navigational visibility.

Considering the existing regulatory measures in place; the limited intermittent activities associated with the Project, which are spread out temporally, as well as geographically, and BOEM's PDC, no significant impacts due to vessel strikes are anticipated. Moreover, due to the nature and volume of existing and historic vessel traffic in the Project area, it is unlikely that the vessel traffic associated with the MET tower would substantially increase the risk that marine mammals and sea turtles would be struck. As a result, the Project would not lead to any substantial effects from vessel traffic to the population of marine mammal and sea turtle species in the Project Area.

Marine mammals and sea turtles may also be affected by the noise generated by surface vessels traveling to and from the Project Area. The dominant source of noise from vessels is from the propeller cavitation, and the intensity of this noise is largely related to ship size and speed. Vessel noise from vessels associated with the Project would generally produce low levels of noise, anticipated to be in the range of 150 to 170 dB re 1 μPa-m, at frequencies below 1,000 Hz, and would dissipate quickly with distance from the source. Exposure of marine mammals and sea turtles to individual construction operations vessels would be transient, and the noise intensity would vary depending upon the source and specific location. Reactions of marine mammals may include apparent indifference, cessation of vocalizations or feeding activity, and evasive behavior (e.g., turns, diving) to avoid approaching vessels (Richardson et al., 1995; Nowacek and Wells, 2001). Behavior would likely return to normal following passage of the vessel, and it is unlikely that such short-term effects would result in long-term population-level impacts for marine mammals. Thus, impacts from vessel noise would be negligible if detectible, and short-term.

It should be noted that the areas adjacent to the Project are well-traveled waters and are host to an active and large fishing industry. While vessel traffic associated with the Project may have some impact on marine mammals and sea turtles, that potential for impact would be exceedingly minor in light of the current potential for impact associated with current status-quo vessel activities in the area of potential effect.

Discharge of Waste Materials and Accidental Fuel Spills

Marine mammals and sea turtles could be adversely impacted by the ingestion of, or entanglement with, solid debris. Marine mammals and sea turtles that have ingested debris, such as plastic, may experience intestinal blockage, which in turn may lead to starvation, while toxic substances present in the ingested materials (especially in plastics) could lead to a variety of lethal and sub-lethal toxic effects. Entanglement in plastic debris can result in reduced mobility, starvation, exhaustion, drowning, and constriction of, and subsequent damage to, limbs caused by tightening of the entangling material. The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEM (30 CFR 250.300) and the USCG (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). Thus, the entanglement in or ingestion of project-related trash and debris by marine mammals would not be expected during normal operations.

Because of the limited amount of vessel traffic and offshore activity that would be associated with the Project, the release of liquid wastes would occur infrequently. The likelihood of an accident resulting in accidental discharges would be limited to the active installation and decommissioning periods of the Project. These are the only time periods when there would be more than one vessel on site conducting complex maneuvers in a restricted space. Impacts to marine mammals and sea turtles from the discharge of waste materials or the accidental release of fuels are expected to be minor, if they occur at all.

Collisions between vessels and allisions between vessels and MET towers and buoys is considered unlikely (see Section 3.2.2 of the EA (2012)). However, in the unlikely event that a vessel allision or collision occurs the most likely pollutant to be discharged would be diesel fuel. If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (see Section 3.2.3 of the EA (2012)).

Decommissioning

During decommissioning of the MET tower marine mammals and sea turtles may be affected by sound and operational discharges as described for MET tower construction. Removal of the piles would be accomplished by cutting the piles (using mechanical cutting or high-pressure water jet) at a depth of 4.6 m (15 ft) below the mudline (30 CFR 585.910). Marine mammals and sea turtles could be affected by sound during pile cutting. Pile cutting techniques and associated sound levels have yet to be tested and evaluated in the Atlantic wind energy context. It is expected that only animals in the immediate vicinity of the tower (those that had not moved away from the area upon arrival of decommissioning vessels) would be expected to be affected during tower removal and transport, and pile cutting. Disturbance of marine mammals and sea turtles during decommissioning is expected to be similar to that of construction with the exception that pile cutting sound is expected to be much lower than that for pile driving. Impacts from vessel activity during decommissioning are expected to be similar to that during construction, and are anticipated to be minor.

Conclusion

Activities associated with the installation, operation, and decommissioning of the MET tower are not anticipated to result in any significant or population level effects to marine mammals and sea turtles. The potential effects to marine mammals are expected to be very localized and temporary resulting in negligible to minor disturbance depending on the specific activity (vessel transit, pile driving activity). With mitigation in place, there should be no potential for injury or harassment. This conclusion accepted in the EA (2012) is supported by the NMFS, which agreed that the activities to be conducted are not likely to adversely affect listed whales or sea turtles when implemented according to BOEM's PDC.

3.6.3 Mitigation Measures

To mitigate any potential impacts to marine mammals and sea turtles highly conservative measures will be implemented. These mitigation measures, which are described below, are derived from multiple sources including: PDCs in the BOEM EA (2012), PDCs in the NMFS concurrence letter (2011), standard operating conditions of the US Wind Leases, informal consultation between BOEM and NMFS, and informal consultation between ESS Group, Inc. and BOEM.

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

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

   1.1. All vessels and aircraft whose operations are authorized under or regulated by the terms of a BOEMRE-issued renewable energy lease would be required to abide by the NOAA Fisheries Northeast Regional Viewing Guidelines, as updated through the life of the project. Guidelines are available at: (http://www.greateratlantic.fisheries.noaa.gov/protected/mmp/viewing/approaching/index.html)

1.2. Vessel Strike Avoidance Measures. The Lessee must ensure that all vessels conducting activities in support of plan (i.e., SAP and COP) submittal comply with the vessel-strike avoidance measures specified in stipulation (1.2), except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk.

1.2.1. The Lessee must ensure that vessel operators and crews maintain a vigilant watch for cetaceans, pinnipeds, and sea turtles and slow down or stop their vessel to avoid striking these protected species.

1.2.2. North Atlantic Right Whales.

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

1.2.2.2. The Lessee must ensure all vessels maintain a separation distance of 500 meters (1,640 ft) or greater from any sighted North Atlantic right whale.

1.2.2.3. The Lessee must ensure that the following avoidance measures are taken if a vessel comes within 500 meters (1,640 ft) of any North Atlantic right whale:

1.2.2.4. If underway, any vessel must steer a course away from any North Atlantic right whale at 10 knots (18.5 km/h) or less until the 500 meters (1,640 ft) minimum separation distance has been established (except as provided in Stipulation-1.2.5).

1.2.2.5. If a North Atlantic right whale is sighted within 100 meters (328 ft) to an underway vessel, the vessel operator must immediately reduce speed and promptly shift the engine to neutral. The vessel operator must not engage the engines until the North Atlantic right whale has moved beyond 100 meters (328 ft).

1.2.2.6. If a vessel is stationary, the vessel must not engage engines until the North Atlantic right whale has moved beyond 100 meters (328ft), at which point the Lessee must comply with Stipulation-1.2.4.

1.2.3. Non-delphinoid Cetaceans Other than the North Atlantic Right Whale.

1.2.3.1. The Lessee must ensure all vessels maintain a separation distance of 100 meters (328 ft) or greater from any sighted non-delphinoid cetacean.

1.2.3.2. The Lessee must ensure that the following avoidance measures are taken if a vessel comes within 100 meters (328 ft) of any non-delphinoid cetacean:

1.2.3.3. If any non-delphinoid cetacean is sighted, the vessel underway must reduce speed and shift the engine to neutral, and must not engage the engines until the non-delphinoid cetacean has moved beyond 100 meters (328 ft).

1.2.3.4. If a vessel is stationary, the vessel must not engage engines until the non-delphinoid cetacean has moved beyond 100 meters (328 ft).

1.2.4. Delphinoid Cetaceans and Pinnipeds

1.2.4.1. The Lessee must ensure that all vessels maintain a separation distance of 50 meters (164 ft) or greater from any sighted delphinoid cetacean.

1.2.4.2. The Lessee must ensure that the following avoidance measures are taken if the vessel comes within 50 meters (164 ft) of any delphinoid cetacean:

1.2.4.3. The Lessee must ensure that any vessel underway remain parallel to a sighted delphinoid cetacean's course whenever possible, and avoid excessive speed or abrupt changes in direction. The Lessee may not adjust course and speed until the delphinoid cetaceans have moved beyond 50 meters (164 ft) or the delphinoid cetaceans have moved abeam of the underway vessel.

1.2.4.4. The Lessee must ensure that any vessel underway reduce vessel speed to 10 knots (18.5 km/h) or less when pods (including mother/calf pairs) or large assemblages of delphinoid cetaceans are observed. The Lessee may not adjust course and speed until the delphinoid cetaceans have moved beyond 50 meters (164 ft) or abeam of the underway vessel.

1.2.4.5. The Lessee must ensure that vessels underway do not divert to approach any delphinoid cetacean and/or pinniped.

1.2.4.6. The Lessee must ensure that if a delphinoid cetacean and/or pinniped approaches any vessel underway, the vessel underway must avoid excessive speed or abrupt changes in direction to avoid injury to the delphinoid cetacean and/or pinniped.

1.2.5. Sea Turtles

1.2.5.1. The Lessee must ensure all vessels maintain a separation distance of 50 meters (164 ft) or greater from any sighted sea turtle.

1.2.6. Vessel Operator Briefing

1.2.6.1. The Lessee must ensure that all vessel operators are briefed to ensure they are familiar with the requirements specified in Stipulation-1.2.

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

1.4. *Marine Trash and Debris Prevention*: the Lessee must ensure that vessel operators, employees, and contractors actively engaged in activity in support of plan (i.e., SAP and COP) submittal are briefed on marine trash and debris awareness and elimination, as described in the BSEE NTL No. 2012-GOI ("Marine Trash and Debris Awareness and Elimination") or any NTL that supersedes this NTL, except that the Lessor will not require the Lessee, vessel operators, employees, and contractors to undergo formal training or post placards. The Lessee must ensure that these vessel operator employees and contractors are made aware of the environmental and socioeconomic impacts associated with marine trash and debris and their responsibilities for ensuring that trash and debris are not intentionally or accidentally discharged into the marine environment. The above-referenced NTL provides information the Lessee may use for this awareness training.

1.5. *Reporting Injured or Dead Protected Species*: Vessel crews must report sightings of any injured or dead protected species (marine mammals and sea turtles) immediately, regardless of whether the injury or death is caused by your vessel. This measure will apply to all activities (e.g. transiting between port and project site), not only construction activities. Report marine mammals and sea turtles to 866-755-6622. In addition, if the injury or death was caused by a collision with the lessee's vessel, the lessee must notify BOEM within 24 hours of the strike. The report should include the date and location (latitude/longitude) of the strike, the name of the vessel involved; and the species identification or a description of the animal, if possible. BOEM will transmit this information to NMFS as soon as possible. If the Lessee's activity is responsible for the injury or death, the Lessee must ensure that the vessel assist in any salvage effort as requested by NMFS.

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

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

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

2.2. *Establishment of Exclusion Zone:* A preliminary 7 km radius exclusion zone for marine mammals and sea turtles must be established around each pile driving site in order to reduce the potential for impacts to these species. The 7 km exclusion zone is based upon the field of ensonification at the 160dB level. The 7 km exclusion zone must be monitored from two locations. One observer must be based at or near the sound source and responsible for monitoring the 180 dB field of ensonification out to 1000m from the sound source. An additional observer must be located on a separate vessel navigating approximately 4-5 km around the pile hammer monitoring 360° out to 7km from the sound source. If this method (one observer near the source and one on a vessel) is not sufficient to allow the observers to adequately monitor the exclusion zone such that any marine mammal or sea turtle in the exclusion zone would be detected, additional observers must be used to ensure complete coverage of the exclusion zone.

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

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

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

2.4. *Visual Monitoring of Exclusion Zone:* Monitoring of the zones must be conducted by a qualified NMFS approved observer. Visual observations must be made using reticle binoculars and other suitable equipment during daylight hours. The number of PSOs must be sufficient to effectively monitor the exclusion zone at all times. In order to ensure effective monitoring, observers must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch, unless otherwise accepted by the Lessor. Observers must not work for more than 12 hours in a 24-hour period. The Lessee must provide to the Lessor a list of observers and their résumés no later than forty-five (45) calendar days prior to the scheduled start of construction activity. The résumés of any additional observers must be provided fifteen (15) calendar days prior to each observer’s start date. The Lessor will send the observer information to NMFS for approval. Data on all observations must be recorded based on standard marine mammal observer collection data. This must include dates and locations of construction operations; time of observation, location, and weather; details of marine mammal/sea turtle sightings (e.g., species, numbers, behavior); and details of any observed taking (behavioral disturbances or injury/mortality). Any observations concerning impacts on marine mammals or sea turtles must be transmitted to NMFS and BOEM within 48 hours. Any observed takes of marine mammals or sea turtles resulting in injury or mortality will be immediately (within 24 hours) reported to NMFS and BOEM.

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

2.4.2. At any time a marine mammal or sea turtle is observed within the exclusion zone, whether due to the marine mammal or sea turtle's movement, the vessel 's movement, or because the marine mammal or sea turtle surfaced inside the exclusion zone, the observer the observer will notify the Resident Engineer, or other authorized individual, and call for a shutdown of pile driving activity. Any disagreement or discussion should occur only after shutdown, unless such discussion relates to the safety of the timing of the cessation of the pile driving activity. Subsequent restart of the pile driving equipment may only occur following clearance of the exclusion zone of any marine mammal or sea turtle for at least 60 minutes. Additionally, the Lessee must ensure that visual surveys are continued diligently during any pause in pile driving activity. If they are not, then the observer(s) must notify the Resident Engineer, or other authorized individual that the exclusion zone must be cleared of all marine mammals and sea turtles for 60 minutes, thereafter the lessee must undertake a soft start prior to proceeding with pile driving operations. If a marine mammal or sea turtle is sighted in the exclusion zone prior to the re-start of pile driving, then the exclusion zone must be cleared of all marine mammals and sea turtles for 60 minutes following the sighting, thereafter the lessee must undertake a soft start prior to proceeding with pile driving operations. In addition, pile driving may not begin during night hours or when the safety radius cannot be adequately monitored (i.e., obscured by fog, sea state, inclement weather, poor lighting conditions, etc.) unless the applicant implements an alternative monitoring method that is agreed to by BOEM and NMFS. However, if a soft start has been initiated before dark or the onset of inclement weather, the pile driving of that segment may continue through these periods. Once that pile has been driven, the pile driving of the next segment cannot begin until the-exclusion zone can be visually or otherwise monitored. (see *Visibility* above).

2.5. *Implementation of Soft Start:* A "soft start" must be implemented at the beginning of each pile installation in order to provide additional protection to marine mammals and sea turtles near the project area by allowing them to vacate the area prior to the commencement of pile driving activities. The lessee must ensure the following at the beginning of all in-water pile driving activities: The impact hammer soft start requires 3 strike sets, with a 1-minute wait period between each strike set. The initial strike set will be at approximately 10 percent energy, the second strike set at approximately 25 percent energy and the third strike set at approximately 40 percent energy. The soft start procedure must not be less than 20 minutes. Strikes may continue at full operational power following the soft start period. If marine mammals or sea turtles are sighted within the exclusion zone prior to pile-driving, or during the soft start, the Resident Engineer (or other mutually agreed upon individual must delay pile-.driving until the animal has moved outside the exclusion zone.

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

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

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

2.7.2. The results of the acoustic monitoring of all pile driving activities are reported to the Lessor and NMFS within 48 hours of foundation installation. The lessee, must include in its report a preliminary interpretation of the results that will include details of the operating frequencies, sound pressure levels (RMS), received cSELs and frequency bands covered, as well as associated latitude/longitude positions, ranges, depths and bearings between sound sources and receivers.

2.7.3. A final technical report within 120 days after completion of the pile driving and construction activities must be provided to BOEM and NMFS which provides full documentation of methods and monitoring protocols, summarizes the data recorded during monitoring, estimates the number of marine mammals and sea turtles that may have been taken during construction activities, and provides an interpretation of the results and effectiveness of all monitoring tasks. The report must also include the results and analysis of the field verification of exclusion zone data collected during pile driving activity.

2.7.4. The lessee must notify the Lessor and NMFS at least 24 hours prior to the initial commencement of pile driving activities, and again within 24 hours of the completion of all pile driving activities.

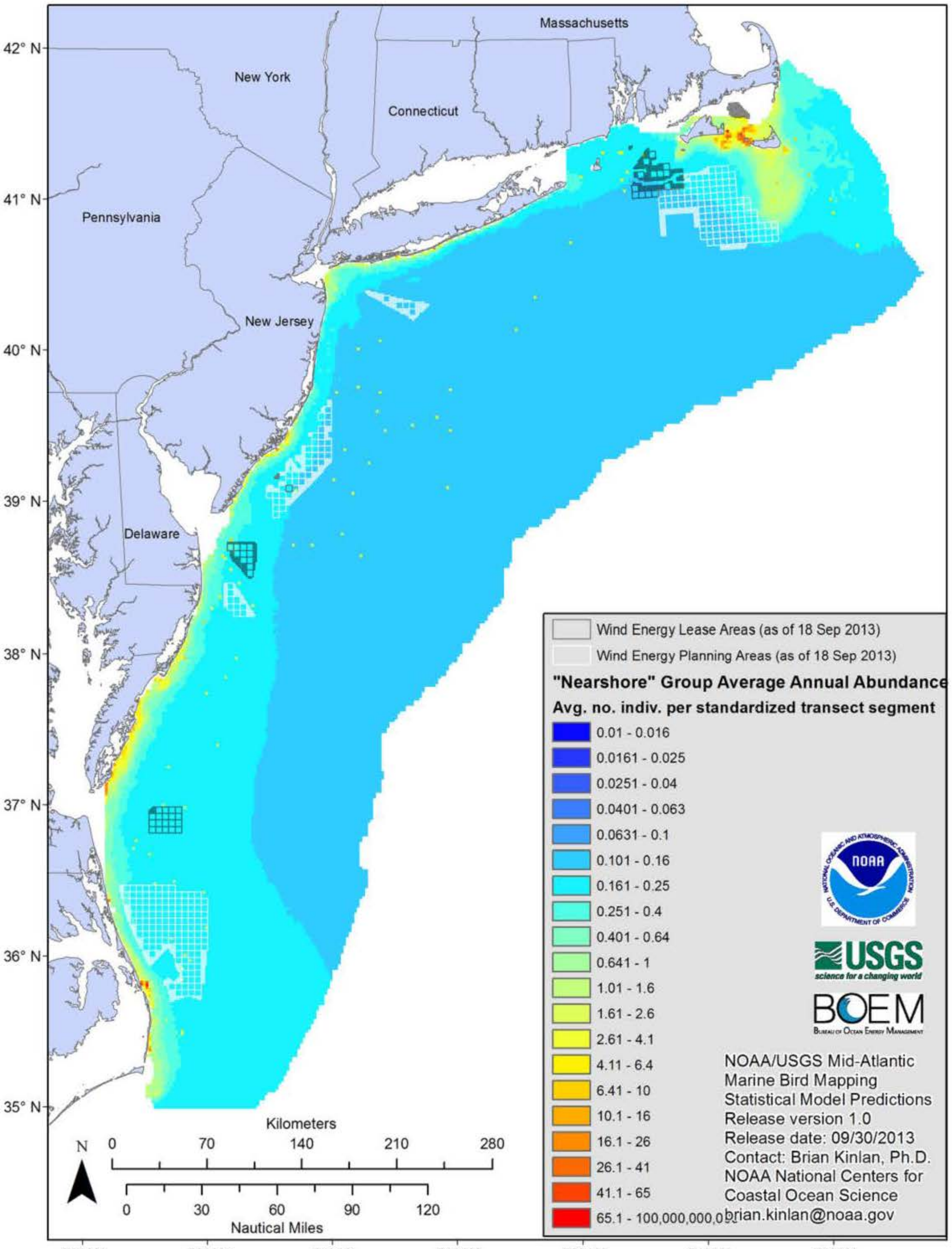
3.7 Coastal and Marine Birds (585.611(b)(3-5))

3.7.1 Environmental Baseline

Within the Project Area, there are numerous marine and coastal bird species present, including both resident and migratory species. Resident species are present throughout the year, whereas migratory species may be present only during breeding and wintering seasons, or they may only migrate through the Project Area. These migrant and resident birds include various species of birds that rely on marine and coastal waters, which may occur in or around the Project Area and adjacent coastlines. Figures 3.7-1, 3.7-2, and 3.7-3 depict abundance estimates for common avian species found in and near U.S. Atlantic waters. For this section, the Area of Interest (AOI) will include the Project Area, surrounding waters, and adjacent coastlines.

Marine and coastal birds that utilize mid-Atlantic waters and therefore may be present within and adjacent to the Project Area encompass hundreds of species which fall into 29 taxonomic families and 14 orders (Table 3.7-1). Bird species within a family share common physical and behavioral characteristics. Because of these commonalities, in this document birds will be presented by taxonomic families (groups) rather than individual species. Because of common behavioral characteristics, the potential to be affected by activities associated with the MET tower construction, operation and decommissioning will be similar for species within these groups.

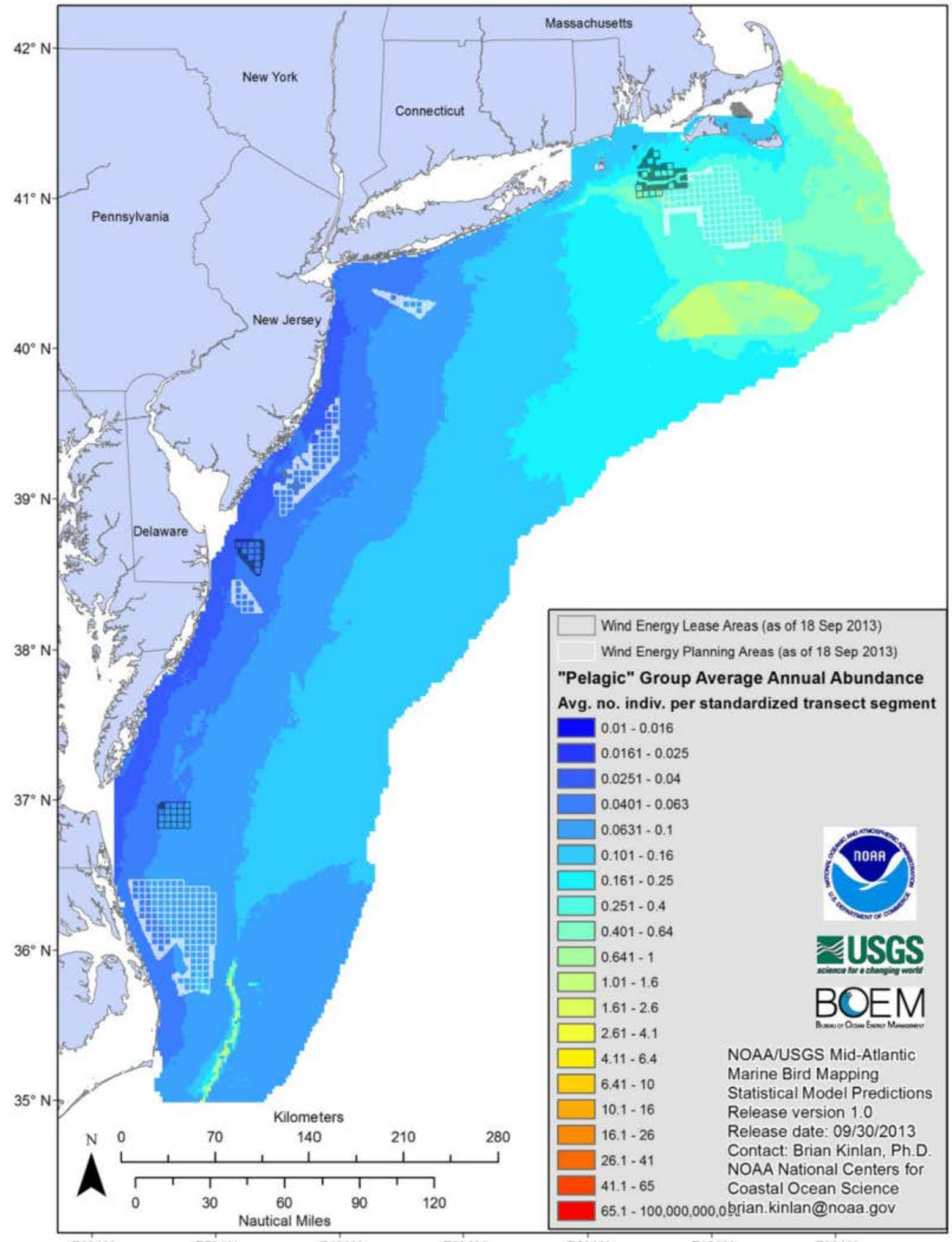
Figure 3.7-1 Predicted Average Annual Distribution of Near-shore Bird Species



Note: "Near-shore Birds" include Black Scoter, Common Eider, Common Loon, Common Tern, Double-crested Cormorant, Long-tailed Duck, Razorbill, Roseate Tern, Red-throated Loon, Surf Scoter, and White-winged Scoter

Source: VOWTAP – EA (BOEM, 2015)

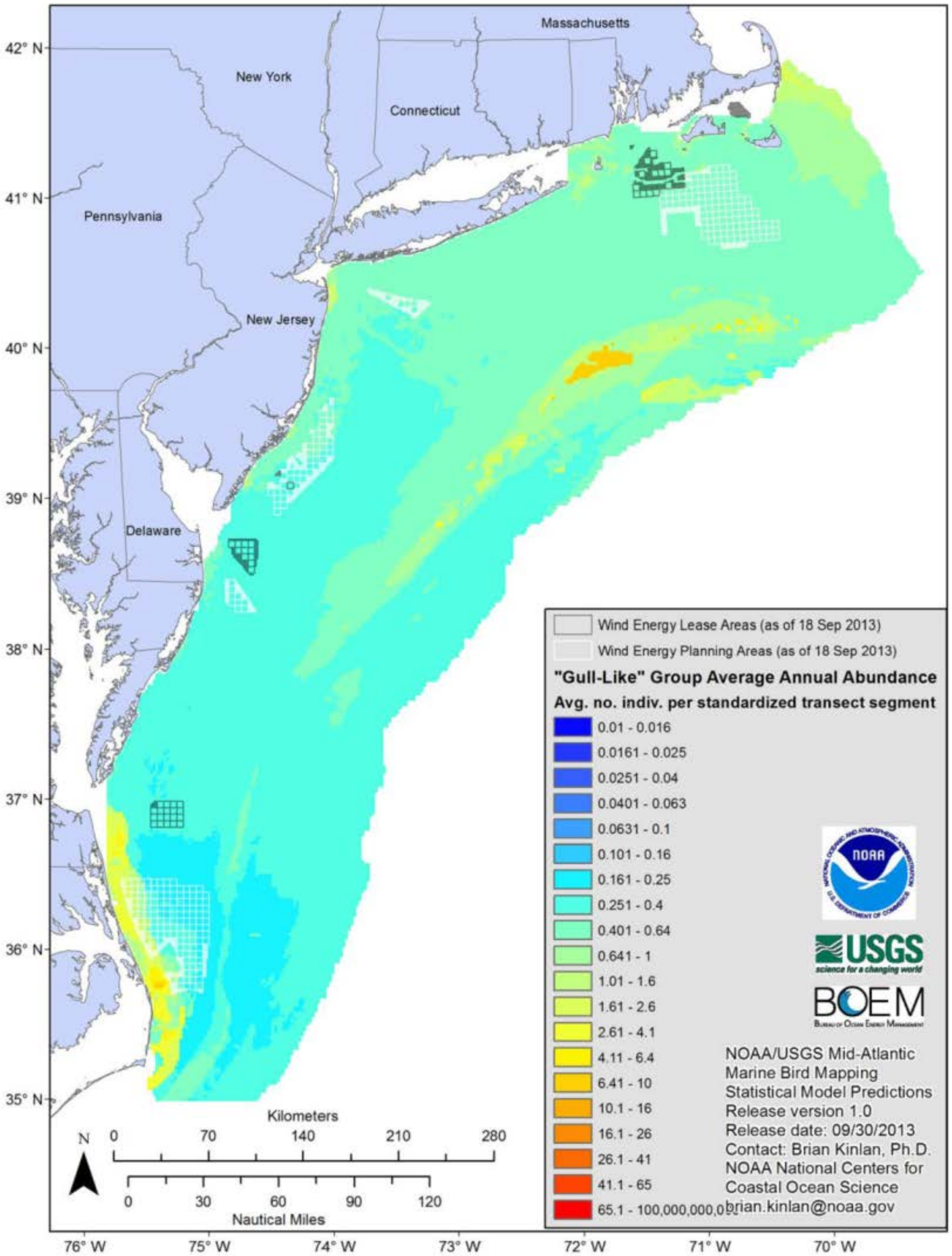
Figure 3.7-2 Predicted Average Annual Distribution of Pelagic Bird Species



Note: "Pelagic Birds" include Cory's Shearwater, Dovekie, Greater Shearwater, Northern Fulmar, Pomarine Jaeger, Red Phalarope, Sooty Shearwater, and Wilson's Storm Petrel.

Source: VOWTAP – EA (BOEM, 2015)

Figure 3.7-3 Predicted Average Annual Distribution of Gulls and Gannets



Note: "Gulls and Gannets" include Black-legged Kittiwake, Bonaparte's Gull, Great Black-backed Gull, Herring Gull, Laughing Gull, Northern Gannet, and Ring-billed Gull.

Source: VOWTAP – EA (BOEM, 2015)

Table 3.7-1 Groups of Coastal and Marine Birds Occurring in and Adjacent to the Mid-Atlantic Program Area

Order	Family	Common Names	Description
Charadriiformes	Stercorariidae	Skuas and Jaegers	Pelagic, gull-like birds, coming to land only to nest. Found in AOI during winter and migration. Often steals food from other seabirds.
	Laridae	Gulls, Terns, Kittiwakes and Skimmers	Gregarious. Nest colonially on beaches in AOI; found in AOI year-round. Gulls omnivorous and opportunistic; terns plunge-dive or pick small prey from water surface; skimmers highly specialized.
	Alcidae	Razorbill and Murres	Pelagic, coming to land only to nest colonially. Dives for fish and crustaceans; ungainly on land. Found in AOI only during winter.
	Charadriidae	Plovers	Small shorebirds which nest singly on beaches and dunes in AOI. Pick small prey from intertidal zone. Found in AOI year-round.
	Haematopodidae	Oystercatchers	Medium-sized shorebirds specialized for consuming oysters and other mollusks. Nests singly on sandy beaches and dunes. Nests in AOI and found there year-round.
	Recurvirostridae	Avocets and Stilts	Slender, long-legged birds that inhabit marshy areas, including coastal marshes and beaches. Captures small invertebrate prey from water. Nests in AOI and found there year-round.
	Scolopacidae	Sandpipers, Turnstones, Dowitchers, Godwits, Yellowlegs, Curlews, and Phalaropes	A diverse family of shorebirds which use a variety of habitats including beaches, dunes, mudflats, saltmarshes, and rocky coasts. Short-billed species pick prey from ground or water, while longer-billed species probe into mud or sand. Found in AOI year-round, though few species nest there.
Gaviiformes	Gaviidae	Loons	Large waterbirds that dive for fish. Leave water only to nest. Can form large groups in coastal bays and nearshore waters of AOI during winter.
Pelicaniformes	Pelecanidae	Pelicans	Large waterbirds typically seen sitting on the water or in flight. Plunge-dives for fish in shallow water. Nests colonially on isolated islands in AOI; found there year-round.
Suliformes	Sulidae	Gannets	Large pelagic species found in nearshore waters of AOI during winter. Plunge-dives for fish and pursues prey underwater.
	Fregatidae	Frigatebirds	Highly aerial; soars over nearshore waters. Plucks fish from water; often steals prey from other seabirds. Roosts colonially.
	Phaethontidae	Tropicbirds	Highly pelagic species; typically stays far from land. Sits on water surface and catches fish from plunge-dive. Nests on Bermuda, found in AOI during migration.
	Phalacrocoracidae	Cormorants	Waterbirds that sit and swim on the water and dive for fish. Roost colonially on perches with spread wings. Nest colonially in AOI; found there year-round.
Podicipediformes	Podicipedidae	Grebes	Found in ponds, bays, and open ocean of AOI year-round. Dives from surface for fish and aquatic invertebrates. May form small groups.

Order	Family	Common Names	Description
Procellariiformes	Procellariidae	Fulmars, Petrels, and Shearwaters	Highly pelagic and aerial species, coming to land only to nest. In AOI, usually found far offshore, primarily during winter and migration. Feeds from water surface or using shallow dives.
	Hydrobatidae	Storm-petrels	Small pelagic birds primarily found in deep ocean waters, but occasionally come near land. Plucks food from water surface. May form very large groups. Found in AOI during migration.
Anseriformes	Anatidae	Ducks, Scoter, Eider, Mergansers, Goldeneyes, Geese, and Swans	A large and diverse family which uses a variety of habitats including coastal ponds, bays, saltmarshes, rivers, and open ocean. Species feed either by dabbling or diving; some have specialized diets. Found in AOI year-round; sea ducks found primarily in winter.
Ciconiiformes	Cinconiidae	Storks	Large, uncommon species found in muddy ponds. Colonial; feeds by catching fish from water using large bill. Nests in AOI and found there year-round.
Pelicaniformes	Ardeidae	Herons, Egrets, Bittern, and Night-herons	Long-legged wading birds that capture fish, reptiles, amphibians, small mammals, and aquatic invertebrates from shallow water. Nest and roost colonially; some species secretive. Many species nest in coastal areas of AOI and found there year-round.
	Threskiornithidae	Ibis and Spoonbill	Similar to herons and egrets. Ibis has long, decurved bill used to probe muddy ponds and saltmarshes for prey. Spoonbill forages by sweeping bill through water. Colonial. Ibis nest in AOI and found there year-round. Spoonbill uncommon in AOI but may be found there during migration.
Gruiformes	Rallidae	Rails and Coots	Rails secretive and inhabit coastal marshes; feed on invertebrates and plants. Several species breed in AOI and found there year-round. Coots duck-like and inhabit ponds and marshes, often near coast. Coots found in AOI during winter.
	Aramidae	Limpkin	Inhabits wooded swamps, primarily in Florida. Long-billed and long-legged. Searches shallow water for mollusks, especially apple snails.
	Gruidae	Cranes	Large, long-legged birds; inhabit saltmarshes and agricultural fields in AOI. Found in small to very large groups. Feeds primarily on vegetation. Experimental population of Whooping Crane found south of Maryland, along with more common Sandhill Crane.
Falconiformes	Falconidae	Falcons, Kestrels, and Caracaras	Peregrine Falcon and Merlin often found along coast. Feed primarily on other birds, including ducks (for Peregrine Falcon), captured in flight.
Accipitriformes	Pandionidae	Osprey	Diurnal raptor highly specialized for diet of fish, which it catches using plunge-dive. Found on ponds, bays, and along beaches. Nests throughout AOI and found there year-round.
	Accipitridae	Eagles, Hawks, Kites, and Harriers	Bald Eagle found in coastal areas in AOI; preys on fish, ducks, small mammals, and carrion. Nest in AOI and found there year-round.

Order	Family	Common Names	Description
Coraciiformes	Alcedinidae	Kingfishers	Relatively small birds that plunge-dive for fish in sheltered waters, including coastal bays and marshes. Nests in AOI and found there year-round.
Passeriformes	Troglodytidae	Wrens	Marsh Wren is secretive and breeds in cattail marshes along coast. Found in AOI year-round.
	Emberizidae	Sparrows	Saltmarsh, Seaside, and Nelson's Sparrows are obligate saltmarsh-breeding birds. Found in saltmarshes throughout AOI year-round.
	Icteridae	Blackbirds and Grackles	Red-winged Blackbird and Boat-tailed Grackle nest in coastal saltmarshes in AOI; found there year-round.

3.7.1.1 Listed Species

Under the ESA, there are four species of marine and coastal birds that may be present within Project Area: piping plover (*Charadrius melodus*) (50 FR 50726), bermuda petrel (*Pterodroma cahow*)(50 FR 6069), red knot (*Calidris canutus rufa*) (79 FR 73705), and roseate tern (*Sterna dougallii*) (52 FR 42064).

There are additional threatened and endangered species that occur in the coastal areas of the mid-Atlantic, which extend outside of the Project Area (e.g., red-cockaded woodpecker); however, they either not considered marine or coastal birds based on their reliance on more terrestrial habitats. Therefore, these species were not analyzed further as they are not likely to be adversely affected by the Project. Table 3.7-2 provides a list of coastal and marine birds that are federally listed and which may be found in or adjacent to the Project Area. For the purposes of this document only the species listed as federally endangered or threatened and found in the Project Area will be discussed further.

Table 3.7-2 Listed Coastal and Marine Bird Species Occurring in the Mid-Atlantic

Common Name	Scientific Name	Federal Status
Bermuda Petrel (cahow)	*Pterodroma cahow*	E
Piping Plover	*Charadrius melodus*	T
Red Knot	*Calidris canutus rufa*	T
Roseate Tern	*Sterna dougallii dougallii*	E

[1]Based on USFWS protected resources (https://ecos.fws.gov/ipac/) as of October 1, 2015
[2]Federal status: Federally Endangered (E); Federally Threatened (T)

Coastal and marine avian species are unlikely to experience major impacts from SAP activities except for the case of major accidental events. Piping plover and red knot are shorebirds that are unlikely to come into contact with SAP activities. Roseate terns are known to occur in the Program Area, as they forage offshore. The Bermuda petrel is known to occur within the mid-Atlantic, feeding in and around giant eddies that break away from the eastern edge of the Gulf Stream and can occur anywhere over a huge area of ocean between the Gulf Stream and Bermuda (Madeiros, 2005); therefore it is unlikely to encounter the Bermuda petrel in the Project Area.

Piping Plover

The piping plover (*Charadrius melodus*) is a small, migratory shorebird that breeds on beaches from Newfoundland to North Carolina (and occasionally in South Carolina) and winters along the Atlantic Coast from North Carolina south, along the Gulf Coast, and in the Caribbean (USDOI, FWS, 1996; Elliot-Smith and Haig, 2004). According to USDOI, FWS (2009), piping plovers that breed on the Atlantic Coast belong to the subspecies *C. melodus melodus*. The Atlantic Coast population is classified as threatened, whereas other piping plover populations inhabiting the Northern Great Plains and Great Lakes watershed are endangered (USDOI, FWS, 2015a). The most recent abundance estimates by USFWS estimate approximately 1,762 nesting pairs in 2011 (USDOI FWS, 2012).

Piping plovers inhabit coastal sandy beaches and mudflats. They use open, sandy beaches close to the primary dune of the barrier islands for breeding, preferring sparsely vegetated open sand, gravel, or cobble for a nest site. They feed on marine worms, fly larvae, beetles, insects, crustaceans, mollusks, and other small invertebrates. They forage along the wrack zone, or line, where dead or dying seaweed, marsh grass, and other debris is left on the upper beach by the high tide (USDOI, FWS, 2015a).

A key threat to the Atlantic Coast population is habitat loss resulting from shoreline development (USDOI, FWS, 1996). Piping plovers are very sensitive to human activities, and disturbances from anthropogenic activities can cause the parent birds to abandon their nests. Since the listing of this species under the ESA in 1986, the Atlantic Coast piping plover population has increased 234 percent (USDOI, FWS, 2009). Although increased abundance has reduced near-term vulnerability to extinction, piping plovers remain sparsely distributed across their Atlantic Coast breeding range, and populations are highly vulnerable to even small declines in survival rates of adults and fledged juveniles (USDOI, FWS, 2009).

The FWS first designated critical habitat for the wintering population of piping plovers in 142 areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas on July 10, 2001 (*Federal Register*, 2001). Critical habitat areas were subsequently revised in North Carolina in 2008 (*Federal Register*, 2008) and in Texas in 2009 (*Federal Register*, 2009). The Atlantic Coast Population of piping plovers nest along beaches in New Brunswick, Prince Edward Island, Nova Scotia, Quebec, southern Maine, Rhode Island, Massachusetts, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina. These birds winter primarily on the Atlantic Coast from North Carolina to Florida, although some migrate to the Bahamas and West Indies from mid-September to March. Although the precise route of migration is not firmly established, it is possible that these birds will fly over the Project Area during migration.

Roseate Tern

The roseate tern (*Sterna dougallii*) is a worldwide species that is divided into five subspecies. The Atlantic subspecies (*S. dougallii dougallii*) breeds in two discrete areas in the western hemisphere (USDOI, FWS, 1998). The northeastern population, which is endangered, breeds from New York north to Maine and into adjacent areas of Canada. Historically this population bred as far south as Virginia; however the southern extent is now New York (USDOI, FWS (2015b). Northeastern roseate terns are thought to migrate through the eastern Caribbean and along the north coast of

South America and to winter mainly on the east coast of Brazil (USDOI, FWS, 2010a). The most current abundance estimate for the northeastern population is approximately 3,200 nesting pairs (Nisbet et. al., 2014). A second population breeds on islands around the Caribbean Sea from the Florida Keys to the Lesser Antilles; this population, which is listed as threatened, also occurs along the U.S. southeast coast, where there are occasional breeding records from North Carolina, South Carolina, and Georgia (USDOI, FWS, 2015b). Reasons for the initial listing of the roseate tern included the concentration of the population into a small number of breeding sites and to a lesser extent, declines in population (USDOI, FWS, 1998). The most important factor in breeding colony loss was predation by herring gulls and/or great black-backed gulls.

The roseate tern is a medium-sized tern that is primarily pelagic along seacoasts, bays, and estuaries, going to land only to nest and roost (Sibley, 2000). They forage offshore and roost in flocks typically near tidal inlets in late July to mid-September. Along the Atlantic Coast, they nest on islands on sandy beaches, open bare ground, and grassy areas, typically near areas with cover or shelter (NatureServe, 2015).

Roseate terns forage mainly by plunge-diving and contact-dipping (in which the bird's bill briefly contacts the water) or surface-dipping over shallow sandbars, reefs, or schools of predatory fish. They are adapted for fast flight and relatively deep diving and often submerge completely when diving for fish (USDOI, FWS, 2015b).

In Maryland, there once were colonies of breeding roseate terns along Assateague Island in the 1930's (Stewart and Robbins, 1958). Currently, there are no roseate tern breeding colonies in Maryland or Delaware. Although the precise route of migration is not firmly established, it is possible that roseate terns will fly over the Project Area during spring and fall migration.

***Rufa* Red Knot**

The *rufa* red knot (*Calidris canutus rufa*) is a medium-sized shorebird that was added to the list of threatened species under the ESA (*Federal Register*, 2014a) on December of 2014 and the listing became effective on January 15, 2015. The red knot migrates long distances in large flocks between breeding grounds in the mid- and high-arctic areas and wintering grounds in southern South America (Harrington, 2001; Morrison et al., 2001; USDOI, FWS, 2010b; Normandeau Associates, Inc., 2011). The northward migration through the contiguous U.S. occurs in April-June and the southward migration in July-October. Delaware Bay is the most important spring migration stopover in the eastern U.S. because it is the final stop at which the birds can refuel in preparation for their nonstop leg to the Arctic (Harrington, 2001; NatureServe, 2015; USDOI, FWS, 2010b). During this migratory stopover, the red knots arrive with body reserves completely depleted and sometime emaciated requiring readily available and easily digestible foods such as juvenile clams and mussels, and horseshoe crab eggs (USDOI, FWS, 2014). Approximately 90 percent of the entire population of the red knot can be present in Delaware Bay in a single day (Cornell Lab of Ornithology, 2015). Although the precise migration route has not been firmly established (Niles et al., 2010), it is possible that these birds will fly over the Project Area during spring and fall migrations. Due to challenges with the species' migratory habits and differing survey methods across the red knots' range there is not a range wide population estimate; however, survey counts in the mid-Atlantic estimate 48,955 knots stopping in Delaware Bay (2013) and 5,547 to 8,482 knots annually stopping in Virginia (2011-2014)(USDOI FWS, 2014).

Surveys of wintering knots along the coasts of southern Chile and Argentina and during spring migration in Delaware Bay on the U.S. coast indicate that a serious population decline occurred in the 2000s (USDOI, FWS, 2014). The primary threat to the red knot has been attributed to the reduction in key food resources resulting from reductions in horseshoe crabs, which are harvested primarily for use as bait and secondarily to support a biomedical industry (USDOI, FWS, 2003; USDOI, FWS, 2010b). Other identified threat factors include habitat destruction resulting from beach erosion and various shoreline protection and stabilization projects, the inadequacy of existing regulatory mechanisms, human disturbance, and competition with other species for limited food resources.

Along the mid-Atlantic and southeastern coasts, red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks (USDOI, FWS, 2010b). In Delaware Bay, they feed primarily on horseshoe crab eggs, and the timing of their arrival within the bay typically coincides with the annual peak of the horseshoe crab spawning period (USDOI, FWS, 2010b). Red knots are known to occur in Worcester County, Maryland (USFWS, 2015d).

Bermuda Petrel

The Bermuda petrel, or cahow (*Pterodroma cahow*), is a member of the "gadfly petrel" group (Genera *Lugensa and Pterodroma*), which are highly pelagic birds widespread in tropical and subtropical seas (Warham, 1990). This species was initially listed by FWS as endangered in 1970 (USDOI, FWS, 2015c). Successful conservation efforts have increased the population size, but it remains listed as endangered (*Federal Register*, 2007). The overall population status of the petrel is unknown due to its range and distribution at sea; however, studies in 2011-2012 estimated 101 breeding pairs (Madeiros, 2012).

The Bermuda petrel is a Bermuda endemic species that breeds on rocky inlets in Castle Harbour, Bermuda (October-June) (Warham, 1990; Onley and Scofield, 2007). The Bermuda petrel and other gadfly petrels are usually colonial when breeding but are often solitary at sea, feeding within oceanic waters on surface and near-surface prey. They are extremely aerial birds and so rarely land on the sea and only return to land to breed (Warham, 1990; Wingate, 1973). Bermuda petrels feed by snatching food by "dipping" or by scavenging dead or dying prey floating on or near the sea surface (Warham, 1990). They and other gadfly petrels are known to feed at night primarily on squids, but also on fishes and invertebrates to a lesser degree (Warham, 1996).

Exploitation of nesting Bermuda petrels by early colonists and predation by introduced mammals decimated their numbers to the point where the species was thought to be extinct. In 1951 eighteen breeding pairs were rediscovered and the Government of Bermuda implemented a conservation plan to protect the Bermuda petrels. Currently the primary threats to the Bermuda petrel include damage to nesting islets by storm events and sea level rise (USDOI, FWS, 2015c).

Outside of the breeding season, its distribution is poorly known, though the species is probably widespread in the North Atlantic, following the warm waters on the western edges of the Gulf Stream. There are confirmed sightings of the Bermuda petrel offshore of North Carolina (Lee, 1987), and there are records of several incidental sightings over the last 10 years east of Cape Hatteras but no records off Virginia, Maryland, Delaware, or New Jersey (eBird, 2011). Although there is no evidence that the Bermuda petrel is present in the mid-Atlantic OCS, the Cahow may potentially be present in the southern offshore waters of the Virginia WEA.

3.7.1.2 Federal Candidate Species

Candidate species are those for which sufficient information is available to support a proposal to list as federally endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions by US Fish & Wildlife Service (71 FR 53756).

No federal candidate species have been identified in or adjacent to the Project Area.

3.7.1.3 Migratory Birds

A migratory bird is any species or family of birds that migrates, and lives or reproduces within or across international borders at some point during their annual life cycle. Migratory birds and their nests are protected under the Migratory Bird Treaty Act (1918). Migratory movements of most marine and coastal birds across North America are known only in general terms (Harrington and Morrison, 1979). Many North American birds seasonally migrate long distances between their northern habitats in the high Arctic, New England, and Canada and their southern habitats in Florida and Central and South America, often traveling as far as 12,000 km (7,457 mi) from breeding to wintering grounds (Helmers, 1992). There are significant species differences with regard to the path or shape of the migratory route (Rappole, 1995).

Many coastal and marine birds as well as terrestrial birds use the Atlantic Flyway, which extends from the offshore waters of the Atlantic Coast west to the Allegheny Mountains and then continues across the prairie provinces of Canada and the Northwest Territories to the arctic coast of Alaska, for migration. The coastal route of this flyway originates in the eastern arctic islands and the coast of Greenland and generally follows the shoreline along the Atlantic Coast (http://www.birdnature.com/flyways.html; Brown et al., 2001; Morrison et al., 2001). Disturbance along the shoreline where the migrating birds forage can cause additional energy requirements for the migrating birds (Helmers, 1992).

There is an additional route termed the North Atlantic or Shorebird Route that is exclusively oceanic and passes directly over the Atlantic Ocean from Labrador and Nova Scotia to the Lesser Antilles, continuing on to South America (Rappole, 1995). This route is followed by thousands of birds, including some shorebirds that nest on the arctic tundra, that fly across Canada to the Atlantic Coast and follow this oceanic course to South America (http://www.birdnature.com/flyways.html; Morrison et al., 2001). Birds traveling along the Atlantic coastal flyway may pass over the Project Area.

3.7.1.4 Bird Conservation Regions and Birds of Conservation Concern

The Fish and Wildlife Conservation Act was amended in 1988 to mandate FWS to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing" under the ESA. The FWS prepared a document (USDOI, FWS, 2008) to identify birds of conservation concern as an effort to comply with this mandate. The overall goal of the document was to accurately identify the migratory and non-migratory bird species, in addition to those already designated as federally threatened or endangered, that represent the highest conservation priorities. The development of the birds of conservation concern took into account three distinct geographic scales—North American Bird Conservation Initiative (NABCI) Bird Conservation Regions (BCRs), FWS Regions, and National (USDOI, FWS, 2008).

The NABCI BCRs were developed by a mapping team comprising members from the U.S., Mexico, and Canada to develop a consistent spatial framework for bird conservation for North America. The efforts resulted in the establishment of a hierarchical framework of nested ecological units, or BCRs which encompass land adjacent to the Project Area. There is one BCR located adjacent to the Project Area: 30) New England/mid-Atlantic Coast (U.S. NABCI Committee, 2000). Tables 28 in USDOI, FWS (2008) include 62 bird species of conservation concern potentially present in the BCRs, excluding Red Knot which has recently been listed (see above). Shorebirds are of high conservation concern (U.S. NABCI Committee, 2009), and nearly half of the ocean bird species in the U.S. are of conservation concern (U.S. NABCI Committee, 2011).

3.7.1.5 Important Bird Areas

The Important Bird Area (IBAs) Program was established by the National Audubon Society as a global effort to identify and conserve areas that are vital to birds and other biodiversity. The IBAs are sites that provide essential habitat for one or more species of bird, and include sites for breeding, wintering, and/or migrating birds. By definition (National Audubon Society, 2010; Smith et al. 2012), IBAs are sites that support the following:

- Species of conservation concern (e.g., threatened or endangered species);
- Restricted-ranges species (species vulnerable because they are not widely distributed);
- Species that are vulnerable because their populations are concentrated in one general habitat type or biome; and/or
- Species or groups of similar species (such as waterfowl or shorebirds) that are vulnerable because they occur at high densities because of their congregatory behavior.

The globally important IBA sites adjacent to the Project Area, in nearshore waters, or offshore are listed in Table 3.7-3.

Table 3.7-3 Important Bird Areas in or Adjacent to the Project Area

IBA Name	State
Delaware Coastal Zone	DE
Maryland Coastal Bays	MD
Assateague Island	MD
Barrier Island/Lagoon System	VA
Delmarva Bayside Marshes	VA

3.7.2 Potential Impacts

All activities (installation, operation, decommission) associated with the Project have the potential to affect birds; including the presence of the MET tower.

It has been estimated that hundreds of millions of birds are killed each year in collisions with communication towers, windows, electric transmission lines, and other structures (*see* Klem, 1989 and 1990; Dunn, 1993; Shire et al., 2000). It is possible that some birds (i.e., gulls, terns, shorebird, petrels, shearwaters, sea ducks, and alcids) may collide with the MET tower and be injured or killed.

However, due to the single structure and its distance from shore, migratory birds (including pelagic birds) colliding with the anticipated MET tower is possible, but would be a rare event.

The safety lighting systems on the MET required under FAA and Coast Guard regulations may also have an impact to marine and coastal birds, as well as lighting from construction, maintenance, and decommissioning vessels. Birds can become disoriented by artificial lights at night, particularly offshore during migration, when they may circle the light source for hours. This increases the risk of collision with vessels and offshore structures and decreases fat reserves (Longcore and Rich, 2004; Montevecchi, 2006; Weiss et al., 2012). Additionally, weather conditions may also play a role in the effects of lighted structures on birds. For instance, variations in day length influence the duration of lighting effects on birds. Birds also appear to be more attracted to lighted structures during periods of low cloud ceiling, fog, or overcast skies (Gauthreaux Jr. and Belser, 2006; Montevecchi, 2006; Evans, 2007; Poot et al., 2008). FAA obstruction lighting that will be proposed for installation at the top of the MET tower will be red flashing LED light of the lowest acceptable intensity which has been shown to have minimal, if any, impacts may have less of an attraction to birds (Orr et al., 2013).

Noises occurring during pile driving of the MET tower may have an impact to birds utilizing the space surrounding the Project Area while the hammer is in operation. Unexpected noise can startle birds and potentially affect feeding, resting, or nesting behavior, and often causes flocks of birds to abandon the immediate area. In many cases, the effects are temporary, with the birds becoming habituated to the noise. For example, weapons testing noise has been reported to have no significant effect on bald eagle activity or reproductive success, suggesting habituation of the birds to the noise (e.g., Brown et al., 1999). Studies of birds exposed to frequent low-level military jet aircraft overflights and simulated (with mortars, shotguns, and propane cannons) mid- to high-altitude sonic booms have shown aircraft and detonation noise to elicit some short-term behavioral responses but to have little effect on reproductive success (Ellis et al. 1991). Given the short time frame that pile driving will occur and the ramp-up procedures for marine mammal and sea turtle mitigation it is expected that impacts to avian species from pile driving will be minor.

Marine and coastal birds could be exposed to operational discharges or accidental fuel releases from vessels in the Project Area and vessels accidentally releasing solid debris. Many species of birds (such as gulls) often follow ships and forage in their wake on fish and other prey that may be injured or disoriented by the passing vessel. In doing so, these birds may be affected by discharges of waste fluids (such as bilge water) generated by the vessels. Operational discharges from construction vessels may be released into the open ocean (see Sections 3.2.3 and 4.1.1.2.2 of the EA (2012)) but would be rapidly diluted and dispersed, or collected and taken to shore for treatment and disposal. Sanitary and domestic wastes would be processed through on-site waste treatment facilities before being discharged overboard. Deck drainage would also be processed prior to discharge. Thus, potential impacts to marine and coastal birds from waste discharges from construction vessels are expected to be negligible.

The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEM (30 CFR 250.300) and the USCG (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). Thus, the entanglement in or ingestion of project-related trash and debris by marine mammals would not be expected during normal operations. Thus, entanglement in or ingestion of

OCS-related trash and debris by marine and coastal birds is not expected, and potential impacts to marine and coastal birds associated with project debris, if any, would be negligible.

Because of the limited amount of vessel traffic and offshore activity that would be associated with the Project, the release of liquid wastes would occur infrequently. The likelihood of an accident resulting in accidental discharges would be limited to the active installation and decommissioning periods of the Project. This is because this is the time period when there would be more than one vessel on site conducting complex maneuvers in a restricted space. Impacts to marine and coastal birds from the discharge of waste materials or the accidental release of fuels are expected to be minor, if they occur at all.

Conclusion

The effects of site characterization activities are not expected to significantly impacts birds. While birds may be affected by vessel discharges, the presence of MET towers and buoys, vessel discharges, and accidental fuel releases, the risk of collisions with the MET tower would be minor due to the single tower proposed, its size, and its distance from shore.

3.7.3 Mitigation Measures

To minimize any potential impacts to birds US Wind will install antiperching devices similar to "bird spikes" to the probable perching location on the MET tower where OSHA regulations do not conflict. Furthermore, the FAA obstruction lighting that will be proposed for installation at the top of the MET tower will be red flashing LED light of the lowest acceptable intensity which has been shown to have minimal, if any, impacts may have less of an attraction to birds (Orr et al., 2013).

3.8 Bats (585.611(b)(3-5))

There are 10 species of bats that known to occur in Maryland (Table 3.8-1)(Maryland DNR, 2015). Six of Maryland's bats are known as cave bats, which utilize caves and mines for part or all of the year and the remaining 4 species are known as tree bats. The silver-haired bat, eastern red bat, and hoary bat are considered migratory tree bats due to their seasonal migrations over several degrees of latitude (Cryan, 2003). Although the migration patterns of bats are not well-documented, many bats species make extensive use of linear features in the landscape, such as ridges or rivers while commuting and migrating suggesting a preference for overland migration routes. It is also known that they fly along the coast. For instance, on the mid-Atlantic coast, the eastern red, hoary, and silver-haired bats, use Assateague Island National Seashore, a barrier island off the coast of Maryland during migration (Johnson et al., 2011).

Table 3.8-1 Bats of Maryland

Common name	Scientific name	Federal Status
Cave Bats		
Big brown bat	*Eptesicus fuscus*	
Eastern small-footed bat	*Myotis leibii*	
Indiana bat	*Myotis sodalist*	Endangered
Little brown bat	*Myotis lucifugus*	
Northern long-eared bat	*Myotis septentrionalis*	Threatened
Tri-colored bat	*Perimyotis subflavous*	

Common name	Scientific name	Federal Status
Tree Bats		
Eastern red bat	*Lasiurus borealis*	
Evening bat	*Nycticeius humeralis*	
Hoary bat	*Lasiurus cinereus*	
Silver haired bat	*Lasionycteris noctivagans*	

Most information on offshore bat activity in the mid-Atlantic comes from The New Jersey Ecological Baseline Study which includes survey results for bats over the New Jersey WEA offshore New Jersey out to 37 km (20 nautical miles) (NJDEP, 2010). Shipboard surveys were conducted in March, April, May, June, August, September, and October 2009. No bats were detected during the 2009 March, April or June surveys, and one was detected in May. Over eight nights in August, September, and October, 53 bats were detected. Of the total 54 recordings, the eastern red bat was the most common bat detected, but they were detected in the fall offshore along the Delmarva Peninsula while only a few hoary bats and big brown/silver haired bats were detected in spring and fall. The mean distance from shore was 9.6 km (5.2 nautical miles), with the farthest distance being 19 km (10.4 nautical miles) (NJDEP, 2010).

During the recent DOE funded wildlife studies 12 presumed eastern red bats were observed during September surveys off the coast of New Jersey, Delaware, and Virginia between 16.9 and 41.9 km (9.1 and 22.6 nmi) from shore; averaging 30 km (16.2 nmi) from the shoreline (Hatch, 2013). All observations occurred during daylight and of the six bats observed during aerial surveys for which flight heights were estimable, all six were at altitudes over 100 m (328 ft) above sea level, and five of the six were over 200 m (656 ft) (Hatch, 2013). Records of bats migrating during daylight and at unexpectedly high altitudes are not common and need to be considered on future surveys (Hatch, 2013).

Given that no bats were detected during the New Jersey surveys at a distance greater than 10.5 nm from shore, that the few observations during DOE wildlife studies occurred at high altitude, and due to the small footprint of the MET tower; it is unlikely that bats will be affected by the Project. Only silver-haired bat, eastern red bat, and hoary bat would possibly migrate or forage near the Project Area.

3.9 Air Quality (585.610(a)(12) and 585.659)

3.9.1 Environmental Baseline

Air quality is characterized by comparing the ambient air concentrations of criteria pollutants to the National Ambient Air Quality Standards (NAAQS), which have been established by the EPA to be protective of human health and welfare. The Clean Air Act (CAA) establishes two types of national air quality standards: (1) primary standards, which set limits to protect public health, including the health of "sensitive" populations (e.g., asthmatics, children, and the elderly); and (2) secondary standards, which set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The NAAQS have been established in 40 CFR Part 50 for each of the seven criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$, particulate matter with a diameter less than or equal to 10 and 2.5 μm, respectively), and lead (Pb).

When the monitored pollutant levels in an area exceed the NAAQS for any pollutant, the area is classified as “nonattainment” for that pollutant. The State of Maryland is presently “in attainment” (or compliant with) with the NAAQS, except for the Baltimore and Washington D.C. metropolitan areas. These densely populated urban core areas are presently in nonattainment with the ozone NAAQS, as are most large east coast population centers.

The NAAQS for ozone are 0.12 ppm (1-hour average) and 0.075 ppm (8-hour average). Ozone is a regional air pollutant issue. Prevailing southwest to west winds carry air pollution from the Ohio River Valley, where major nitrogen oxides (NOx) emission sources (e.g., power plants) are located, and from Mid- Atlantic metropolitan areas, to the northeast, contributing to high ozone concentrations in these areas.

3.9.1.1 Regulatory Controls on OCS Activities That Affect Air Quality

Section 328 of the Clean Air Act Amendments of 1990 (CAA 1990) directs the USEPA to promulgate regulations for OCS sources that may affect the air quality of any state (42 U.S.C. 7627). The regulations are found in 40 CFR Part 55. Under 40 CFR Part 55, the USEPA has the authority to regulate the air emissions associated with OCS sources, which would include meteorological towers, any vessels used for the purposes of constructing, servicing, or decommissioning them, and equipment used for seafloor boring. Under 40 CFR 55, all OCS sources located within 25 nm of States’ seaward boundaries must satisfy the same air permitting requirements as would be applicable if the source were located in the corresponding onshore area. US Wind expects that any CAA permit that may be required for the MET tower would be issued by the state of Maryland, which is authorized by the USEPA to permit OCS Sources.

Section 328 of the CAA 1990 also establishes a unique treatment for vessels associated with OCS sources. With respect to the calculation of an OCS source’s Potential to Emit (PTE), emissions from vessels that are servicing or associated with the operations of the OCS source must be counted as direct emissions from the OCS source when those vessels are at the source or enroute to or from the source when within 25 nm of the source. The USEPA rules set forth in 40 CFR Part 55 replicate this treatment of vessels with respect to the PTE calculations.

Some emissions associated with OCS sources may require compliance with the General Conformity Rule established in 40 CFR Part 93, Subpart B. These regulations implemented Section 176 of the CAA 1990 which requires that Federal actions conform to applicable SIPs developed by States and approved by USEPA for the purpose of attaining or maintaining compliance with NAAQS. To determine whether a conformity determination is required for activities described in a particular SAP, BOEM would conduct an applicability analysis when the SAP is received. A conformity determination is required when the total direct and indirect emissions of criteria pollutants in a nonattainment or maintenance area exceed rates (known as de minimus rates), specified in 40 CFR 93.153(b)(1) and (2). The emissions estimates must include emissions from the transportation of materials, equipment, and personnel, and must include the construction and decommissioning phases, as well as the operational phase of the action. Conformity only applies to emissions within State boundaries (onshore and in state waters).

The USEPA General Conformity Rule (40 CFR Part 93) ensures that Federal actions comply with the national ambient air quality standards, in order to meet the Clean Air Act requirement. The Clean Air Act requires that Federal actions resulting in emissions in non- attainment areas and maintenance areas in a state conform to the federally approved State Implementation Plan (SIP). Because vessels supporting site characterization and assessment activities travel through state waters, a conformity determination would be required if emissions exceed 100 tons per year in the non-attainment areas.

In accordance with 40 CFR § 55.14(11), the MET Tower must therefore comply with all applicable sections of the Maryland Department of Environmental (MDE) Regulations listed in 40 CFR § 55, Appendix A.

3.9.2 Potential Impacts

Due to the low level of additional vessel traffic that will be traversing any of the areas offshore or in the coastal or harbor areas of Maryland at any one time over the course of the MET Tower's construction, operation, and decommissioning phases, and due to the existing air quality in these areas, the amount of human activity that emits air pollutants in these areas, and the short duration of the emissions associated with these activities, the potential impacts to onshore ambient air quality would be expected to be minor, if detectable.

A non-routine event such as a diesel spill may have short-term impacts on ambient air quality in a localized area, but these effects would dissipate very quickly.

US Wind has completed a preliminary emission assessment to determine whether a permit from the Maryland Department of Environment (MDE) is required for the installation and operation of the MET Tower and whether the operation of the MET Tower complies with other applicable MDE air pollution control requirements.

3.9.2.1 Impacts of Routine Activities

Routine activities associated with the construction, operation, and decommissioning of the Met Tower, have the potential to impact air quality locally. Potential emission sources are expected to include work boats, cranes, pile drivers, tow tugs, crew boats, and generators.

Emission Sources & Emissions

Emissions of criteria pollutants will result from the combustion of fuels (diesel oil and gasoline) in the propulsion engines of vessels (e.g., boats and barges) and stationary equipment on vessels and barges (e.g., cranes and generators). These emissions will include primarily nitrogen oxides NOx and carbon monoxide (CO), lesser amounts of volatile organic compounds (VOCs) and PM_{10} (mostly in the form of $PM_{2.5}$), and negligible amounts of sulfur oxides (SOx). Emissions of non-criteria pollutants will be negligible.

Construction and Decommissioning

Installation of the MET Tower will require a jack-up barge containing the installation crane, pile driver and other support equipment. The barge will be supported by additional tug boats and crew boats as necessary. Similar equipment will be used for decommissioning. A general conformity analysis would be required only if construction or decommissioning activities would emit over 100 tons of a criteria pollutant in any year. The total criteria pollutant emissions during construction and decommissioning activities are expected to be well below the 100 ton per year threshold for all pollutants.

Operations

The equipment on the MET Tower will be powered by batteries charged by solar panels. A diesel generator may be used as the main source of power. While the solar panels would produce no emissions, a diesel generator would emit NOx, CO, PM_{10} and SO_2. There will be vessels servicing the MET Tower periodically throughout its operational period.

Vessel traffic during construction, operation, and decommissioning has the potential to affect onshore air quality. However, it is expected that support vessels traveling from the port to the offshore site would contribute very little to pre-existing emission totals in these areas. Therefore, impacts from additional pollutant emissions, based on estimated vessel trips associated with the Project, in conjunction with vessel trips and associated air emissions for the already busy ports and harbors would be negligible, if detectible.

US Wind has estimated the Project emissions during MET Tower construction, operations, and decommissioning based on their expected combustion equipment usage during each phase. The emissions from all transit vessel propulsion engines have been based on the number of trips to and from the MET Tower location. The emissions from all stationary engines have been estimated based on their expected number of hours of usage during each project phase. Appendix T contains the detailed emissions summaries, including the expected number and size of each engine type, the expected usage of each engine during each project phase, and the load factors and emission factors used for the Project emissions estimates. Summaries of the expected annual emissions during each MET Tower project phase are below in Table 3.9-1, 3.9-2, and 3.9-3.

Table 3.9-1 Emissions and Estimates for Construction

Pollutant	Tons/yr
NO_X	19.4
SO_2	15.3
CO_2	916.3
CO	1.6
PM	3.7
HAPS	0.7

Table 3.9-2 Emissions Estimates for Operations

Pollutant	Tons/yr
NO_X	0.0
SO_2	0.0
CO_2	2.9
CO	0.1
PM	0.0
HAPS	0.0

Table 3.9-3 Emissions Estimates for Decommissioning

Pollutant	Tons/yr
NO_X	29.3
SO_2	23.2
CO_2	1379.2
CO	2.4
PM	5.7
HAPS	1.1

Impacts of Non-Routine Activities

The most likely impact to air emissions from non-routine activities would be caused by vapors from fuel spills resulting either from vessel collisions or from servicing or refueling any diesel generators that may be used. A spill could occur from vessel collisions while in transit, or at the MET Tower Site. If such a spill were to occur, it would be expected to dissipate very rapidly and then evaporate and biodegrade within a few days. Air emissions from a diesel spill would be minor and temporary. A diesel spill occurring at the MET Tower Site would not have any impacts on onshore air quality, because of the likely size of such a spill, the prevailing atmospheric conditions, and the distance from shore. The impacts of emissions to air quality in the vicinity of the spill would be minor and temporary.

Conclusion

Prevailing westerly (west to east flow) winds would minimize the dispersion of offshore emissions associated with the Project to onshore areas. The emissions associated with MET Tower construction, operation, and decommissioning within ports and harbors would be negligible, if detectable, due to the low volume of vessel activity required, particularly when compared to the high volume of current activity in and around these areas which emit pollution, and in light of the current ambient air quality in most of these areas. A non-routine event such as a diesel spill may have short-term impacts on ambient air quality in a localized area, but these effects would dissipate very quickly. Neither routine activities nor non-routine events in harbor areas, coastal waters, or at the MET Tower Site would significantly impact onshore air quality.

Based on US Wind's emissions estimates, the annual emissions from the Project during MET Tower construction, operation, and decommissioning will not exceed the major source permitting thresholds. It is anticipated that the MET Tower may require a Maryland Department of Environment Air Quality Permit to Construct and Air Quality Permit to Operate. US Wind is preparing the Notice of Intent required for 40 CFR § 55 that will commence the air permitting process with US EPA and MDE. If applicable, the MDE Air Quality Permit to Construct wouldl require the implementation of Best Available Control Technology (BACT) for project emissions sources and could require air dispersion modeling to comply with Code of Maryland Regulation (COMAR) 26.11.15.06, Ambient Impact Requirement. If required, US Wind will use TM 86-02 or other acceptable air dispersion modeling procedures for this analysis.

3.9.3 Mitigation Measures (585.610(a)(8))

Mitigation measures will be implemented to ensure that air emissions from the Project during MET Tower construction, operation, and decommissioning are minimized to the degree practicable. The project will be required to implement BACT for all emission sources. A top-down BACT analysis will be conducted for each emission source type to determine the appropriate emissions control measures for that source type.

Clean fuels which meet EPA sulfur content standards will be used, as will engines which meet the applicable EPA non-road and marine engine standards. Unnecessary idling of project engines will be limited. When, available, engines with add-on emission controls will also be used to further minimize and avoid temporary ambient air impacts which could occur during project MET Tower construction and decommissioning. As a result of these and other measures to be identified during the BACT analysis, the impacts of the Project during MET Tower construction, operation, and decommissioning to air quality will be minor.

3.10 Archaeological Resources (585.611(b)(6))

R. Christopher Goodwin & Associates, Inc. (RCG&A) conducted a Phase I archeological assessment to identify potential archeological resources within the MET tower APE. This work was performed to assist the US Wind and BOEM in compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, and its implementing regulations 36 Code of Federal Regulations (CFR) 800, entitled Protection of Historic Properties. All work was performed in accordance with the NHPA of 1966, as amended; the National Environmental Policy Act of 1969, as amended, and its implementing regulations (36 CFR Part 800); and the Archeological Resources Protection Act of 1979.

RCG&A's report, titled *Marine Archeological Resources Assessment for the US Wind Offshore Energy Project*, is provided in Appendix R. The report's findings, conclusions, and recommendations are summarized below.

3.10.1 Baseline Conditions

RCG&A conducted a detailed analysis of all HRG survey data that was acquired in the MET tower APE accordance with the BOEM, Office of Renewable Energy Programs' Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585 (BOEM 2012) (Appendices N, O, and P). This survey data was analyzed using currently acceptable scientific methodologies. Magnetic contours, anomaly locations, shipwreck positions, archeological sites and hazard locations, and side scan sonar data were projected over navigational charts using ESRI ArcGIS or AutoCAD software to establish relationships between these datasets and identify targets with potential to represent submerged cultural resources. Subbottom profiler data were analyzed to determine the presence or absence of paleo-landforms. All data were correlated via DGPS position data and plotted via ArcGIS. Magnetometer and bathymetric data were contoured via Global Mapper to provide visual aids for interpretation. Remote sensing data then were correlated with a variety of shipwreck databases, geomorphic and historical research results, nautical charts, and any observations noted in survey logs and sediment sample logs during data collection.

RCG&A also conducted archival research for the Project. This research had two objectives: the creation of relevant and focused prehistoric and historic maritime contexts for the Project area, and identification of potentially significant submerged cultural resources within that study area. Research conducted in support of the first objective relied upon information obtained during previous RCG&A studies that were located on and offshore of the Maryland and Delaware coastlines (e.g., Irion et al. 1994; Williams 2001; Schmidt et al. 2011a). Repositories that contributed archival material for these earlier projects included, among others, the Philadelphia and Baltimore Districts of the U. S. Army Corps of Engineers; the Maryland and Delaware State Historic Preservation Offices; and maritime museum libraries and archives in Philadelphia and Newport News. The historic background material provided by those reports was updated and augmented by referencing the extensive background material included in the Tidewater Atlantic Research report (TAR 2014), and by accessing relevant online information databases and web pages. The second objective was accomplished through review of five sources: NOAA's Automated Wreck and Obstruction Information System (AWOIS), the shipwreck database maintained by the Bureau of Offshore Energy Management (BOEM 2015), the Northern Shipwreck Database (Northern Maritime Research 2002), and two dive references (Gentile 1992 and 2002) that provided discrete locational coordinates.

The results of this investigation were as follows:

- Multibeam bathymetric data revealed that, in general, the seafloor in the MET tower APE gradually slopes away from shore towards the northeast. No other anthropogenic seafloor disturbances or features were noted during review of bathymetric data.
- No side scan sonar images were recorded that identified potential cultural resources within the MET tower APE.
- The marine magnetometer data revealed a relatively noise free environment throughout the lease area. Spatial and magnetic contour analyses coupled with careful review of each magnetic anomaly in the MET tower APE resulted in the determination that none of the anomalies represent submerged cultural resources.
- Sub-bottom profiler data was analyzed to identify paleolandscape features. Core samples were examined to identify any intact paleosols, and to describe deposition and erosion processes. No paleochannels or other paleo-landforms were identified in the MET tower APE.

3.10.2 Potential Impacts

No potential cultural resources were identified by RCG&A within the MET tower APE. Therefore, RCG&A concluded that no potential archeological resources will be affected by the proposed MET tower installation, operation, and decommissioning activities and recommended a determination of "No historic properties affected" (36 CFR 800.4).

3.10.3 Mitigation Measures (585.610(a)(8))

Disturbance of the seafloor during construction activities has the potential to encounter and cause significant long-term adverse impacts to unidentified submerged cultural resources. Although remote sensing surveys conducted in accordance with current professional standards for cultural resource identification are expected to be highly effective at recognizing submerged cultural resources, the possibility of encountering an unidentified and unanticipated submerged cultural resource, however unlikely, is always present during bottom disturbing construction activities. As a result, RCG&A has recommended implementation of an unanticipated discoveries plan, including archeological resource identification training. US Wind will work with RCG&A to develop this plan in consultation with BOEM and other federal agencies, as applicable, prior to initiation of MET tower construction activities.

3.11 Visual Resources (585.611(b)(7))

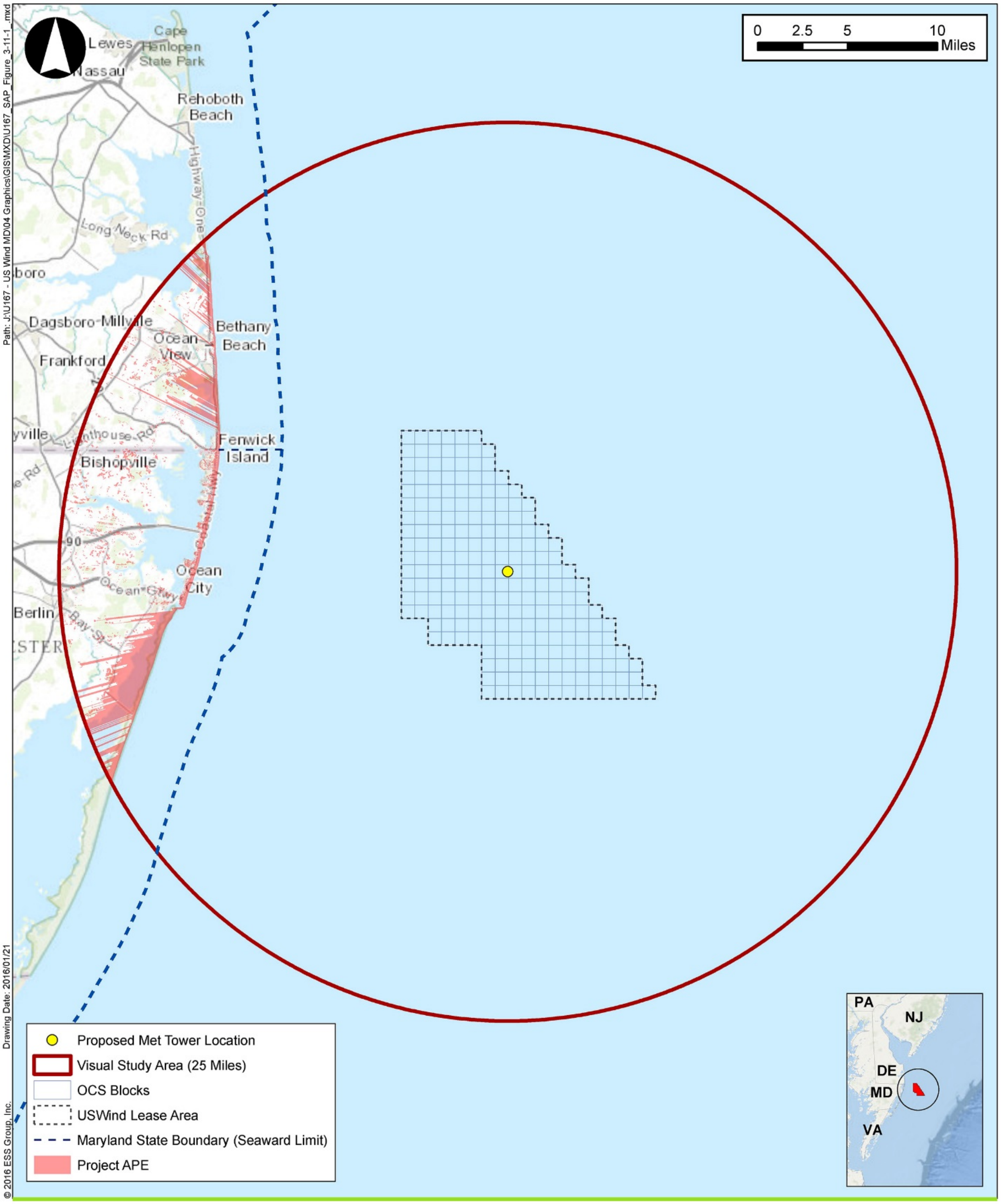
3.11.1 Environmental Baseline

3.11.1.1 Visual Study Area and Area of Potential Effect

In order to establish the visual character of the potentially affected on-shore and offshore locations there must first be an established area of potential affect or visual study area and Area of Potential Effect (APE). The Bureau of Land Management (BLM) suggests the following distance zone breakdown, Foreground to middle ground views occur between 0-5 Miles, background views range from 5-15 Miles, and views beyond 15 miles are classified as the "Seldom Seen" zone (BLM, 2013). Observations of existing offshore facilities suggest that night visibility of aviation hazard signals may extend as far as 25 miles (Sullivan, 2010). Based on the BLM zones and actual facility observations, 25 miles (radius buffer around the MET tower) was determined an appropriate distance for the purposes of establishing a visual threshold, and was established to represent the visual study area. For daytime observations, this study area is likely overly conservative due to the Project distance from shore and the narrow profile of the tower. Additionally, meteorological conditions will likely reduce the visual threshold distance dramatically in daytime and nighttime conditions. The resulting visual study area is 1962 square miles, 161 square miles (8.2 percent) of which are landward of the shoreline, henceforth the landward study area. The study area encompasses 31.8 miles of oceanfront shoreline (see Figure 3.11-1).

The study area was then refined to include only those areas that would likely have visibility of the MET tower. To this end, a viewshed analysis was completed to determine the potential geographic extent of visibility, or area of potential effect (APE). In order to complete the viewshed analysis, the USGS National Elevation Dataset (NED) at a resolution of 10-meters was loaded into Global Mapper software as an elevation surface. To account for the screening effect of vegetation, National Land Cover Dataset (NLCD) was incorporated at a resolution of 30 meters. The NLCD provides a breakdown of cover type in 30-meter blocks. Deciduous, evergreen, mixed forest, and woody wetland cover types were used to create a single forested vector layer for use on the surface model. The vegetation layer was assigned a height of 30 feet and a "not visible" status in the model. Next "High Intensity Developed" land was extracted from the NLCD model and assigned a height of 50 feet to represent the concentration of large buildings on the shoreline. The buildings layer was assigned a status of visible with the assumption upper level views from structures would likely have ocean views. Curvature of the earth and refraction are also considered in the visibility model. With the final surface prepared, the MET tower coordinates were entered into the workspace and the software scanned every 10-meter cell within the 25-mile study area to determine whether an unobstructed line of sight exists from a particular cell from the maximum height of the MET Tower. The resulting layer identifies all potentially visible cells in the study area or the APE.

Figure 3.11-1 Visual Study Area



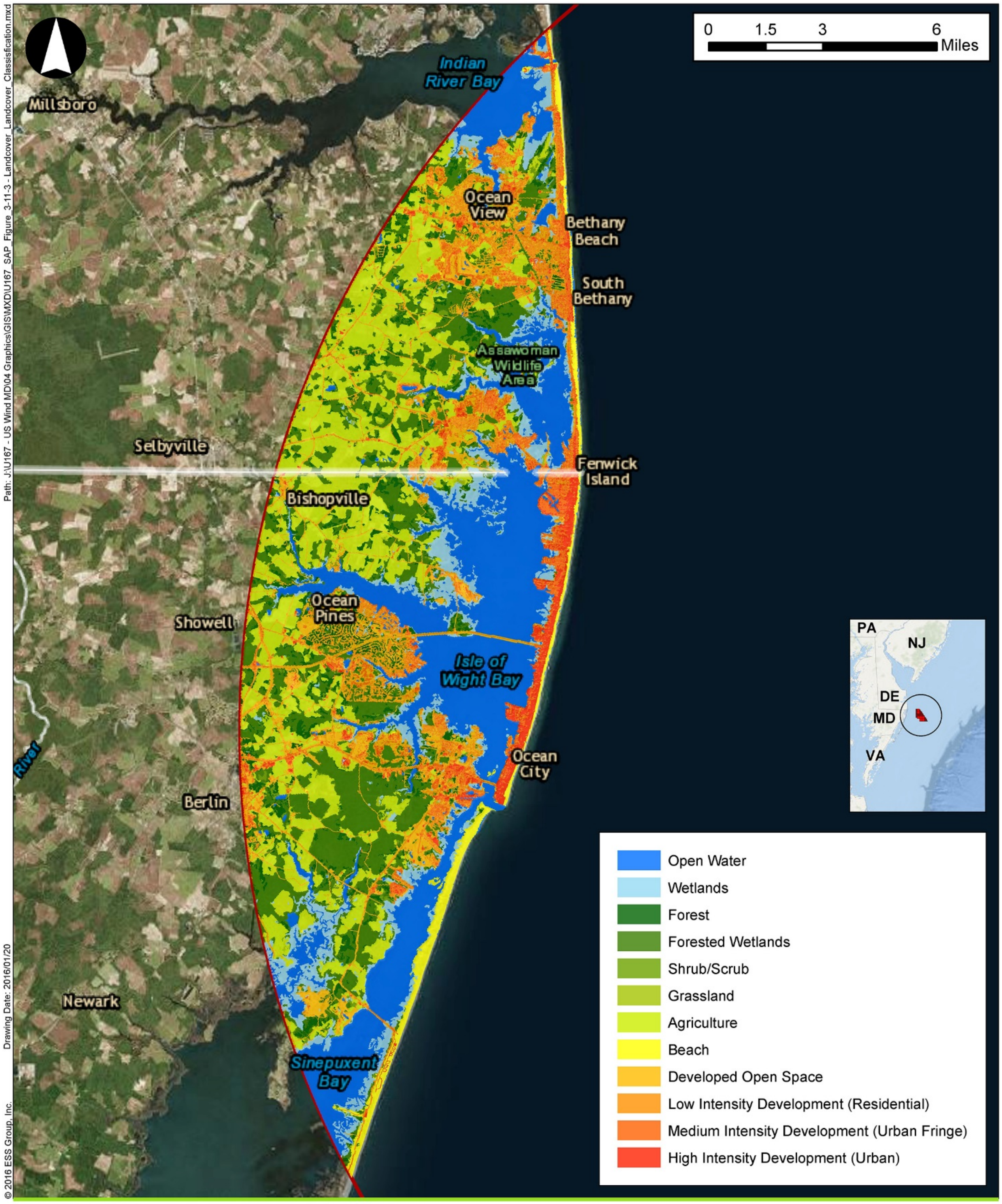
3.11.1.2 Existing Study Area Landscape Zones

Landscape zones can be defined as those areas within the visual study area that have a similar land use or viewer groups. Since cover type can often loosely define the landuse, the US Geological Survey (USGS) National Landcover Dataset (NLCD) data was used to provide the basis for this analysis. When looking at the entire study area, approximately 91.8 percent is open ocean. However, for the purposes of defining user experience, only landscape zones on the landward coastal portion of the study area are considered in Table 3.11-1, below, and Figure 3.11-2.

Table 3.11-1 Landcover Types within the Shoreward Visual Study Area

Landcover Type	Acres	Percent
Open Water (bays, ponds, etc.)	24627.5	24%
Forest and Forested Wetlands	21830.0	21%
Agriculture	20811.4	20%
Developed Open Space	9180.3	9%
Wetlands	8288.4	8%
Low Intensity Development (Residential)	7408.6	7%
Medium Intensity Development (Urban Fringe)	4765.9	5%
Beach	2430.4	2%
High Intensity Development (Urban)	2045.0	2%
Scrub/Shrub and Grasslands	1358.6	1%
Total	**102924.8**	**100%**

Figure 3.11-2 Land Cover Classifications



Open water (not including ocean) accounts for 24 percent of the landward study area and includes bays such as Assawoman Bay, Isle of Wight Bay, and Sinepuxent Bay. Some of these features extend up large estuaries and rivers right to the 25-mile study area boundary. Users in this landscape zone will likely include residents and recreationists. Residents and recreationists taking advantage of water views will likely have a high sensitivity to visual change. Additionally, expansive views are typically available from open water location. However, the inland open water areas within the study area have minimal views beyond the developed eastern shore. Therefore, these users will have low exposure to visual change.

Forest and Forested Wetlands (17 percent) are found throughout the study area; however, large concentrations occur bordering emergent wetlands adjacent to open water areas. These large tracts of forest are typically undeveloped, but are occasionally interspersed with either agricultural fields or residential developments. Users within this zone may include recreationist but the exposure to views from forested areas will be minimal.

Agricultural areas (20 percent) are concentrated almost entirely along the western portion of the visual study area and include large open field lots bordered by mature hedgerows and interspersed with rural residential lots. Agricultural areas will be comprised or residents and farm workers. These users are likely to have medium to high viewer sensitivity but typically limited to the pastoral landscape, rather than the coastal landscape. Additionally, this zone has little exposure to coastal views and therefore low exposure to visual change.

Developed open space (9 percent) typically includes golf courses and recreation fields. The actual number of open recreation areas, such as golf courses and fields, is expected to be much lower than suggested by the NLCD data due to the inclusion of expansive road shoulders, residential grass lots, and some roads due to the similar cover types. This zone may be comprised of recreationists, tourists, and residents. Often these users have a high sensitivity to visual change, but views are often focused within the zone. In the case of golf courses, the views are generally framed with wood lots or forest to give a pastoral impression, thus expansive views beyond the zone are not typical.

Wetlands (8 percent) occur almost entirely along the perimeter of open water portions of the study area bordering the bays, rivers and tributaries. Wetlands are typically void of any development. Recreationists are the most likely users in this zone and visual sensitivity is generally low as views are typically focused within the zone with little opportunity for expansive views beyond.

Low, medium, and high intensity developed areas are contiguous throughout the entire study area. The pattern formed by these categories follows typical urban development patterns where there are multiple cores of high intensity development leading to medium and then low intensity development, similar to when an urban area becomes increasingly rural residential as one travels away from the center. In this study area, the high intensity areas are generally clustered along the outer beaches (Ocean City and Bethany Beach) and then become increasingly less developed to the west. Along major road routes, such as, Route 28 in Bethany Beach and Route 20 in Fenwick Island, there are some additional pockets of high intensity development surrounded by medium and low intensity. Together these developed areas make up approximately 14 percent of the landward study area. Users in developed areas will include tourists, residents, workers and recreationist. Most views in the developed zone are localized and distracted by visual clutter or an abundance of visual interest within the zone itself. These user groups may range from low to high viewer sensitivity, but exposure to expansive views is generally low.

Beaches (2 percent) are located along the entire shorefront of the study area and vary in width depending on the proximity of development. These beach areas are the recreational draw for much of this study area and the most exposed to ocean views. Predominant users in this zone will include residents and recreationist. Passive recreationists, tourists and residents will likely have a high viewer sensitivity and high exposure to expansive views along the coast. Therefore, users within this zone are the most likely to recognize visual change.

Scrub/shrub and grassland areas were combined in the analysis, are relatively insignificant remainders scattered throughout the entire study area, and are not considered in this visual assessment.

3.11.1.3 Landform and Elevation

Elevations within the shoreward study area range from 0 feet to 72 feet and have an average slope of less than one percent. With relatively flat topography such as this, structures and vegetation stands have a big influence on available views to the water, especially considering the number of large structures built right up to the edge of beach barriers. Therefore, views of the ocean from areas inland of the first several hundred feet are rare throughout the study area.

3.11.1.4 Existing Visual Resources

A visual resource is defined as a natural or built feature that contributes to the character of a place. These resources might include scenic roads, overlooks, historic structures, or places that draw large concentrations of people. Visual resources were collected from multiple federal, state, and county records as GIS features. Three hundred and sixteen (316) visual resources were found in the 25-mile study area, most of which are clustered around Ocean City and Berlin. These visual resources and the sources from which they were obtained are provided in Table 3.11-2.

Table 3.11-2 MET Tower Visibility from Resources in Study Area

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
1	**Assateague Island National Seashore**	**National Seashore - National Park**	**Worcester**	**MD**	●	**20.2**				**Minimal**
National Register Historic Sites (IRMA Portal Integrated Resource Management Applications) Maryland National Register of Historic Places (iMAP)										
2	St. Pauls by-the-Sea Protestant Episcopal Church	National Register	Worcester	MD	●	18.0	8001013	WO-524	Architecture	Negligible to Minimal
3	**Williams Grove**	**National Register**	**Worcester**	**MD**	●	**22.6**	**96000919**	**WO-12**	**Architecture**	**Negligible to Minimal**
4	Fassitt House	National Register	Worcester	MD						None
5	**Henrys Grove**	**National Register**	**Worcester**	**MD**	●	**22.0**	**84001891**	**WO-8**	**Architecture**	**Negligible to Minimal**
6	St. Martins Church	National Register	Worcester	MD						None
7	Genesar	National Register	Worcester	MD						None
8	Caleb's Discovery	National Register	Worcester	MD						None
9	Fenwick Island Lighthouse Station	National Register	Sussex	DE						None
10	Tunnell--West House	National Register	Sussex	DE						None
11	**Sandy Point Archeological Site**	**National Register**	**Worcester**	**MD**	●	**23.8**	**75000932**		**Prehistoric Information Potential**	**Negligible**

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
MD State Historic Sites and Districts **Maryland Inventory of Historic Properties MD iMAP (Spatial Data)**										
12	Bridge	State Historic	Worcester	MD			-			None
13	Perry G. Bennett House	State Historic	Worcester	MD			-			None
14	Edward B. Mitchell; Sr. House	State Historic	Worcester	MD			-			None
15	Grace T. Trader Farm	State Historic	Worcester	MD			-			None
16	L. Coffin Farm	State Historic	Worcester	MD			-			None
17	Shirley T. Bowen House	State Historic	Worcester	MD			-			None
18	Henry Hastings House	State Historic	Worcester	MD			-			None
19	Lorenzo Joseph & Irene Tindley Brown House	State Historic	Worcester	MD			-			None
20	John W. Hudson House	State Historic	Worcester	MD			-			None
21	Norwood Robert & Mary Etta Marshall Whaley House	State Historic	Worcester	MD			-			None
22	Morris-Holland-Gault Cemetery	State Historic	Worcester	MD			-			None
23	Frank A. Sr. & Julia K. Widic Farm	State Historic	Worcester	MD			-			None
24	Parley D. & Mary E. Littleton Property	State Historic	Worcester	MD			-			None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
25	Roy Squares House	State Historic	Worcester	MD			-			None
26	Rachel A. Gault House	State Historic	Worcester	MD			-			None
27	William R. Powell House	State Historic	Worcester	MD			-			None
28	James E. & Hettie M. Thomas Tenant House	State Historic	Worcester	MD			-			None
29	Newport Properties; Inc.	State Historic	Worcester	MD			-			None
30	Charles S. & Annie May Perdue House	State Historic	Worcester	MD			-			None
31	Alice M. & Emma A. Fisher House	State Historic	Worcester	MD			-			None
32	John L. & Gloria P. Scott House	State Historic	Worcester	MD			-			None
33	13312 Muskrattown Rd.	State Historic	Worcester	MD			-			None
34	Diakonia	State Historic	Worcester	MD			-			None
35	219 Branch St.	State Historic	Worcester	MD			-			None
36	402 Flower St.	State Historic	Worcester	MD			-			None
37	404 Flower St	State Historic	Worcester	MD			-			None
38	406 Flower St	State Historic	Worcester	MD			-			None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
39	10209 Germantown Rd.	State Historic	Worcester	MD			-			None
40	110 Railroad Ave.	State Historic	Worcester	MD			-			None
41	100 Maple Ave.	State Historic	Worcester	MD			-			None
42	101 Maple Ave.	State Historic	Worcester	MD			-			None
43	11243 Grays Corner Rd.	State Historic	Worcester	MD			-			None
44	10316 Harrison Rd.	State Historic	Worcester	MD			-			None
45	10616 Harrison Rd.	State Historic	Worcester	MD			-			None
46	Downtown Brewing Company	State Historic	Worcester	MD			-			None
47	Beecher House	State Historic	Worcester	MD			-			None
48	Schaefer House	State Historic	Worcester	MD			-			None
49	Vincent House	State Historic	Worcester	MD			-			None
50	City Hall	State Historic	Worcester	MD			-			None
51	Ocean City Survey District	State Historic	Worcester	MD			-			None
52	Emery/Hartman House	State Historic	Worcester	MD			-			None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
53	Bunting House	State Historic	Worcester	MD			-			None
54	Francis Scott Key Motel	State Historic	Worcester	MD			-			None
55	Germantown School	State Historic	Worcester	MD			-			None
56	2nd Street Pumping Station	State Historic	Worcester	MD			-			None
57	Thomas Cropper Farm	State Historic	Worcester	MD			-			None
58	Grays Corner Survey District	State Historic	Worcester	MD			-			None
59	Hannah Davis House	State Historic	Worcester	MD			-			None
60	Ocean Downs Raceway	State Historic	Worcester	MD			-			None
61	Isle of Wight Lifesaving Station	State Historic	Worcester	MD			-			None
62	Mason-Dixon Line Initial Marker	State Historic	Worcester	MD			-			None
63	Fenwick Island Lighthouse	State Historic	Worcester	MD			-			None
64	**Williams Grove DUPLICATE LISTING**	**State Historic**	**Worcester**	**MD**	●		**-**	**WO-12**	**Architecture/Engineering**	**Negligible to Minimal**
65	**Henrys Grove (Bayside Farm; Pony Farm) - DUPLICATE LISTING**	**State Historic**	**Worcester**	**MD**	●	**22.0**	**84001891**	**WO-8**	**Architecture**	**Negligible to Minimal**
66	Fassitt House	State Historic	Worcester	MD			-			None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
67	Golden Quarter	State Historic	Worcester	MD			-			None
68	Zadok Purnell House (George Purnell House)	State Historic	Worcester	MD			-			None
69	Old Lime Kiln	State Historic	Worcester	MD			-			None
70	Newport Farm (Isaac Purnell House)	State Historic	Worcester	MD			-			None
71	Comfort Powell House (Elizabeth Gray House)	State Historic	Worcester	MD			-			None
72	St. Pauls Methodist Episcopal Church	State Historic	Worcester	MD			-			None
73	Evans House	State Historic	Worcester	MD			-			None
74	Taylorville United Methodist Church	State Historic	Worcester	MD			-			None
75	Holly Grove Farm (Laban Taylor Swamp Farm)	State Historic	Worcester	MD			-			None
76	Vics Country Store	State Historic	Worcester	MD			-			None
77	Walker House (Walker Cottage; Romarletta Bungalow)	State Historic	Worcester	MD			-			None
78	Joseph Edward Collins House	State Historic	Worcester	MD			-			None
79	St. Pauls By-the-Sea Episcopal Church	State Historic	Worcester	MD			-			None
80	Marvel House	State Historic	Worcester	MD			-			None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
81	Ocean City Baptist Church	State Historic	Worcester	MD			-			None
82	Lyle R. Cropper House	State Historic	Worcester	MD			-			None
83	John Dale Showell House	State Historic	Worcester	MD			-			None
84	Charles Ludlam House (Regal Restaurant)	State Historic	Worcester	MD			-			None
85	Taylor House (Perdue Property)	State Historic	Worcester	MD			-			None
86	Mount Vernon Hotel Annex	State Historic	Worcester	MD			-			None
87	**Mount Vernon Hotel (Isle of Wight Hotel)**	**State Historic**	**Worcester**	**MD**	●	**18.1**	**-**	**WO-328**	**Demolished**	**None**
88	St. Marys Star-of-the-Sea Catholic Church	State Historic	Worcester	MD			-			None
89	**Atlantic Hotel**	**State Historic**	**Worcester**	**MD**	●	**18.2**	**-**	**WO-76**	**Visual Character of District**	**Negligible to Minimal**
90	**U.S. Lifesaving Station Museum**	**State Historic**	**Worcester**	**MD**	●	**18.2**	**-**	**WO-323**	**Architecture Transportation**	**Negligible to Minimal**
91	**U.S. Coast Guard Tower**	**State Historic**	**Worcester**	**MD**	●	**18.3**	**-**	**WO-347**	**Architecture Transportation**	**Negligible to Minimal**
92	Samuel Ludlam House (Esposito Cottage)	State Historic	Worcester	MD			-			None
93	Henrys Hotel	State Historic	Worcester	MD			-			None
94	**Lambert Ayres House (Kate Bunting House)**	**State Historic**	**Worcester**	**MD**	●	**18.1**	**-**	**WO-334**	**Architecture**	**Negligible to Minimal**

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
95	Edwin L. Purnell Store	State Historic	Worcester	MD			-			None
96	Town Market	State Historic	Worcester	MD			-			None
97	**Tarry-A-While Guest House (Margaret Vandegrift Cottage)**	**State Historic**	**Worcester**	**MD**	●	**18.2**	**-**	**WO-333**	**Architecture**	**Negligible to Minimal**
98	**Pier Building (Pier Pavilion)**	**State Historic**	**Worcester**	**MD**	●	**18.2**	**-**	**WO-327**	**Architecture/Commerce**	**Negligible to Minimal**
99	St. Martins Church	State Historic	Worcester	MD			-			None
100	Edward Mariner Farm (Atkinsons Conclusion; Hales Farm)	State Historic	Worcester	MD			-			None
101	Old Collins Farn	State Historic	Worcester	MD			-			None
102	Levin W. Collins House	State Historic	Worcester	MD			-			None
103	Lizzie Bishop House (Dr. T.A.J. Holloway House)	State Historic	Worcester	MD			-			None
104	Davidson Farm (Dr. T.A.J. Holloway Farm)	State Historic	Worcester	MD			-			None
105	Zion United Methodist (M.E.) Church	State Historic	Worcester	MD			-			None
106	School No. 3	State Historic	Worcester	MD			-			None
107	Bishopville Survey District	State Historic	Worcester	MD			-			None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
108	**Woodcock House (Sandy Point; Dirickson Farm)**	**State Historic**	**Worcester**	**MD**	●	**23.3**	**-**	**WO-11**	**Archeology/ Historic**	**Negligible to Minimal**
109	Gabriel & Diana Purnell Store	State Historic	Worcester	MD			-			None
110	Pennington Farm	State Historic	Worcester	MD			-			None
111	**North Beach Lifesaving Station**	**State Historic**	**Worcester**	**MD**	●	**20.0**	**-**	**WO-357**	**Architecture Transportation**	**Negligible to Minimal**
112	Harry W. Kelley Memorial Bridge	State Historic	Worcester	MD			-			None
113	Bridge 230013 (SHA)	State Historic	Worcester	MD			-			None
114	Genesar (Genezir)	State Historic	Worcester	MD			-			None
115	Julia Timmons House	State Historic	Worcester	MD			-	-	-	None
116	Showell Survey District	State Historic	Worcester	MD			-	-	-	None
117	Richard J.; Jr. & Ellen M. Truitt House	State Historic	Worcester	MD			-	-	-	None
118	Calvin E. Davis House	State Historic	Worcester	MD			-	-	-	None
119	Erma & Norwood Davis House	State Historic	Worcester	MD			-	-	-	None
120	Stephen Decatur Monument	State Historic	Worcester	MD			-	-	-	None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
Byway, Parks, Open Space Recreation Various Sources (Delaware.gov, Visit Maryland, Google Earth, iMAP, Delaware FirstMap Open Data)										
121	Cape to Cape Scenic Byway	State Scenic Byway	MD-DE				-	-	-	None
122	**Assateague State Park**	**State Park**	**Worcester**	**MD**	●	**22.4**	**-**	**-**	**-**	**Negligible to Minimal**
123	**Fenwick Island State Park**	**State Park**	**Sussex**	**DE**	●	**18.4**	**-**	**-**	**-**	**Negligible to Minimal**
124	South Bethany Community Park	Park	Sussex	DE			-	-	-	None
125	Gorman Avenue Park	Park	Worcester	MD			-	-	-	None
126	North Side Park	Park	Worcester	MD			-	-	-	None
127	West Park	Park	Sussex	DE			-	-	-	None
128	Assawoman Bay State Wildlife Area	Park	Sussex	DE			-	-	-	None
129	**Bethany Beach Boardwalk**	**Local Historic**	**Sussex**	**DE**	●	**20.7**	**-**	**-**	**-**	**Negligible to Minimal**
130	**Ocean City MD Boardwalk**	**Local Historic**	**Worcester**	**MD**	●	**17.9**	**-**	**-**	**-**	**Negligible to Minimal**
131	Mattapany (historical)	Local Historic	Sussex	DE			-	-	-	None
132	Marsh Island (historical)	Island	Sussex	DE			-	-	-	None
133	Reedy Island	Island	Sussex	DE			-	-	-	None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
134	Seal Island	Island	Sussex	DE			-	-	-	None
135	Cherrybush Island	Island	Sussex	DE			-	-	-	None
136	Little Sheep Hammock	Island	Sussex	DE			-	-	-	None
137	Point of Cedars Island	Island	Sussex	DE			-	-	-	None
138	Bush Island	Island	Sussex	DE			-	-	-	None
139	Big Sheep Hammock	Island	Sussex	DE			-	-	-	None
140	Bethany Bay Golf Club	Golf Course	Sussex	DE			-	-	-	None
141	Rum Pointe Seaside Golf Links	Golf Course	Worcester	MD	●	23.5	-	-	-	Negligible to Minimal
142	Ocean City Golf Club	Golf Course	Worcester	MD			-	-	-	None
143	Pine Shore Golf	Golf Course	Worcester	MD			-	-	-	None
144	Glen Riddle Golf Club	Golf Course	Worcester	MD			-	-	-	None
145	Ocean Pines Golf& Country Club	Golf Course	Worcester	MD			-	-	-	None
146	Ocean Pines Golf Club	Golf Course	Worcester	MD			-	-	-	None
147	Ocean Resorts Golf Club	Golf Course	Worcester	MD			-	-	-	None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
148	Links At Lighthouse Sound	Golf Course	Worcester	MD			-	-	-	None
149	Bayside Resort Golf Club	Golf Course	Sussex	DE			-	-	-	None
150	**Eagle's Landing Golf Course**	**Golf Course**	**Worcester**	**MD**	●	**20.5**	**-**	**-**	**-**	**Negligible to Minimal**
151	Ocean City Golf Groups	Golf Course	Worcester	MD			-	-	-	None
152	Bear Trap Dunes Clubhouse	Golf Course	Sussex	DE			-	-	-	None
153	**Bethany Beach**	**Beach**	**Sussex**	**DE**	●	**20.9**	**-**	**-**	**-**	**Negligible to Minimal**
154	**Ocean City Beach**	**Beach**	**Worcester**	**MD**	●	**17.6**	**-**	**-**	**-**	**Negligible to Minimal**
National Register Eligible										
155	College	Building(s)	Worcester	MD						None
156	Gravatte House #2	Building(s)	Sussex	DE						None
Unevaluated Historic Resource										
157	100 Ocean View Parkway	Building(s)	Sussex	DE						None
158	101 Second Street	Building(s)	Sussex	DE						None
159	103 Ocean View Parkway	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
160	103 Parkwood Street	Building(s)	Sussex	DE						None
161	103 Second Street	Building(s)	Sussex	DE						None
162	103 Wellington Parkway	Building(s)	Sussex	DE						None
163	104 First Street	Building(s)	Sussex	DE						None
164	104 Oakwood Street	Building(s)	Sussex	DE						None
165	104 Parkwood Street	Building(s)	Sussex	DE						None
166	104 Third Street	Building(s)	Sussex	DE						None
167	105 Maplewood Street	Building(s)	Sussex	DE						None
168	106 First Street	Building(s)	Sussex	DE						None
169	106 Ocean View Parkway	Building(s)	Sussex	DE						None
170	107 Ashwood Street	Building(s)	Sussex	DE						None
171	107 Second Street	Building(s)	Sussex	DE						None
172	108 Fifth Street	Building(s)	Sussex	DE						None
173	108 First Street	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
174	108 Third Street	Building(s)	Sussex	DE						None
175	109 Parkwood Street	Building(s)	Sussex	DE						None
176	109Central Boulevard	Building(s)	Sussex	DE						None
177	110 Central Boulevard	Building(s)	Sussex	DE						None
178	110 Maplewood Street	Building(s)	Sussex	DE						None
179	110 Ocean View Parkway	Building(s)	Sussex	DE						None
180	110 Parkwood Street	Building(s)	Sussex	DE						None
181	110 Wellington Parkway	Building(s)	Sussex	DE						None
182	111 Ashwood Street	Building(s)	Sussex	DE						None
183	111 Maplewood Street	Building(s)	Sussex	DE						None
184	111 Second Street	Building(s)	Sussex	DE						None
185	111 Third Street	Building(s)	Sussex	DE						None
186	113 First Street	Building(s)	Sussex	DE						None
187	113 Parkwood Street	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
188	113 Third Street	Building(s)	Sussex	DE						None
189	114 Central Boulevard	Building(s)	Sussex	DE						None
190	114 Wellington Parkway	Building(s)	Sussex	DE						None
191	115 Ocean View Parkway	Building(s)	Sussex	DE						None
192	116 Central Boulevard	Building(s)	Sussex	DE						None
193	116 Maplewood Street	Building(s)	Sussex	DE						None
194	116 Ocean View Parkway	Building(s)	Sussex	DE						None
195	117 Fifth Street	Building(s)	Sussex	DE						None
196	117 Second Street	Building(s)	Sussex	DE						None
197	117 Third Street	Building(s)	Sussex	DE						None
198	118 Central Boulevard	Building(s)	Sussex	DE						None
199	118 Ocean View Parkway	Building(s)	Sussex	DE						None
200	118 Parkwood Street	Building(s)	Sussex	DE						None
201	118 Third Street	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
202	119 Fourth Street	Building(s)	Sussex	DE						None
203	119 Oakwood Street	Building(s)	Sussex	DE						None
204	119 Parkwood Street	Building(s)	Sussex	DE						None
205	119 Third Street	Building(s)	Sussex	DE						None
206	120 First Street	Building(s)	Sussex	DE						None
207	120 Oakwood Street	Building(s)	Sussex	DE						None
208	121 First Street	Building(s)	Sussex	DE						None
209	121 Third Street	Building(s)	Sussex	DE						None
210	122 Fourth Street	Building(s)	Sussex	DE						None
211	122 Parkwood Street	Building(s)	Sussex	DE						None
212	123 First Street	Building(s)	Sussex	DE						None
213	123 Oakwood Street	Building(s)	Sussex	DE						None
214	123 Ocean View Parkway	Building(s)	Sussex	DE						None
215	123 Parkwood Street	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
216	**15 Atlantic Avenue**	**Building(s)**	**Sussex**	**DE**	●	**20.8**			**Unknown**	**Negligible to Minimal**
217	16 Atlantic Avenue	Building(s)	Sussex	DE						None
218	18 Atlantic Avenue	Building(s)	Sussex	DE						None
219	201 Central Boulevard	Building(s)	Sussex	DE						None
220	26 Atlantic Avenue	Building(s)	Sussex	DE						None
221	26 Atlantic Avenue	Building(s)	Sussex	DE						None
222	30 Pennsylvania Avenue	Building(s)	Sussex	DE						None
223	**33 Fifth Street**	**Building(s)**	**Sussex**	**DE**	●	**21.1**			**Unknown**	**Negligible to Minimal**
224	33 Pennsylvania Avenue	Building(s)	Sussex	DE						None
225	35 Pennsylvania Avenue	Building(s)	Sussex	DE						None
226	50 Pennsylvania Avenue	Building(s)	Sussex	DE						None
227	53 Atlantic Avenue	Building(s)	Sussex	DE						None
228	64 Atlantic Avenue	Building(s)	Sussex	DE						None
229	66 Atlantic Avenue	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
230	7 Atlantic Avenue	Building(s)	Sussex	DE						None
231	8 Pennsylvania Avenue	Building(s)	Sussex	DE						None
232	**84 Atlantic Avenue**	**Building(s)**	**Sussex**	**DE**	●	**21.1**			**Unknown**	**Negligible to Minimal**
233	**86 Atlantic Avenue**	**Building(s)**	**Sussex**	**DE**	●	**21.1**			**Unknown**	**Negligible to Minimal**
234	9 Pennsylvania Avenue	Building(s)	Sussex	DE						None
235	99 Third Street; Northeast corner of Atlantic and Third	Building(s)	Sussex	DE						None
236	Adams House	Building(s)	Sussex	DE						None
237	Alexander House #1	Building(s)	Sussex	DE						None
238	Alexander House #2	Building(s)	Sussex	DE						None
239	Alexander House #3	Building(s)	Sussex	DE						None
240	Anderson House #1	Building(s)	Sussex	DE						None
241	Anderson House#2	Building(s)	Sussex	DE						None
242	**Andrew Forgash House**	**Building(s)**	**Sussex**	**DE**	●	**17.7**			**Unknown**	**Negligible to Minimal**
243	**Assateague Island State Park**	**Site**	**Worcester**	**MD**	●	**22.2**			**Unknown**	**Negligible to Minimal**

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
244	**Assateague Island State Park**	**Site**	**Worcester**	**MD**	●	**23.3**			**Unknown**	**Negligible to Minimal**
245	Baltimore Trust	Building(s)	Sussex	DE					Unknown	
246	**Bently - Druar House**	**Building(s)**	**Sussex**	**DE**	●	**17.7**			**Unknown**	**Negligible to Minimal**
247	**Bethany Beach Wreck Site**	**Site**	**Sussex**	**DE**	●	**20.7**			**Unknown**	**Negligible to Minimal**
248	Bowman House	Building(s)	Sussex	DE						None
249	Britt House	Building(s)	Sussex	DE						None
250	Burney House	Building(s)	Sussex	DE						None
251	Casa Mara	Building(s)	Sussex	DE						None
252	Corner of Atlantic Avenue and Ocean View Parkway	Building(s)	Sussex	DE						None
253	Drexler House Apartments / Farm Complex	Building(s)	Sussex	DE						None
254	**Elise Bunting House**	**Building(s)**	**Sussex**	**DE**	●	**17.7**				**Negligible to Minimal**
255	**Emma Halpen House**	**Building(s)**	**Sussex**	**DE**	●	**17.7**			**Unknown**	**Negligible to Minimal**
256	Errett House #1	Building(s)	Sussex	DE						None
257	Errett House #2	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
258	Ewing-Bowen House	Building(s)	Sussex	DE						None
259	Ferris House	Building(s)	Sussex	DE						None
260	Fire Control Towers	Structure	Sussex	DE						None
261	Fire Control Towers	Structure	Sussex	DE						None
262	Gannon House	Building(s)	Sussex	DE						None
263	Graeber House	Building(s)	Sussex	DE						None
264	Haddaway	Building(s)	Sussex	DE						None
265	Happy Landing	Building(s)	Sussex	DE						None
266	Harms House	Building(s)	Sussex	DE						None
267	Heiber House	Building(s)	Sussex	DE						None
268	Hickman House	Building(s)	Sussex	DE						None
269	High Tide	Building(s)	Sussex	DE						None
270	Hollander House	Building(s)	Sussex	DE						None
271	Howard House	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
272	Hugg House	Building(s)	Sussex	DE						None
273	Isle of Wight Hotel	Building(s)	Worcester	Maryland						None
274	J. Conn Scott House	Building(s)	Sussex	DE						None
275	Journey's End	Building(s)	Sussex	DE						None
276	Lilly House	Building(s)	Sussex	DE						None
277	Marshall House	Building(s)	Sussex	DE						None
278	Melton's Folly	Building(s)	Sussex	DE						None
279	Merker-Campbell House	Building(s)	Sussex	DE						None
280	**Minkoff House**	**Building(s)**	**Sussex**	**DE**	●	**21.1**				**Negligible to Minimal**
281	Montana House	Building(s)	Sussex	DE						None
282	Mulligan House	Building(s)	Sussex	DE						None
283	Northeast corner of Atlantic Avenue and First Street	Building(s)	Sussex	DE						None
284	Northeast corner of Atlantic Avenue and Wellington	Building(s)	Sussex	DE						None
285	Ostergard House	Building(s)	Sussex	DE						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
286	Pepper House #1	Building(s)	Sussex	DE						None
287	Pepper House #2	Building(s)	Sussex	DE						None
288	Rhodes 5 & 10	Building(s)	Sussex	DE						None
289	Robert Moran House	Building(s)	Sussex	DE						None
290	Rowe House	Building(s)	Sussex	DE						None
291	Russell Brown House	Building(s)	Sussex	DE						None
292	Sandpiper	Building(s)	Sussex	DE						None
293	**Sandra Robertson House**	**Building(s)**	**Sussex**	**DE**	●	**17.7**			**Unknown**	**Negligible to Minimal**
294	Schlosser House	Building(s)	Sussex	DE						None
295	Sea Gull	Building(s)	Sussex	DE						None
296	Sea Roc	Building(s)	Sussex	DE						None
297	Sea Roc Jr.	Building(s)	Sussex	DE						None
298	Sea Shellter	Building(s)	Sussex	DE						None
299	**Sherman House**	**Building(s)**	**Sussex**	**DE**	●	**20.6**			**Unknown**	**Negligible to Minimal**

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
300	Sweeny House	Building(s)	Sussex	DE						None
301	The Ark	Building(s)	Sussex	DE						None
302	The Tide's	Building(s)	Sussex	DE						None
303	The Townsend Hotel / The Clubhouse	Building(s)	Sussex	DE						None
304	Wade House	Building(s)	Sussex	DE						None
305	Weightman House	Building(s)	Sussex	DE						None
306	Williams Inn	Building(s)	Sussex	DE						None
307	Wood House	Building(s)	Sussex	DE						None
National Register Not Eligible										
308	Bounded by 3rd st.; Somerset St.; Baltimore Ave & Sinepuxent Bay	District	Worcester	MD						None
309	Caroline Boarding House	Building(s)	Worcester	MD						None
310	Chrales Ludlam House	Building(s)	Worcester	MD						None
311	Margaret Vandergrift Guest House	Building(s)	Worcester	MD						None
312	Martha & Irving Mumford House	Building(s)	Worcester	MD						None

Map ID	Label	Type	County	State	Visible (Within APE)	Distance	National Listing ID	State Listing ID	Listing Criteria	Potential Visual Impact Resulting from Project
313	Morton House	Building(s)	Sussex	DE						None
314	Ocean City Presbyterian Church	Building(s)	Worcester	MD						None
315	Salt Box	Building(s)	Sussex	DE						None
316	Bethany Beach	Site	Sussex	DE						None

Visual Resource Sources

1. Department of Planning, Maryland Historical Trust; The Maryland Inventory of Historic Properties: http://data.imap.maryland.gov/datasets?q=Historic
2. National Park Service – National Register of Historic Places – MD, DE http://focus.nps.gov/nrhp/Download/
3. MD SHPO Outreach. Finding of sufficient background research and minimal visual impact to historic resources. 1/20/2016 – See Attachment A
4. DE SHPO Outreach. Finding of sufficient background research and minimal visual impact to historic resources. 1/14/2016 – See Attachment B
5. Department of Planning, Maryland Historical Trust Maryland National Register of Historic Places (from Maryland GIS Data Catalog: Historic) http://data.imap.maryland.gov/datasets?q=Historic
6. National Register-listed Properties – Delaware - https://chris-users.delaware.gov/public/#/
7. Cape to Cape Scenic Byway - http://www.visitmaryland.org/listing/tours/scenic-byways-cape-to-cape
8. ESRI Arcgis National Seashore Boundary https://www.arcgis.com/home/item.html?id=3faca513214f43c6b1dc581cfd055c6b
9. Google Earth (Parks, Golf Courses, Boardwalks, Beaches)
10. Delaware State Parks http://www.destateparks.com/
11. Maryland Public Lands http://dnr2.maryland.gov/publiclands/Pages/default.aspx
12. Delaware Geographic Names - http://opendata.firstmap.delaware.gov/datasets/c41a55ec4a4f4b538398930b8b35d8f5_0
13. Cape to Cape Scenic Byway - http://www.visitmaryland.org/listing/tours/scenic-byways-cape-to-cape

3.11.2 Potential Impacts

In order to identify potential impacts, a viewshed analysis, line of sight cross section analysis, field visit, and simulations were completed. The process for completing these analyses and the results of each are presented below.

3.11.2.1 Viewshed Analysis Results

The viewshed analysis suggests that 84 percent of the visual study area is shown as having potential MET Tower visibility. A large portion of the total visible area includes 1801 square miles of open ocean. More relevantly, potential MET tower visibility occurs in approximately seven (7) percent of the landward study area. This visibility is concentrated along the entire shoreline, but in places, such as Ocean City and Bethany Beach, the first row of buildings tend to block views from locations further inland (Figure 3.11-3 Sheets 1 to 14). Visibility does occur across the barrier islands in places such as Assateague National Seashore and Fenwick Island State Park where there is little to no waterfront development. Potential visibility of the MET tower from visual resources in APE is indicated in Table 3.1-2. The location of these resources in relation to the potential project visibility can be found in Figure 3.11-3 Sheets 1 to 14.

Figure 3.11-3 Viewshed Analysis and Visual Resources – Index

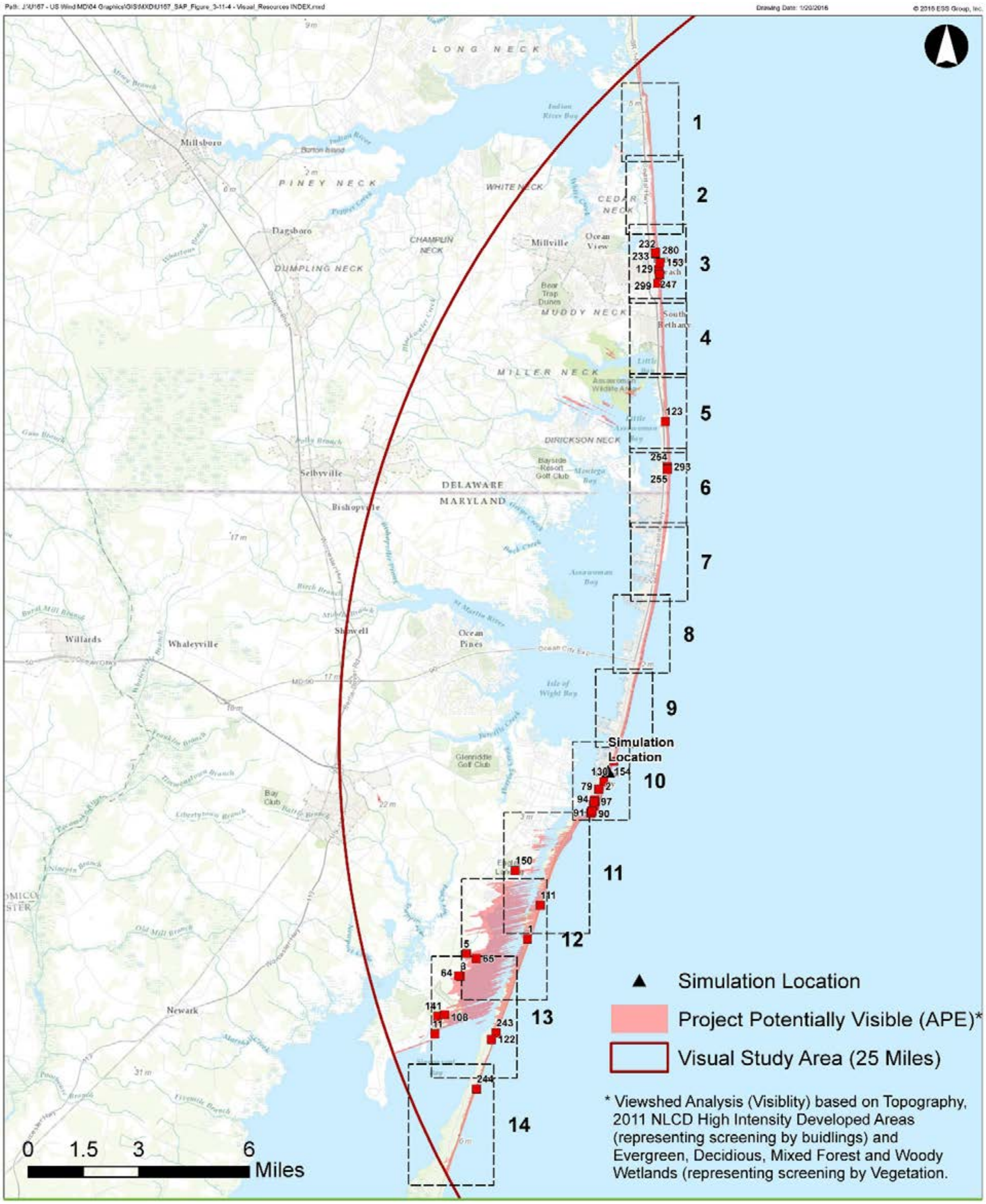
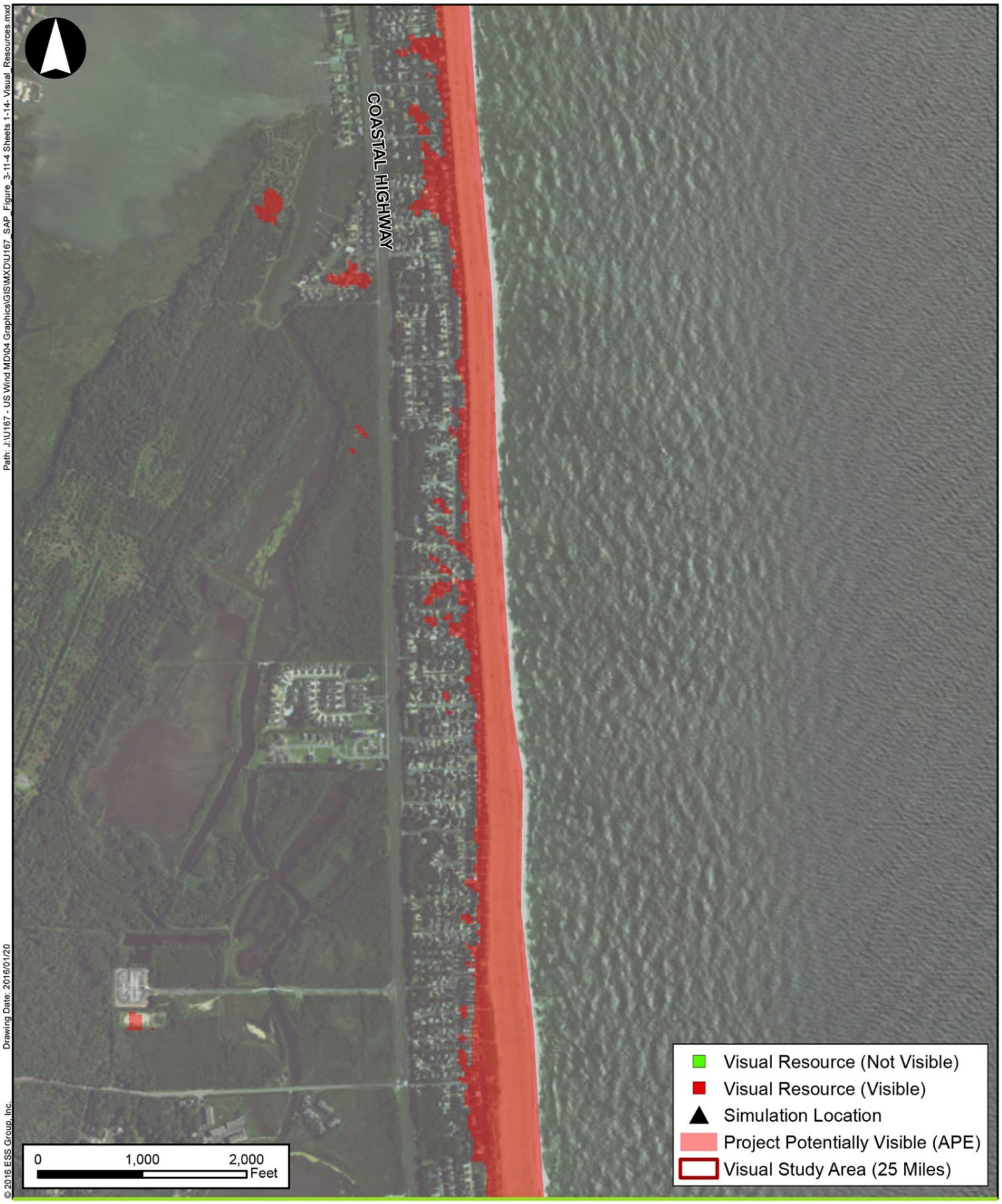


Figure 3.11-4 Viewshed Analysis and Visual Resources – Detail Sheet 1

Figure 3.11-5 Viewshed Analysis and Visual Resources – Detail Sheet 2



Path: J:\U167 - US Wind MD\04 Graphics\GIS\MXD\U167_SAP_Figure_3-11-4 Sheets 1-14- Visual_Resources.mxd

Drawing Date: 2016/01/20

Figure 3.11-6 Viewshed Analysis and Visual Resources – Detail Sheet 3

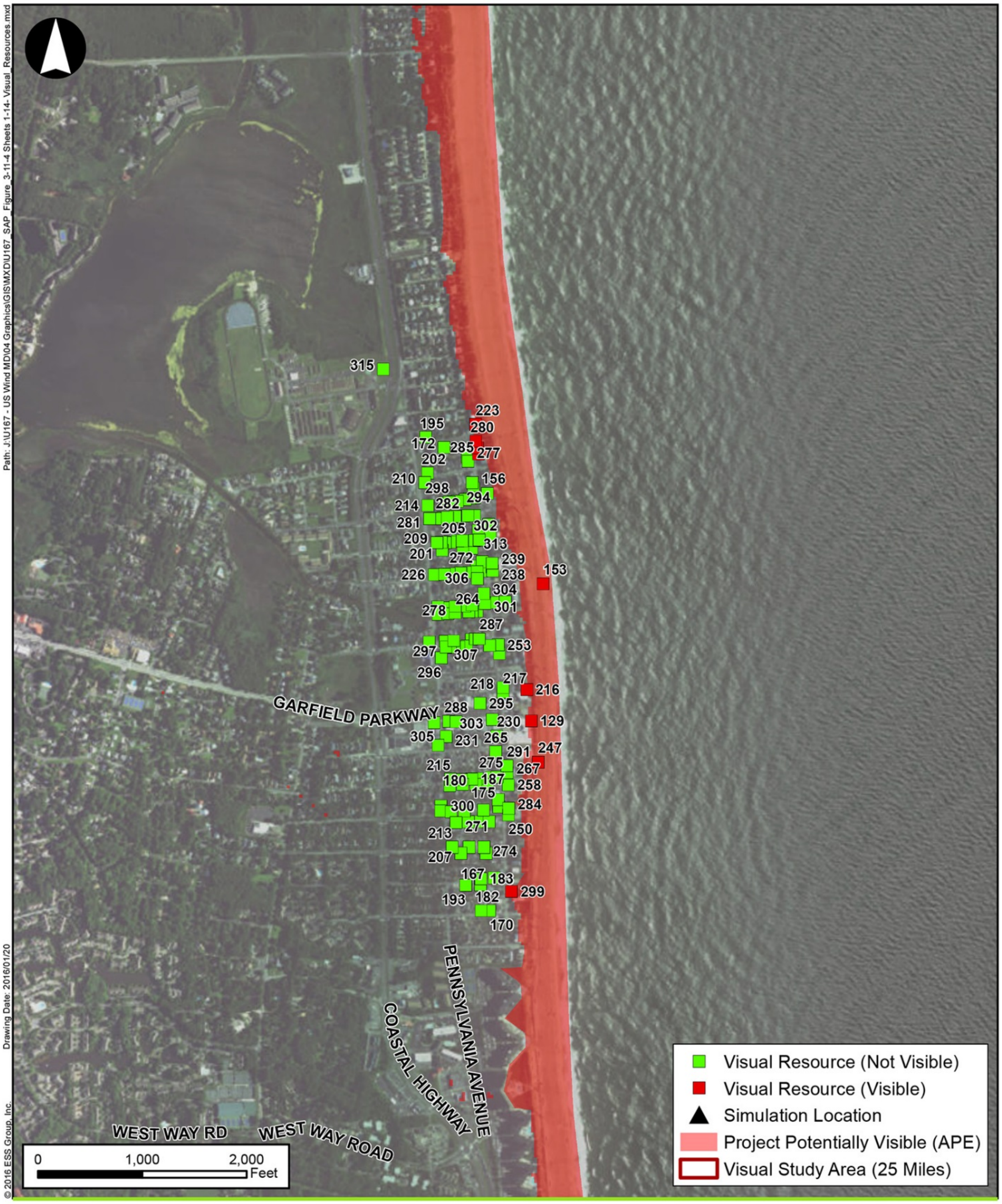


Figure 3.11-7 Viewshed Analysis and Visual Resources – Detail Sheet 4

Figure 3.11-8 Viewshed Analysis and Visual Resources – Detail Sheet 5

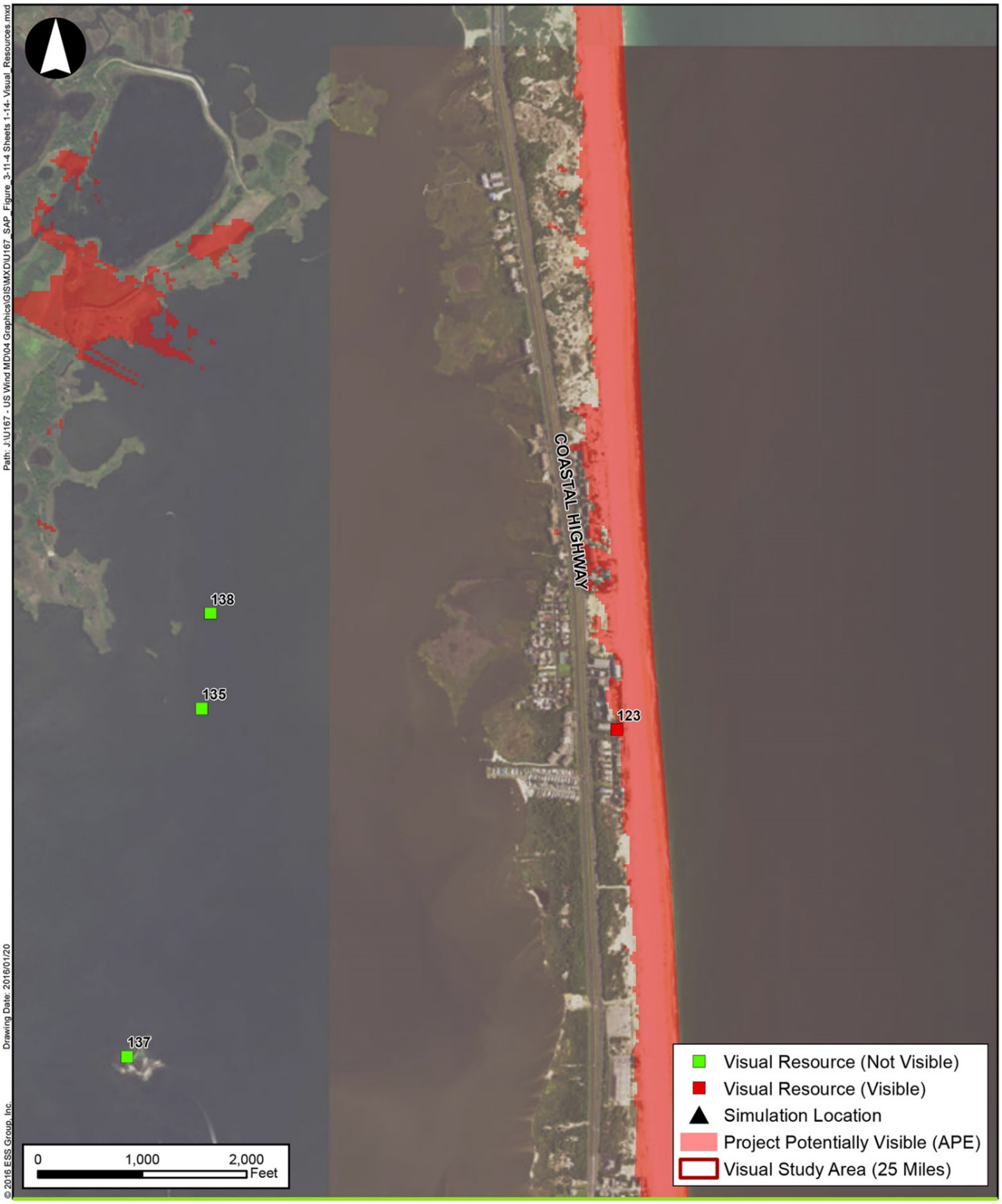


Figure 3.11-9 Viewshed Analysis and Visual Resources – Detail Sheet 6

Figure 3.11-10 Viewshed Analysis and Visual Resources – Detail Sheet 7

Figure 3.11-11 Viewshed Analysis and Visual Resources – Detail Sheet 8

Figure 3.11-12 Viewshed Analysis and Visual Resources – Detail Sheet 9

Figure 3.11-13 Viewshed Analysis and Visual Resources – Detail Sheet 10

Figure 3.11-14 Viewshed Analysis and Visual Resources – Detail Sheet 11

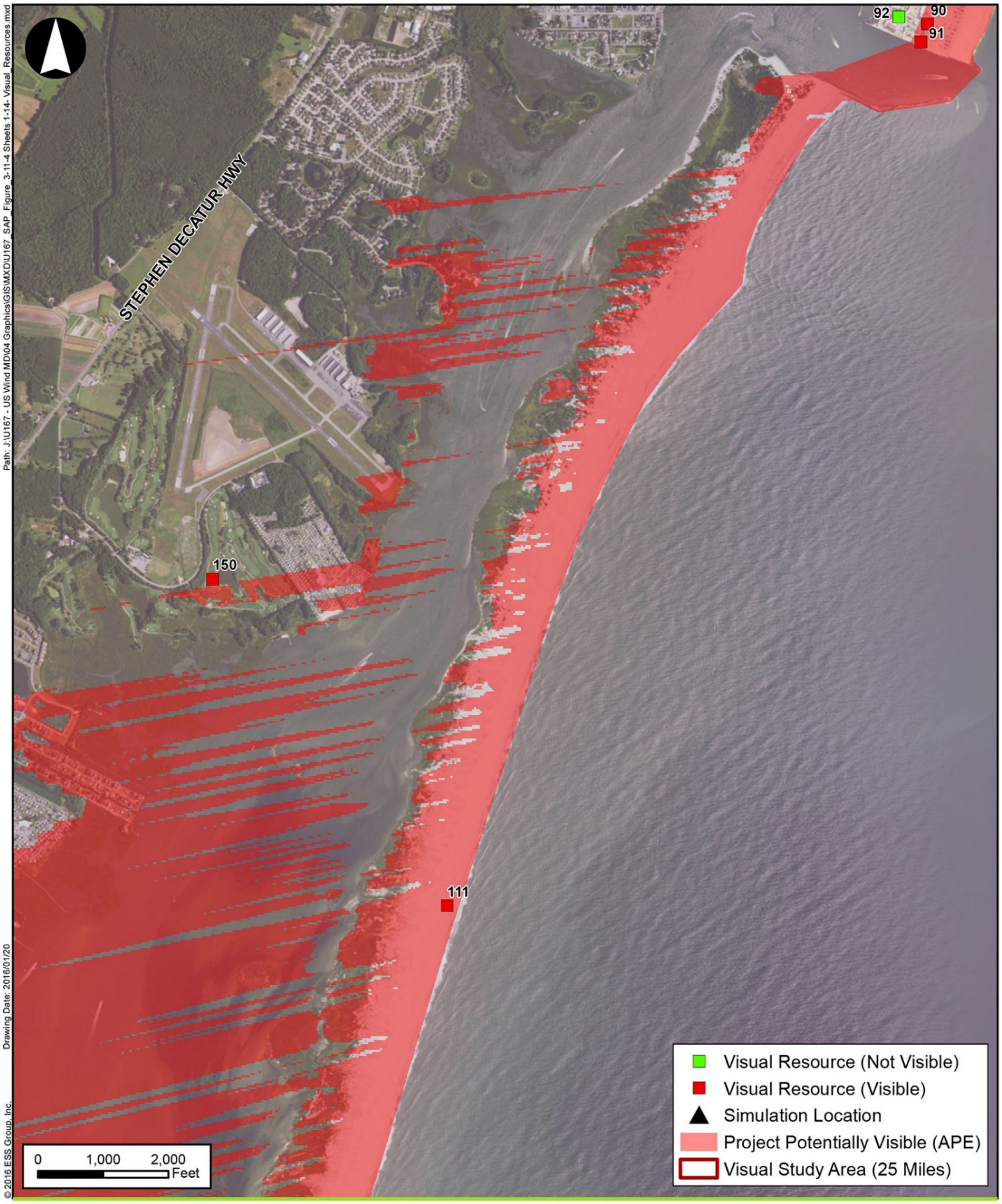


Figure 3.11-15 Viewshed Analysis and Visual Resources – Detail Sheet 12

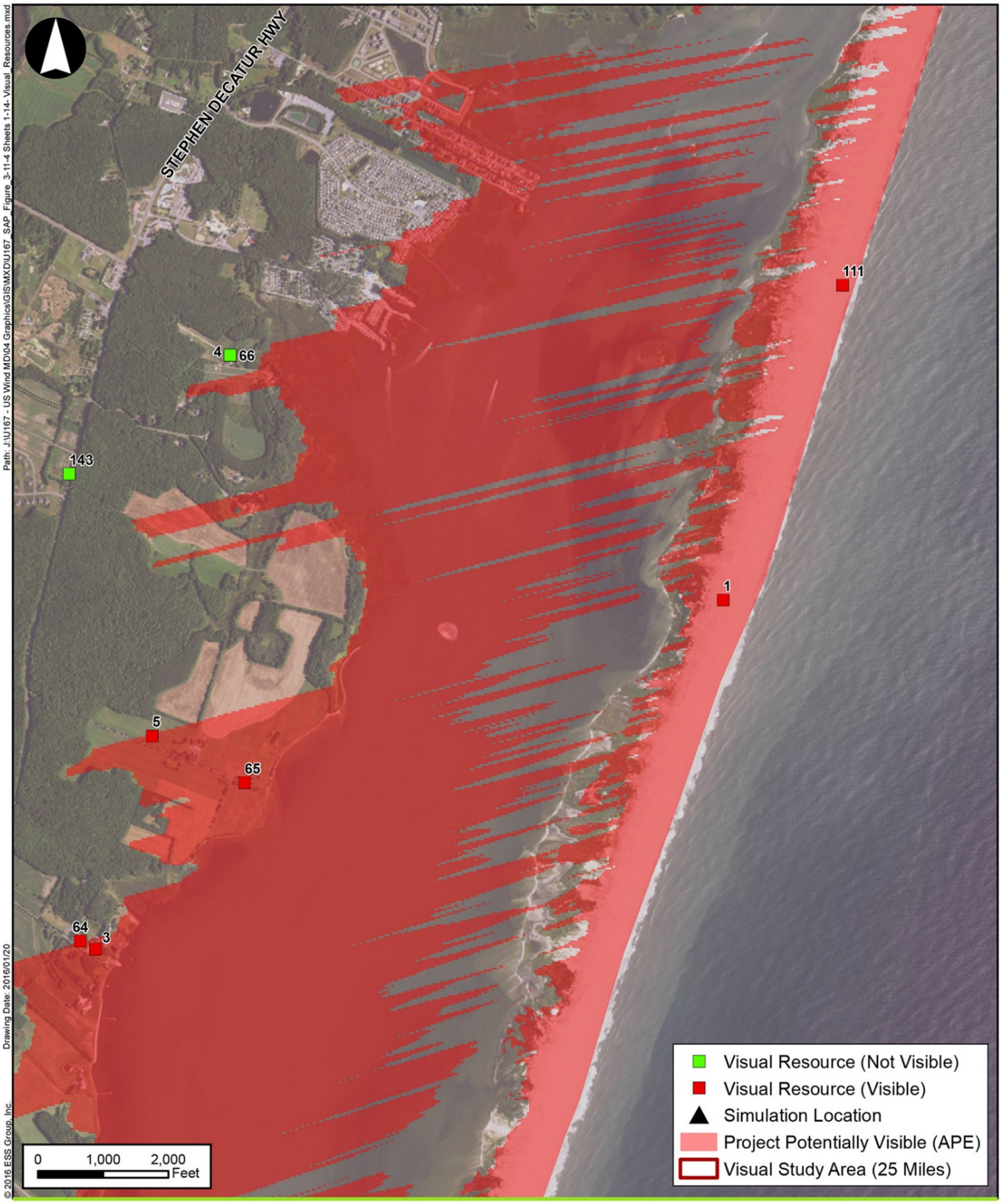


Figure 3.11-16 Viewshed Analysis and Visual Resources – Detail Sheet 13

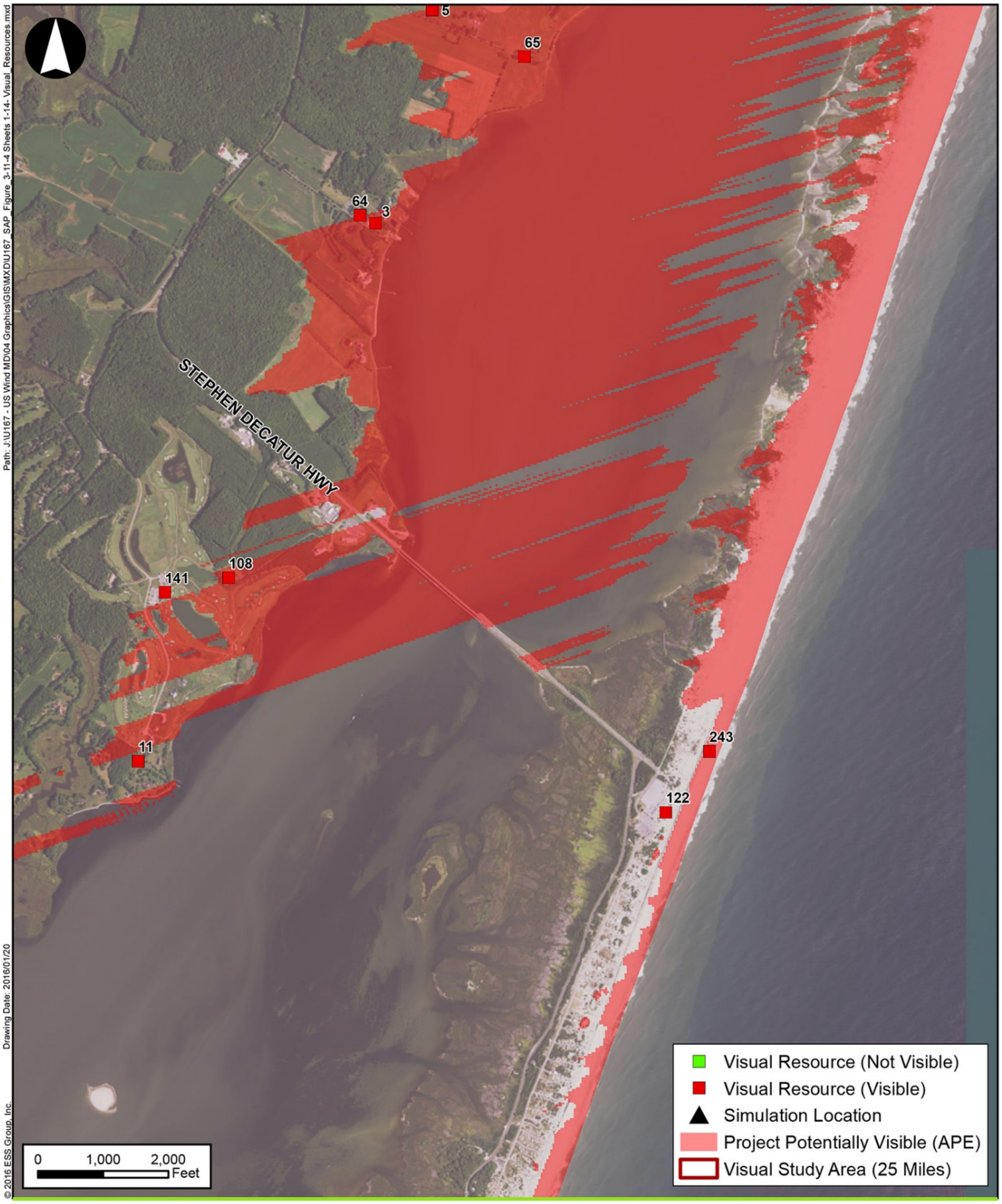
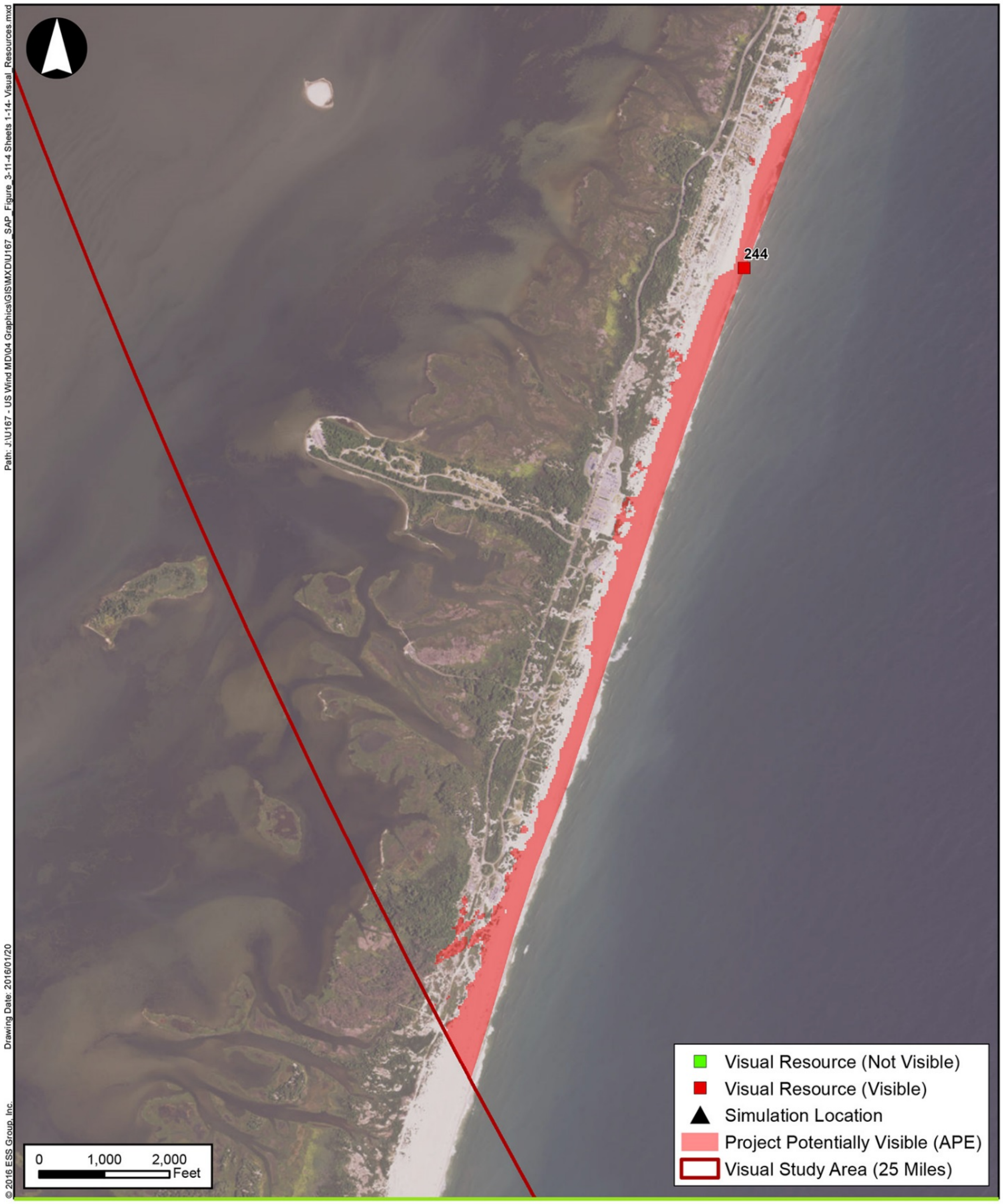


Figure 3.11-17 Viewshed Analysis and Visual Resources – Detail Sheet 14



3.11.2.2 Field Visit and Visual Simulations

On October 20, 2015 a visual expert visited the Project study area in order to document views in the direction of the proposed MET tower. Weather conditions were sunny and the mean temperature was 54 degrees. Mean humidity was 65 percent (National Weather Service, Observed Weather Reports, 2015) and visibility was ideal for maximum viewing distance. A total of six locations were photographed during the day and three locations at night. A Nikon D810 full frame digital SLR with a 50mm lens was used to document the existing views. The camera was mounted on a tripod for stability and images were taken at 36.3 megapixels for a resulting image dimension of 7360x4912 pixels. GPS positions were also recorded at each photo location. Before the photograph was taken, the GPS was used to setup a bearing line to the proposed MET tower such that it would be centered in each photograph.

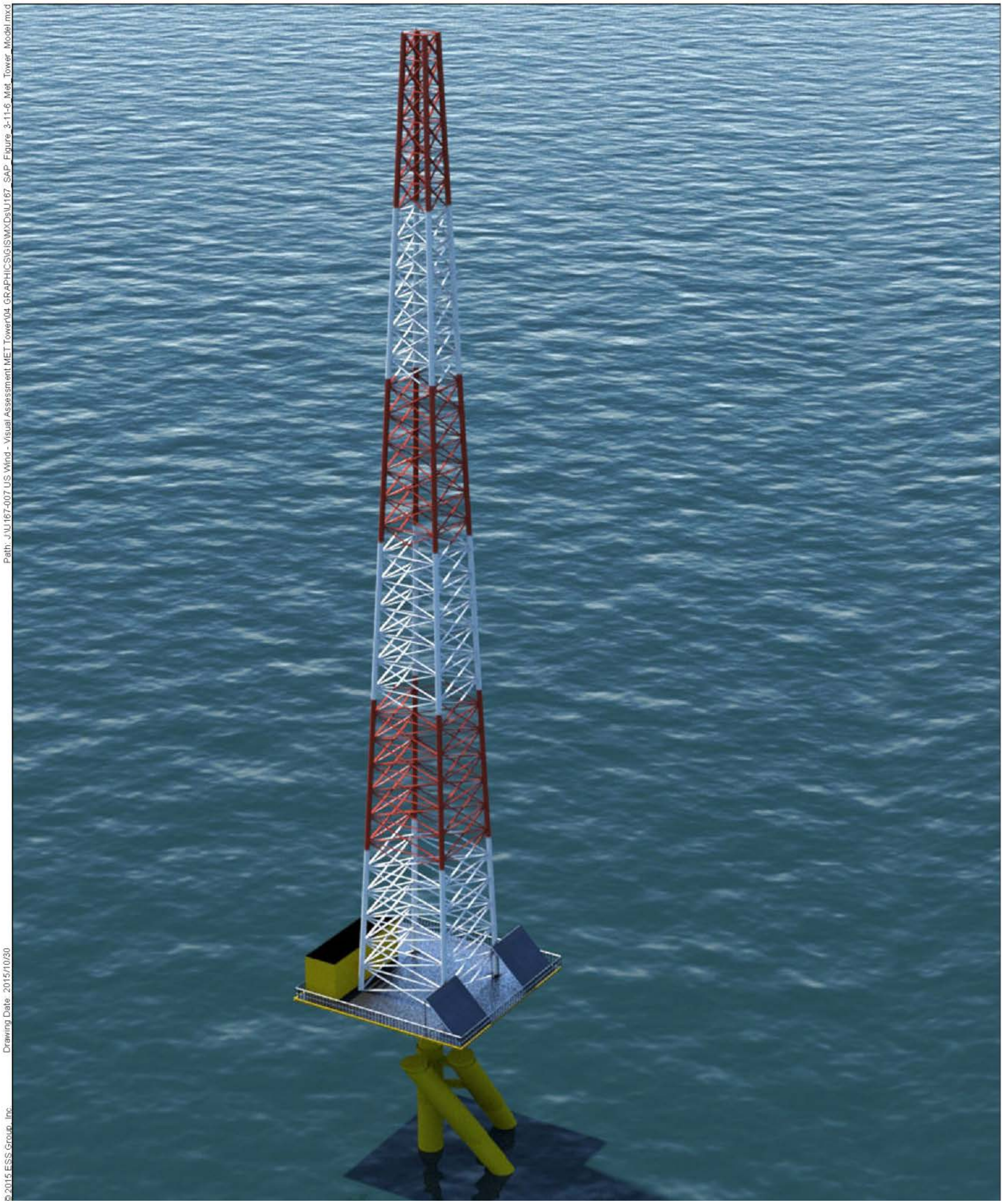
Visual simulations were developed using industry standard methodology. Additional methodology standards can be found in A Visual Impact Assessment Process for Wind Energy Projects (Vissering, 2011). The simulations were developed from photographs taken from 1109 Atlantic Ave, Ocean City, Maryland from a fourth floor hotel deck 17.724 miles from the proposed MET tower (See Figure 3.11-3 Sheet 10 for simulation location). The simulation position relative to the Project can be considered a worst-case visibility scenario due to the relative distance to the MET tower, elevated viewer position, high visibility conditions, and close proximity to visual resources.

In order to produce the simulations a scale model of the proposed MET tower was built in Autodesk 3D Max Software (Figure 3.11-18). The MET tower model was then placed in 3D space with the exact coordinates provided by US Wind. A virtual camera was also created in 3D Max to match the exact specifications of the Nikon D810 camera, as well as the field recorded location. The camera bearing in the model was set to match the field recorded bearing line. Next, the field recorded photograph was set as the virtual camera background and the 3D horizon was matched to the actual horizon. With the virtual camera aligned to the photograph, the modeled MET tower appeared to scale in the field photograph. A virtual environment was created to match the sun and weather conditions observed in the field. Using a curvature of the earth model, the appropriate elevation for the MET tower was set so that it appeared in the correct location behind the horizon. The view was then rendered and post processing was completed to seamlessly integrate the rendered model into the photograph.

Nighttime conditions were considered to address the potential for nighttime impacts associated with the aviation safety beacons on the proposed MET tower. The Project is located outside of FAA jurisdictional limits, but it is likely that the FAA regulations will be followed to ensure aviation safety. FAA Advisory Circular AC_70_7460-1L recommends a single medium intensity (L-864), red flashing light and two low intensity (L-810) red flashing lights (all lights to flash synchronously) half way down the tower. Nighttime simulations were produced by modelling the dimensions and output for a LED L-864 and L-810 FAA beacons and placing them on the appropriate positions on the modeled MET tower. In order to verify the intensity, actual field observations of similar fixtures were included in the light model and resulting simulation. The resulting rendering of the FAA lights were then overlaid on nighttime photograph and seamlessly integrated (note that the L-810 lights are not visible at this distance).

The visual simulations (Figure 3.11-19 to 3.11-22) reveal that visibility of the proposed MET tower is minimal and will not likely be distinguishable to the average viewer. Similarly, the FAA lights at night have the appearance of a single offshore buoy, several of which are currently visible at Ocean City Inlet. It is likely that offshore buoys, combined with the abundance of offshore vessel traffic will completely minimize any potential impacts to the night sky.

Figure 3.11-18 Preliminary MET Tower Model



Model Based on Preliminary MET Tower Design Subject to Change

Figure 3.11-19 Existing Daytime View

Image should be printed at full size, resulting in an image that is 9.2 inches in width. At this size, the image should be viewed from thirteen (13) inches.

Figure 3.11-20 Simulated Daytime View

Image should be printed at full size, resulting in an image that is 9.2 inches in width. At this size, the image should be viewed from thirteen (13) inches.

Figure 3.11-21 Existing Nighttime View

Image should be printed at full size, resulting in an image that is 9.2 inches in width. At this size, the image should be viewed from thirteen (13) inches.

Figure 3.11-22 Proposed Nighttime View

Image should be printed at full size, resulting in an image that is 9.2 inches in width. At this size, the image should be viewed from thirteen (13) inches.

3.11.2.3 Visual Impacts to Visual and Historic Resources

Based on the viewshed analysis, 316 visual resources found within the study area 39 fall within the APE. However two (2) of the visible sites were contradictory duplicate listings on the National and Maryland State Registers of Historic Places. Thus, 37 unique resources may have visibility of the proposed MET tower. Resources that occur within the APE can be found on Table 3.11-2. Of the resources with project visibility, four (4) are listed on the National Register of Historic Places, ten (10) are Maryland State Historic Sites, one (1) is a National Seashore, and two (2) are State Parks. The other resources do not have official designations, but may be eligible for historic designation (14 sites). Six resources are considered resources of local concern, such as golf courses, boardwalks or beaches. The distance to the MET tower from the resources with visibility ranges from 17.6 to 23.8 miles. Since the simulation location is 17.7 miles from the MET tower and taken from within a cluster of historic resources, it is reasonable to assume that the individual resources will have a similar (if not more distant) view of the Project. Therefore, based on the results of the visual simulation, it is anticipated that the integrity of these visual and historic resources will experience negligible to minimal visual impacts. The historic integrity of the eligible and listed properties will not be impacted by the Project.

3.11.2.4 Outreach to State Historic Preservation Offices

Coordination was undertaken with the Delaware and Maryland SHPOs to introduce plans for the proposed MET tower, and to assure the appropriateness of the resource identification effort within the APE. The information presented in Table 3-11.2 and the viewshed assessment presented in Section 3.11.2 below were used during this outreach.

The Delaware Division of Historical and Cultural Affairs determined that the undertaking will have no adverse effect to historic properties in Delaware, as documented in correspondence dated 14 January 2016 (Figure 3.11-23). Therefore no additional assessment of effects to Delaware historic properties was undertaken under the current analysis.

The Maryland Historical Trust/MD SHPO noted in their email correspondence dated 20 January 2016 that views of the tower from historic resources appear to be negligible to minimal (Beth Cole, Administrator, Project Review and Compliance 2016) (Figure 3.11-24). The email references future formal Section 106 consultation with BOEM, as the lead Federal agency charged with Section 106 compliance. The current assessment of visual effects to Maryland historic resources was undertaken to support the Section 106 process.

3.11.2.5 Qualified Architectural Historian Review

Architectural historians on staff with R. Christopher Goodwin & Associates, Inc. (RGCA) conducted an analysis to assess visual effects upon historic properties from the proposed MET tower to support review by the BOEM pursuant to Title 54 U.S.C. 306108 (formerly “Section 106”) of the National Historic Preservation Act of 1966, as amended. This work was conducted by staff whose professional qualifications exceed those established by the Secretary of the Interior in the field of architectural history. RCGA’s analysis and visual effects recommendations were undertaken in accordance with the following Federal regulations and agreements:

- 36 CFR Part 800 – Protection of Historic Properties, and
- Programmatic Agreement (PA) Among the U.S. Department of the Interior, Bureau of Ocean Management; the State Historic Preservation Officers of Delaware, Maryland, New Jersey, and Virginia; the Advisory Council on Historic Preservation; The Narragansett Indian Tribe; and, the Shinnecock Indian Nation Regarding the "Smart from the Start" Atlantic Wind Energy Initiative (2012).

RCGA reviewed the information presented in this section and found that the Area of Potential Effect (APE) was defined in accordance with the 2012 PA as "the viewshed from which lighted meteorological structures would be visible" as defined through computer modeling incorporating such factors as topography, vegetation, and high intensity development. The APE extends to portions of Worcester County, Maryland and Sussex County, Delaware. Historic properties within the APE were identified through a comprehensive literature search of relevant inventories and databases, including properties listed on the National Register of Historic Places and properties included in the respective state inventories of the Delaware Division of Historical and Cultural Affairs (DE SHPO) and the Maryland Historical Trust (MD SHPO).

RCGA then conducted a desktop review of previously compiled data on the thirteen properties identified in Maryland through the visibility study that may have visibility of the proposed MET tower[1]. These data included Nominations to the National Register of Historic Places, Maryland Inventory of Historic Property Forms (MIHP), and Determination of Eligibility (DOE) forms. Narrative, cartographic, and photographic data were analyzed. The purpose of this review was to identify the characteristics that qualify the resources as historic properties. Particular attention was paid to documentation related to the integrity of each property's location, design, setting, materials, workmanship, feeling, and association. Information on the scale, use, orientation, and physical context of the properties was sought. Additional field investigations were not undertaken as part of this effort. The potential of the MET tower to introduce visual elements that will diminish the significance and integrity of resource was assessed based on the desktop review applying 36 CFR 800.5 Assessment of adverse effects.

The results of RCGAs review were as follows:

As summarized in Table 3.11-3, five of the thirteen historic resources are historic properties that are listed in the National Register of Historic Places. These historic properties include four architecturally significant buildings (WO – 326, WO – 12, WO – 8, WO – 76) and one archeological site. Documentation on the buildings generally provides detailed discussions of the design and construction of the resources with minimal reference to setting. Due to the type of resources represented in the formally designated properties, their physical context, area of significance and primary orientations, the distant visibility of the MET tower will have no adverse effect upon these qualities of significance and integrity that qualified the properties for National Register listing.

[1] No additional assessment of effects to Delaware historic properties was undertaken under the current analysis due to the Delaware Division of Historical and Cultural Affairs determination that the undertaking will have no adverse effect to historic properties in Delaware, as documented in correspondence dated 14 January 2016 (Attachment 3.11-B).

The eight remaining historic resources are documented in the Maryland Inventory of Historic Properties and are not listed in the National Register of Historic Places. These resources include two properties that have been demolished (WO-328 & WO – 329, WO – 334), two resources that have been determined not to possess the significance and integrity necessary for National Register consideration by the Maryland Historical Trust (WO – 333, WO – 11), and the former location of a demolished Life Saving Station (WO – 357). The three remaining resources (WO – 323, WO – 347, WO – 327) are located in Ocean City. The U. S. Lifesaving Station Museum (WO -323) was moved to its current location in 1977; distant views of the MET tower will not diminish the building's architectural character. The U.S. Coast Guard Tower (WO – 347) is an engineering structure oriented towards the ocean; the distant view of the Met tower will have no adverse effect on its function or integrity. The Pier Pavilion (WO – 333) is oriented west; distant views of the MET tower from the rear elevation will not diminish its architectural or commercial character.

Views to the MET tower will have no adverse effect upon the qualities of significance and integrity or upon the character of historic properties documented in the Maryland Inventory of Historic Properties.

Table 3.11-3 MET Tower Visibility from Resources in Study Area

Property	MIHP Number	Designation	Criteria/Area of Significance	Distance	Analysis of Effects
St. Paul's by-the-Sea Protestant Episcopal Church, 302 N Baltimore Ave, Ocean City, MD	WO-326	National Register of Historic Places (2008)	C / Architecture	18	The property is an early 20th century, Gothic Revival church complex located at intersection of Baltimore Ave. and Third Street. Documentation notes that setting currently is dominated by modern streetscape. Distant view of MET tower from rear elevation will not diminish the property's integrity and will have no adverse effect upon its significant characteristics.
Williams Grove, 11842 Porfin Drive, Berlin, MD	WO-12	National Register of Historic Places (1996)	C / Architecture	22.6	Williams Grove is a two-story, three-part frame dwelling constructed between 1810 and 1860. The building is oriented northwest. Nomination does not define setting as contributing to architectural character. Aerial views available on Google Earth suggest that the house occupies a water front residential site flanked by single family dwellings. Distant view of MET tower from rear elevation will not diminish the property's integrity and will have no adverse effect upon its significant architectural characteristics.
Henry's Grove, Steven Decatur Road, Berlin, MD	WO-8	National Register of Historic Places (1984)	C / Architecture	22	Henry's Grove is significant as an example of late 18th century domestic architecture associated with the lower Eastern Shore. The two-and-one-half-story, brick dwelling was constructed in 1792. Documentation emphasizes the building's elaborate and intact interior detailing. Dwelling was vacant at the time of nomination and occupied an agricultural site that included a 20th century tenant house and outbuildings. Original house lot was characterized as substantially overgrown. Distant view of MET tower will not diminish the property's integrity and will have no adverse effect upon its significant architectural characteristics.
Sandy Point Archeological Site		National Register of Historic Places (1975)	D / Archeology	22.8	The archeological site contains the southernmost component of the Townsend Series and is one of the few documented Woodland period village sites in the area. The site was investigated by amateur archeologists in 1944 and is currently protected by a bulkhead and lawns. Distant views of the MET tower will pose no adverse effect to the significant characteristics of the below grade historic property.
Mount Vernon Hotel & Annex, Talbot St, Ocean City, MD	WO-328; WO-329	Maryland Inventory of Historic Properties	N/A	18.1	Demolished 2005.
Atlantic Hotel, 2 Main St., Berlin, MD; Berlin Commercial Historic District	WO-76; WO-184	Berlin Commercial National Register Historic District (1980)	C / Architecture	18.2	The three- story brick hotel was constructed in 1896 and is a contributing element to the Berlin Commercial Historic District, a discontinuous historic area listed on the National Register in 1980. The hotel is part of a late 19th to early 20th century commercial streetscape characterized by a continuous line of low scale commercial structures oriented directly to the street. Distant views of the MET tower that may be visible form the upper stories of the building will not diminish its integrity and will pose no adverse effect to the significant architectural characteristics of the hotel or the surrounding historic district.

Property	MIHP Number	Designation	Criteria/Area of Significance	Distance	Analysis of Effects
U.S. Lifesaving Station Museum, Boardwalk and South 2nd St., Ocean City, MD	WO - 323	Maryland Inventory of Historic Properties	C /Architecture	18.2	The U.S. Life-Saving Station originally was constructed in 1891 and occupied an ocean front site on North Division Street. The unique building was relocated to its current location in 1977 and restored as a city museum. The station's original location and setting were altered by its relocation. Distant views of the MET tower pose no adverse effect to the building's significant architectural characteristics.
U.S. Coast Guard Tower, Boardwalk and South 2nd St., Ocean City, MD	WO - 347	Maryland Inventory of Historic Properties	C / Transportation	18.3	The U.S. Coast Guard Tower is a braced metal tower that rises four flights to an observation platform and cabin. Constructed in 1934-35, the structure is the oldest of its type along Maryland's Atlantic coast. Oriented to the ocean, the structure was built as a functional observation point. While distant views of the MET tower will be visible from the tower, these views will not diminish the engineering character of the property and pose no adverse effect to the structure's integrity.
Lambert Ayres House, 6 Dorchester St, Ocean City, MD	WO - 334	Maryland Inventory of Historic Properties	N/A	18.1	Demolished 2004.
Tarry-A-While Guest House,108 Dorchester St., Ocean City, MD	WO - 333	Maryland Inventory of Historic Properties	N/A	18.2	The Tarry -a-While Guest House is a two-and-one-half story, frame dwelling that was moved to its present location in 2004. The house, constructed ca. 1897, was determined ineligible for National Register consideration by the Maryland Historical Trust in 2005. The house is not an historic property.
Pier Pavilion, the Boardwalk, Ocean City, MD	WO - 327	Maryland Inventory of Historic Properties	C / Architecture, Commerce	18.2	The Pier Pavilion is a two-story, frame, Colonial Revival style commercial structure constructed at the entry of the Ocean City boardwalk in 1926. The building is a rare example of early 20th century, seaside entertainment architecture in Maryland. The building is oriented to the west. Distant views of the MET tower will be visible primarily from the rear elevation. These distant views will not diminish the architectural or commercial character of the resource.
Woodcock House, Berlin Vicinity, MD	WO -11	Maryland Inventory of Historic Properties	N/A	23.3	The Woodcock Farm originally consisted of an eighteenth century two-story, brick dwelling, and a dairy. The house was damaged by a fire in the early 20th century and substantially rebuilt altering its overall design. The Maryland Historical Trust determined that the property did not possess significance or integrity necessary for National Register consideration in 1995.
North Beach Life Saving Station, Assateague Island, Ocean City, MD	WO - 357	Maryland Inventory of Historic Properties	N/A	20	Documentation on the North Beach Life Saving Station records the former location of a one-and-one-half story building constructed in 1884 and burned following substantial storm damage in 1962. Historical and locational data were compiled based on archeological and historical interest. Distant views of the MET tower from the potential archeological site pose no adverse effect to its potential significance or integrity.

Figure 3.11-23 Correspondence from DE SHPO

State of Delaware
Historical and Cultural Affairs

21 The Green
Dover, DE 19901-3611
Phone: (302) 736.7400 Fax: (302) 739.5660

Elizabeth Gowell, Vice President
ESS Group, Inc.
10 Hemingway Drive, 2nd Floor,
East Providence, RI 02915

January 14, 2016
ER: 2016.01.05.01

Project: US Wind - Offshore Meteorological Tower - Historic Resources

Dear Ms. Gowell,

This Office has reviewed the e-mail and locational information along with visual images related to the above project. The e-mail states US Wind submitted a Site Assessment Plan (SAP) to BOEM for approval for the construction and operation of a Meteorological Tower within Lease Area OCS-A-0490.

It is our understanding the proposed tower will be 100 meters in height, and be located in Maryland waters, about 16 miles for the Delaware coast. The only possible effect the tower would have on historic properties in Delaware would be visual. At a distance of 16 miles, the tower is barely visible from the Delaware shore. While the lighting on the tower at night may have an impact to the view shed, it would not be notable compared with those from the current shipping traffic.

To conclude, we find the undertaking will have a no adverse effect on the Indian River Life Saving Service Station (S02109), the Fenwick Island Lighthouse Station (S00187), or any other historic properties in the State of Delaware.

If you have any questions at this time, I can be reached at: craig.lukezic@state.de.us .

Sincerely,

Craig Lukezic, Archaeologist

Cc Gwen Davis, Deputy SHPO, Delaware Division of Historical and Cultural Affairs

Figure 3.11-24 Correspondence from MD SHPO

From: Beth Cole - MHT
To: Liz Gowell; Gordon Perkins
Cc: william.hoffman@boem.gov; Troy Nowak -MDP-
Subject: Re: US Wind - Meteorological Tower - MD Wind Energy Area
Date: Wednesday, January 20, 2016 11:22:41 AM

Liz and Gordon,

Thank you for contacting the Maryland Historical Trust / MD SHPO as part of early consultation for the proposed US Wind Meteorological Tower - MD Wind Energy Area. The information you provided via email, along with the discussions in our conference call this morning, provided us with a better understanding of the scope, schedule, and potential visibility of the proposed meteorological tower. We offer the following preliminary comments regarding the Maryland component of the study area.

From the materials provided, it appears that you have done your due diligence to identify historic resources, including properties listed in or eligible for the National Register of Historic Places, within the defined visual study area utilizing available state GIS and database records. I understand that you have also requested data updates from our GIS staff and this data will be a useful reference as project planning proceeds. Based on the available information, it appears that views of the tower from historic resources in Maryland will be negligible to minimal. Once you obtain the updated data, you'll want to add any newly recorded resources to your data lists, if applicable. We understand that you have completed an underwater archeological survey of the area of potential disturbance and provided those results to BOEM, for subsequent submittal to our office as part of the formal Section 106 consultation.

We look forward to further coordination with you, BOEM, and any other involved parties to complete the Section 106 review of the proposed meteorological tower in accordance with the Programmatic Agreement executed for the Smart from the Start Atlantic Wind Energy Initiative. Please let me know if you have questions or need any further assistance.

Have a good day,

Beth Cole

Beth Cole
Administrator, Project Review and Compliance
Maryland Historical Trust
100 Community Place
Crownsville, MD 21032
beth.cole@maryland.gov / 410-514-7631
mht.maryland.gov

On Tue, Jan 19, 2016 at 2:16 PM, Liz Gowell <LGowell@essgroup.com> wrote:

> Hi Beth,

Thank you for your reply.

A call tomorrow morning at 10 am would work well. Should I plan to call you at the number below?

In response to your questions, I have attached the following additional information:

- Simulations of the proposed MET tower under daytime and nighttime conditions (4 figures total).
- A model showing the tower design.

The MET tower foundation will be a braced caisson design consisting of a main steel pile 1.8 m (72 inch) in diameter and two bracing piles each 1.2 m (48 inch) in diameter. Piles will be driven to a depth of approximately 54 m (177 ft). A deck will be fixed onto the piles and a galvanized steel lattice mast will be erected onto the deck. The overall tower height will be 100 m (328 ft) above mean sea level. The purpose of the tower is to collect scientific data needed for the design, construction and operation of a wind farm. Empirical wind measurements will be used to quantify the local wind resource, calculate the energy yield and develop an annual energy production report. Measurement sensors will be installed on cross-arms at various levels on the mast. The expected useful life of the tower for the wind farm project may be 20+ years.

Liz

Liz Gowell | ESS Group, Inc.

p 401.330.1203 | lgowell@essgroup.com

From: Beth Cole - MHT [mailto:beth.cole@maryland.gov]
Sent: Tuesday, January 19, 2016 12:07 PM
To: Liz Gowell
Cc: Elizabeth Hughes -MDP-; Troy Nowak -MDP-
Subject: Fwd: US Wind - Meteorological Tower - MD Wind Energy Area

Liz,

Thank you for your email inquiry to Elizabeth Hughes, Director/SHPO, regarding consultation for the proposed US Wind - Meteorological Tower in the MD Wind Energy area. I will be your primary point of contact for coordination related to

Section 106 review of the proposed tower, along with Troy Nowak, Assistant Underwater Archeologist. I have printed out the materials you attached for our preliminary review. Your email also mentioned that you could provide a simulation of the facility - that would be very helpful in order for us to better understand the project and its potential for visual impacts in this area. If you have any additional information regarding the installation measures and duration the tower will be in place, that would be helpful as well.

I am in conference calls all afternoon today, but would be available to speak with anytime tomorrow between 8-12 or 2-4. Let me know what works for your schedule. We look forward to working with you on this project. Have a good day,

Beth Cole

Beth Cole

Administrator, Project Review and Compliance

Maryland Historical Trust

100 Community Place

Crownsville, MD 21032

beth.cole@maryland.gov / 410-514-7631

mht.maryland.gov

---------- Forwarded message ----------
From: **Elizabeth Hughes -MDP-** <elizabeth.hughes@maryland.gov>
Date: Tue, Jan 19, 2016 at 11:47 AM
Subject: Fwd: US Wind - Meteorological Tower - MD Wind Energy Area
To: Beth Cole -MDP- <beth.cole@maryland.gov>
Cc: Michael Day -MDP- <michael.day@maryland.gov>

Beth: Who should I refer her to?

---------- Forwarded message ----------
From: **Liz Gowell** <LGowell@essgroup.com>
Date: Mon, Jan 18, 2016 at 5:57 PM
Subject: US Wind - Meteorological Tower - MD Wind Energy Area
To: "Elizabeth.Hughes@maryland.gov" <Elizabeth.Hughes@maryland.gov>
Cc: Gordon Perkins <GPerkins@essgroup.com>

Dear Ms. Hughes,

My company, ESS Group, Inc. is currently working with US Wind, an offshore energy developer and Bureau of Offshore Energy Management (BOEM) leaseholder, to obtain approval from BOEM to construct a Meteorological Tower in the Maryland Wind Energy Area. Mr. Willie Hoffman at BOEM has suggested that US Wind contact the Maryland State Historic Preservation Office/Maryland Historic Trust regarding the project, specifically with respect to historic properties and the potential for visual effects from the project. I understand that your office has previously been involved in consultations with BOEM regarding the Maryland Wind Energy Area designation and potential offshore energy development activities as they may relate to Maryland historic, cultural, and archeological interests.

In November, US Wind submitted a Site Assessment Plan (SAP) to BOEM for construction and operation of a Meteorological Tower within Lease Area OCS-A-0490. The purpose of the tower is to collect scientific data needed for the design and construction of a wind farm. The proposed tower location is approximately 14 nm offshore Ocean City, MD. The tower will consist of a galvanized steel, lattice framework mast fixed to a steel deck atop a steel braced caisson style foundation. The overall height of the tower structure (mast & foundation) will be approximately 328 feet (~100 m) above the mean sea level. No upland facilities are proposed.

To assess potential visibility of the Meteorological Tower, ESS Group conducted a viewshed analysis within a radius of 25 miles and developed an inventory of historic properties located within the viewshed using available on-line data, including the Department of Planning – Maryland Historical Trust Inventory of Historic Properties (Maryland Historical Trust Historic Sites Survey) and Geospatial Data from the Maryland GIS Data Catalog – IMAP (see attached table and figures).

On behalf of US Wind, and at Mr. Hoffman's recommendation, I am reaching out to you to determine if there are other historic properties within the project viewshed, not already identified from on-line resources, that should be added for the purpose of BOEM's Section 106 consultations with the Maryland SHPO/MHT. I also have a simulation of the facility that I can forward to you if that would assist your review.

Would you have time on Tuesday or Wednesday of this week to speak with me briefly about the project? I can be reached at the number below or would be pleased to call you at your convenience.

Thank you in advance for your assistance.

Liz Gowell

Elizabeth Gowell | Vice President

ESS Group, Inc.

3.11.2.6 Conclusions

Based on results of the viewshed analysis (Figure 3.11-3 Sheets 1-14), 37 of 316 visual resources identified in the study area may have some level of visibility of the MET Tower. Visibility rarely occurs beyond the eastern shore beaches and the first row of buildings or houses, with the exception Assateague Island and the inland shores west of Assateague Island. The viewshed analysis suggests that 7 percent of the landward study area may have visibility of the MET tower and associated FAA lights. Much of the visible area (41 percent) occurs over open water in the south portion of the study area. Visibility from beaches constitutes 36 percent of the visible viewshed areas and the remainder of visibility is distributed over urban and urban fringe areas along the shoreline.

The visual simulations (Figure 3.11-6 to 3.11-9) reveal that visibility of the proposed MET tower is minimal and will not likely be distinguishable to the average viewer. Similarly, the FAA lights at night have the appearance of a single offshore buoy, several of which are currently visible at Ocean City Inlet. Despite the fact that this area capitalizes on ocean views, it is unlikely that the installation of the MET tower will diminish the enjoyment of those views or the resources identified within the APE. Therefore, the visual impact of the proposed MET tower is negligible to minimal.

Based on an assessment of the Project by architectural historians, views to the MET tower will have no adverse effect upon the qualities of significance and integrity or upon the character of historic properties documented in the Maryland Inventory of Historic Properties. Similarly, the Delaware Division of Historical and Cultural Affairs determined that the undertaking will have no adverse effect to historic properties in Delaware

3.11.3 Mitigation Measures (585.610(a)(8))

Mitigation will not be necessary, as the visual impact will be negligible to minimal.

3.12 Navigation, Shipping, and Military Activities (585.611(b)(11))

3.12.1 Environmental Baseline

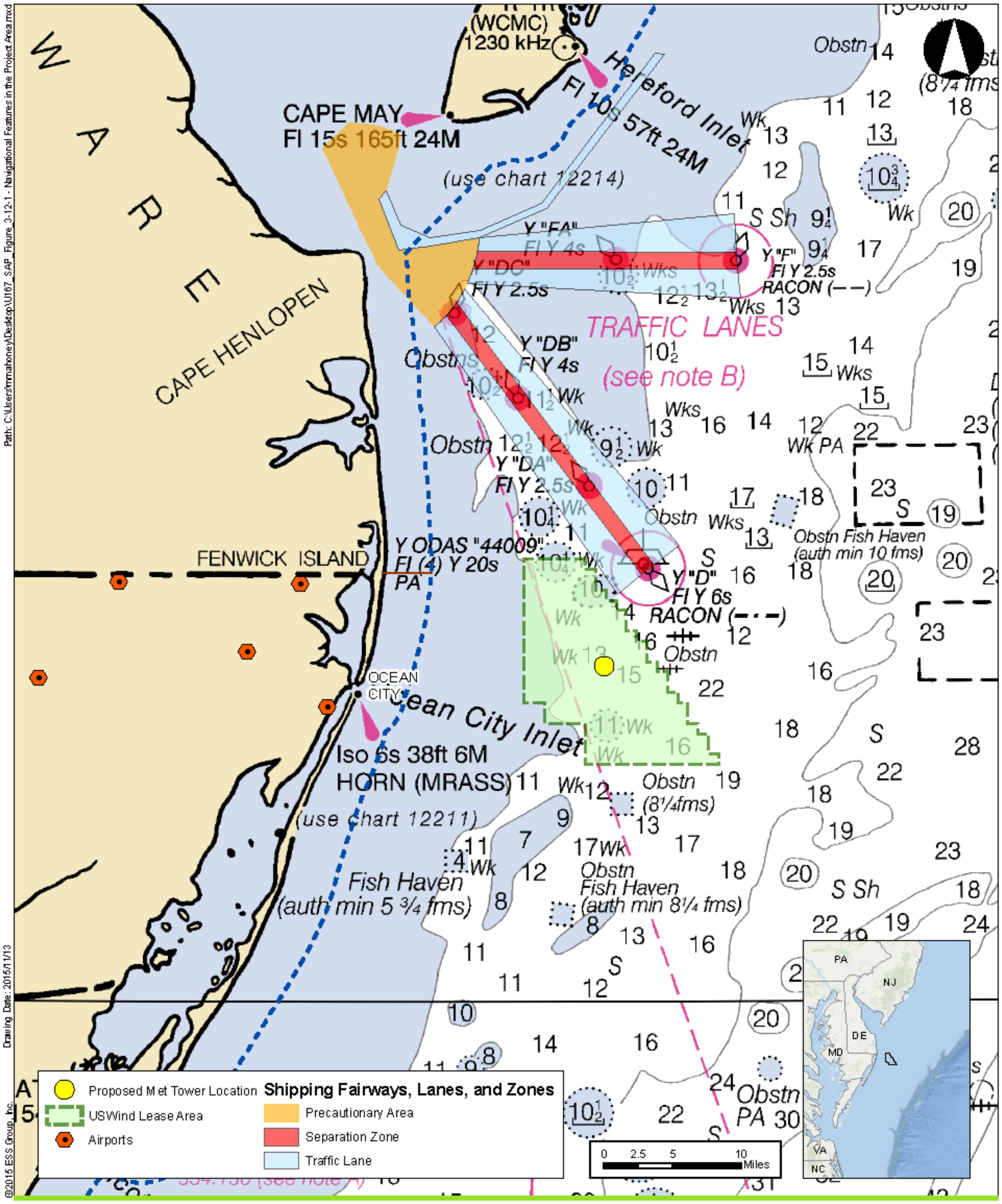
Existing marine and uses occurring within and/or in the vicinity of the Lease Area include shipping and marine transportation, military range complexes supporting exercises and testing, commercial and recreational fishing, and recreational boating. Recreational boating activity occurs primarily inshore of the Lease Area except for that associated with recreational fishing. Fishing is discussed in Section 3.13. Other marine uses are discussed below.

3.12.1.1 Shipping and Marine Transportation

Commercial vessel traffic typically concentrates at the entrances of large bays, such as the Chesapeake and Delaware Bays. The Lease Area is located offshore between these two waterways approximately 95 nm from the entrance to the Chesapeake and approximately 25 nm from the entrance to Delaware Bay (Figures 3.12-1, 3.12-2). These two bays provide access to several major U.S. east coast ports, including Baltimore, Maryland; Philadelphia, Pennsylvania; Wilmington, Delaware; and the Hampton Roads area of Virginia. Large commercial vessels (cargo ships, tankers, and container ships) use these ports to access upland rail and road routes to transport goods throughout the U.S. Other vessels using these ports include military vessels, commercial business craft (tug boats, fishing vessels, and ferries), commercial recreational craft (cruise ships and fishing/sight-seeing/diving charters), research vessels, and personal craft (fishing boats, house boats, yachts and sailboats, and other pleasure craft) (BOEM 2012).

The U.S. Coast Guard (USCG) designates shipping fairways and establishes traffic separation schemes (TSSs) that control the movement of vessels as they approach major ports. A non-mandatory TSS has been defined by the USCG near the mouths of both the Chesapeake and Delaware Bays (Figure 3.12-1). (EA 2012). The Delaware Bay TSS consists of two approaches (SE and NE). Each approach has an inbound and outbound lane.

Figure 3.12-1 Navigational Features in the Project Area



US Wind Maryland
Offshore Maryland

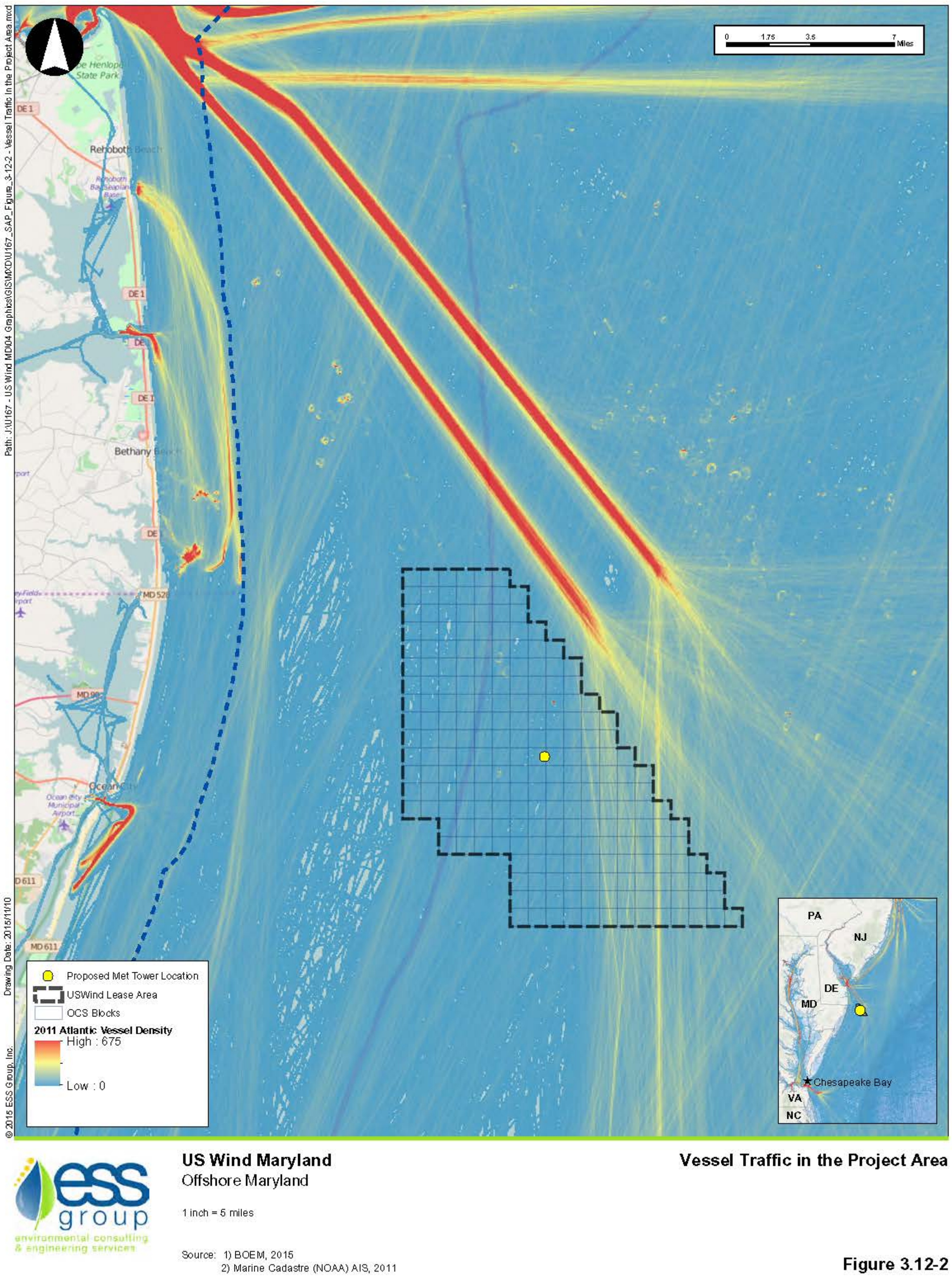
1 inch = 9 miles

Source: 1) BOEM, 2015
2) Marine Cadastre (NOAA) AIS, 2011

Navigational Features in the Project Area

Figure 3.12-1

Figure 3.12-2 Vessel Traffic in the Project Area



The Lease Area is located outside of the TSS for Delaware Bay, approximately 1 nm from the southern approach (Figure 3.12-1). The MET Tower location is approximately 6 nm from the TSS. The placement of any meteorological tower within a TSS is prohibited (see 33 U.S.C. Section 1223).

Vessel traffic in the vicinity of Delaware Bay and the Lease Area generally follows the TSS routes (Figure 3.12-2); however, vessels may also follow routes not designated on charts. These routes may be determined by factors such as vessel destination, depth requirements, and weather conditions. In the vicinity of the Lease Area and MET Tower, the highest density of vessel traffic leaving the Bay is concentrated in the TSS areas. Further offshore the routes become more dispersed as vessels begin to transit south, some through the Lease Area to the east of the Met tower location, or even further east out to sea (Figure 3.12-2). The USCG Atlantic Coast Port Access Route Study (PARS) Interim Report also shows some tug and barge routes transiting inshore of the Maryland WEA (USCG, 2012). This traffic, though of a much smaller volume than the TSS traffic, can also be seen in the AIS data (Figure 3.12-2).

3.12.1.2 Airports

Airports located in the vicinity of the Project are shown in Figure 3.12-1. The airport closest to the Project site is the Ocean City Municipal Airport. This airport is more than 17 nm from the MET tower location.

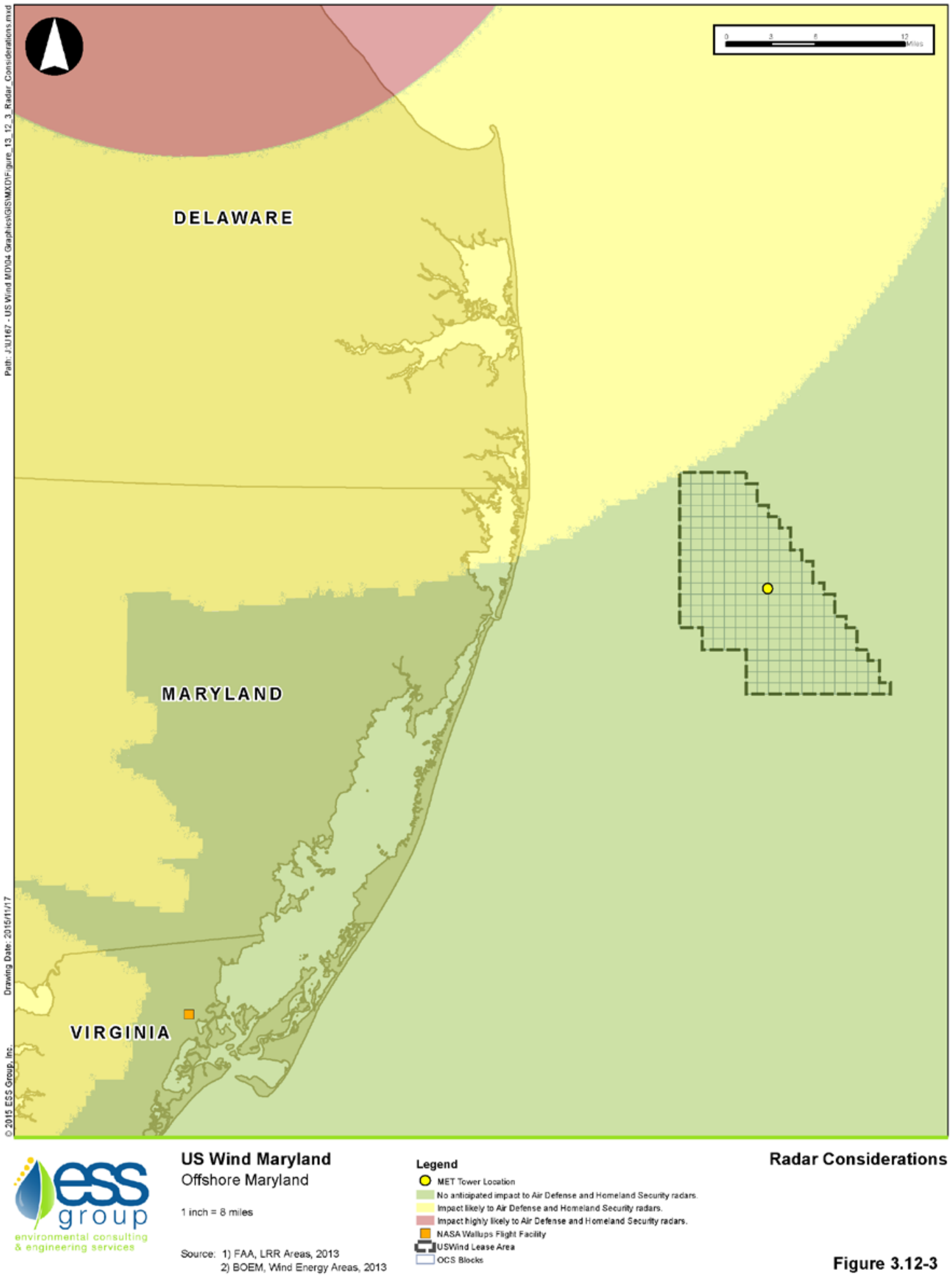
3.12.1.3 Military Activities

Military range complexes and civilian space program use areas, including restricted areas and danger zones, are established in areas off U.S. coastlines to allow military forces to conduct training and testing activities. The Lease Area is located in a naval operating area (OPAREA), Virginia Capes (VACAPES), where the Navy conducts surface, subsurface, and air-to-surface exercises training exercises. The VACAPES OPAREA extends along the coastlines of Delaware, Maryland, and North Carolina (EA 2012)

Within VACAPES, the NASA Goddard Space Flight Center’s Wallops Flight Facility (WFF) is located on approximately 42 nm from the MET tower location (Figure 3.12-3). NASA conducts science, technology, and educational flight projects from WFF aboard rockets, balloons, and UAV’s, using the Atlantic waters for operations on almost a daily basis. (BOEM 2012)

A small portion of the northwest corner of the Lease Area is located within the range of a U.S. Navy radar facility located at WFF (Figure 3.12-3). The MET tower is located to the east of this area. This radar facility is used to track launch and flight activities conducted by NASA and its partners. The radar may be used to track air-to-air, air-to-surface, surface-to-air, and surface-to-surface missile exercises, gunnery exercises, aircraft flights and rocket launches. When the Wallops Island radar is not in use for range support activities it may be released to the FAA (EA 2012).

Figure 3.12-3 Radar Considerations



3.12.2 Potential Impacts

There will be a very limited increase in vessel traffic associated with the construction, operation, and decommissioning of the MET tower, and only limited potential for impacts to navigation and military activities during MET Tower operation.

Lease Area activities are subject by stipulation (Addendum C, Item 3) to restrictions imposed by military and NASA needs, rules, and regulations. A major impact would include extensive interference with military operations due to activities occurring within these areas. To address the requirements of its Lease and avoid such interference, coordination between the Department of Defense (DoD) and vessel operators and contractors performing construction, operation and decommissioning activities will be required. US Wind has initiated consultations with U.S. Fleet Forces (USFF) N46 and Fleet Forces Atlantic Exercise Coordination Center (FFAECC) at NAS Oceana, Virginia. FFAECC coordinates all regional military/other agency activities (both sea and air) for the Virginia Capes operating area (VACAPES OPAREA) and ensures events are de-conflicted. US Wind will continue to coordinate with DoD, as needed throughout Project Activities to ensure there are not conflicts with and/or adverse impacts to military activities in the Project area.

MET Tower Construction

Several trips over an approximately two-week period would be required to transport construction crews and materials to the MET tower site.

The main construction vessel will be a lift boat (137 ft LOA with 100 ft beam). The lift boat will make two trips – one from the Port of Baltimore to the Lease Area and one return trip to Baltimore. The crew will stay on the lift boat for the duration of construction, so there will be no daily crew boat runs.

A materials barge (400 ft x 100 ft deck barge) and tug (120 ft LOA ocean-going tug) will make four trips, two out to the Lease Area and two back to Baltimore, during the construction period.

A crew/supply boat (60 ft LOA) will be used for crew transport and spare parts. This vessel will make an estimated eight trips over the 14-day construction period

Once at the Project site, construction vessel activity will be localized (within the 300 m radius MET tower area), and temporary (taking place within a period of two weeks or less). A Notice to Mariners will be issued during this time notifying transiting vessels of the location of the construction activity. US Wind contractors will also coordinate daily as instructed by Fleet Forces Command for the VACAPES OPAREA to ensure there are no conflicts with military activities during MET tower construction.

Due to the limited number of total trips required (14 trips over two weeks), the localized area of construction activity, and coordination with the USCG and Fleet Forces, MET tower construction will have negligible impacts on marine traffic or military activities.

MET Tower Operation

Approximately two trips per month via small (25 ft) vessels, likely operating from Ocean City, will be required to service the MET tower during operation. This increase in vessel activity will have a negligible impact on exiting vessel traffic in the area.

Although the MET tower will not be located within designated TSSs and will be outside of the area of the highest commercial vessel activity, its placement in an area that did not have a stationary object prior could pose a hazard to navigation and possibly increase the likelihood of a collision with the tower or between vessels attempting to avoid a meteorological tower. To minimize this potential for navigational impacts, the MET tower will be marked in accordance with USCG requirements applicable to a Private Aid to Navigation, including color, lights, etc.

Military activity in the vicinity of the Lease Area includes air and surface to air operations and there is a municipal airport approximately 17 nm from the MET tower location. The proposed MET Tower will be approximately 100 m (328 ft) high. BOEM will conduct an obstruction evaluation analysis, similar to that conducted by the Federal Aviation Administration (FAA) for offshore towers over 200 ft located within 12 nm, to determine if the MET tower would pose a hazard to air traffic. As a result of this assessment, the MET tower will be marked in accordance with BOEM requirements for aviation safety, including color, lights, etc.

Radar, like that at WFF, can experience signal interference from tower-like structures and the radar's ability can be degraded by this interference. Meteorological towers could affect radar usage and abilities; however, in consultations with BOEM regarding Met towers on the OCS, the FAA responded that interference from MET tower to radar systems would be negligible unless the towers are situated within a quarter mile of active radar (BOEM 2012). The Project MET tower will be more than 42 nm from WFF and, therefore, should have no impact on that radar system.

MET Tower Decommissioning

Impacts associated with this activity will be comparable to that for MET tower construction and will also have negligible impacts on navigation and military activities.

Non-Routine Events

The addition of the very limited vessel traffic from the Project to existing vessel traffic in close proximity to the major shipping lanes and ports serving the Delaware and Chesapeake Bays would cause only a very negligible increase in the potential for vessel allisions and/or collisions. Collisions or allusion due to the MET tower should be negligible given the requirements to meet USCG specifications as described above.

Conclusion

The Maryland WEA boundaries were identified and refined by BOEM to avoid the highest marine traffic areas and other high use areas. The increase in vessel traffic and activities associated with the installation/operation/decommissioning of the MET tower will not significantly impact marine transportation, navigation, or military activities. It is unlikely that vessels or military/public air activity would collide with the MET tower due to USCG and BOEM requirements for marking and lights.

3.12.3 Mitigation Measures (585.610(a)(8))

The following proposed mitigation measures are intended to reduce or eliminate potential impacts of installation, operation, and decommissioning of the MET tower on military activities, shipping, and navigational safety.

The Project will comply with USCG and BOEM required MET tower marking and lighting. Based on previous USCG and FAA recommendations for marking and lighting of meteorological towers these are expected to include the following:

- The structure will be color-coded a standard yellow, such as Munsell Chip number 2.5Y 8/12, from the water line to the base of the tower.
- Two white lights will be installed, 180-degrees apart, at an elevation specified by the USCG, each with an operational range of 5 nm and a flash rate of 30/second.
- Any aviation warning lights located on the MET tower mast will be seen in a 360- degrees arc, display a quick red characteristic, and flash synchronously.
- A fog signal with a range of 0.5 nm will activate whenever the visibility decreases below 3 nm.
- Visual aids to navigation will operate with sufficient backup power and redundancy to assure a minimum availability rate of 99.7%.

As summarized in Section 1.3, US Wind has met/corresponded with the Mariners Advisory Committee (MAC) and American Waterways Operators regarding the Maryland Offshore Energy Project. US Wind has also consulted with the USCG regarding the potential for navigational risk associated with the MET tower and the safety equipment that will be required to minimize potential navigational impacts. US Wind will continue to communicate with commercial shipping interests, including the tug and barge industry, to keep them informed during MET tower construction and operations primarily in conjunction with the USCG via Local Notices to Mariners and other navigation communications. US Wind is also planning outreach to these interests regarding potential navigational conflicts and risks for the overall wind farm in consultation with the USCG.

US Wind has and will continue to consult with Fleet Forces Command prior to any construction or decommissioning activity, regarding the location, density, and planned periods of activity, to minimize potential conflicts with DoD activities in the VACAPES OPAREA. During recent US Wind survey activities conducted on the Lease Area in the summer of 2015, FFAECC requested that the G&G Contractor and survey Vessel Masters coordinate daily with FFAECC and comply with any of their requests during survey operations. As a result, US Wind is familiar with FFAECC requirements for Commercial Vessels Working in the VIRGINIA CAPES OPAREAS, will provide all Service Request Forms to FFAECC that are required prior to initiation of construction or decommissioning activities in the Lease Area, and will comply with all FFAECC directives, including any related to MET tower lighting or instrumentation, to avoid potential impacts during Project activities.

The MET tower will be greater than 199 ft tall. However, as it will be located more than 12 nm from shore, BOEM rather than the FAA will conduct the Obstruction Evaluation and Determination of Hazard/No Hazard. The same information required by the FAA to make its determinations for inshore structures, via a “Notice of Proposed Construction or Alteration,” can be found in this SAP to assist BOEM in its assessment (i.e., location, height, distance from nearest public airport, etc.).

3.13 Commercial and Recreational Fishing (585.611(b)(6))

3.13.1 Environmental Baseline

3.13.1.1 Fisheries and Gear Types

US Wind contracted Sea Risk Solutions to conduct a study of fisheries and fishing activities in the Lease Area (Sea Risk Solutions 2015). The complete findings of this study are presented in Appendix U. A summary of these results are presented below.

America Lobster Trap/Pot

The commercial fishing season for the American lobster (*Homarus americanus*) peaks from July to September. Pots are set individually or along strings, typically on grounds 12-60 nm offshore Ocean City, MD. Fewer than 12 commercial vessels with lobster licenses operate out of Ocean City. Fishing areas shift frequently, but it appears unlikely that a substantial concentration of lobster traps would be fished in the Lease Area.

Black Sea Bass

Black sea bass (*Centropristis striata*) is fished via pots, bottom trawling, and with hook and line often near rocks or reefs mainly at depths of 70-80 m. Due to the typical water depth range for this fishery, it is unlikely that large concentrations of sea bass pots would be placed in the Lease Area.

Conch Trap/Pot

Conch (channeled whelk *Busycotypus canaliculatus* and knobbed whelk *Busycon carica*) is targeted using pots, but can also be landed as bycatch from the black sea bass pot fishery and the trawl fishery. Dedicated conch pots are set within a depth range of 5-33 m. This fishery has been expanding quickly in recent years and pots are now reported to be set in large numbers over broad areas, which may include the Lease Area.

Horseshoe Crab

Horseshoe crabs (*Limulus polyphemus*) are used for baiting fish and crustacean pots and for blood collection associated with a copper containing protein called hemocyanin. They have been harvested mainly by trawl, dredge, and by hand at the shoreline. Approximately 50% of the allowable catch is landed in state waters (1-3 nm from shore) and the rest in federal waters as a bycatch of trawl fisheries. The bycatch allowance is open from July through November. It is likely that some trawling occurs in the Lease Area.

Atlantic Deep Sea Red Crab Trap/Pot

The Atlantic deep sea red crab (*Chaceon quinquedens*) fishery sets strings of traps from New England through the Mid-Atlantic, but the fishery is actively pursued only by 4-6 vessels based in New Bedford, Massachusetts, in depths of 400-600 m, well offshore of the Lease Area.

Hard Clam Dredge

Surf clams (*Spisula solidissima*) may be targeted by dredges near the WEA. Vessels targeting clams off Maryland typically fish one or two dredges at a time and operate at speeds near two knots. Ocean quahogs (*Artica islandica*) are generally targeted offshore in deeper water. One or two clam vessels were recently reported to work the general area of the WEA or slightly deeper.

Gillnets

Some gillnet fishing is likely to occur in the Project area on a seasonal basis, notably in winter and early spring. Within Maryland state waters, there is limited effort for striped bass (*Morone saxatilis*). In federal waters, there is a seasonal fishery for monkfish (*Lophius americanus*) and other species, which has moved beyond the WEA at the present time.

Longline

There is a longline demersal fishery for tilefish (*Lopholatilus chamaeleonticeps*) that occurs in waters much deeper than those in the WEA. A pelagic (midwater) longlining fishery targets swordfish (*Xiphias gladius*) and various tuna species, but the lines are drifted much farther from the coast. It is unlikely that any substantial concentration of longline fishing occurs in the Project area.

Trawling

It is likely that occasional trawling occurs in the Project area.

Sea Scallop Dredge

In recent years the Atlantic sea scallop (*Placopecten magellanicus*) fishery has been closely managed and profitable. The important Delmarva and Elephant Trunk Access Areas fishing grounds are offshore of the WEA. Scallop dredging could occur in the Project area but most scallop dredging is likely to be concentrated farther offshore in deeper waters of 65-90 m.

Recreational Fisheries

Recreational fishing is very substantial in the Project area.

Artificial Reefs

Artificial reefs have been established offshore Ocean City to provide substrate that encourages growth of marine invertebrates and provides protection for crustaceans and fish. They also provide recreational fishing opportunities. The reef locations are shown in Appendix T. None are located within the WEA.

3.13.1.2 Potential Fishery Activity Exposure to WEA Activities

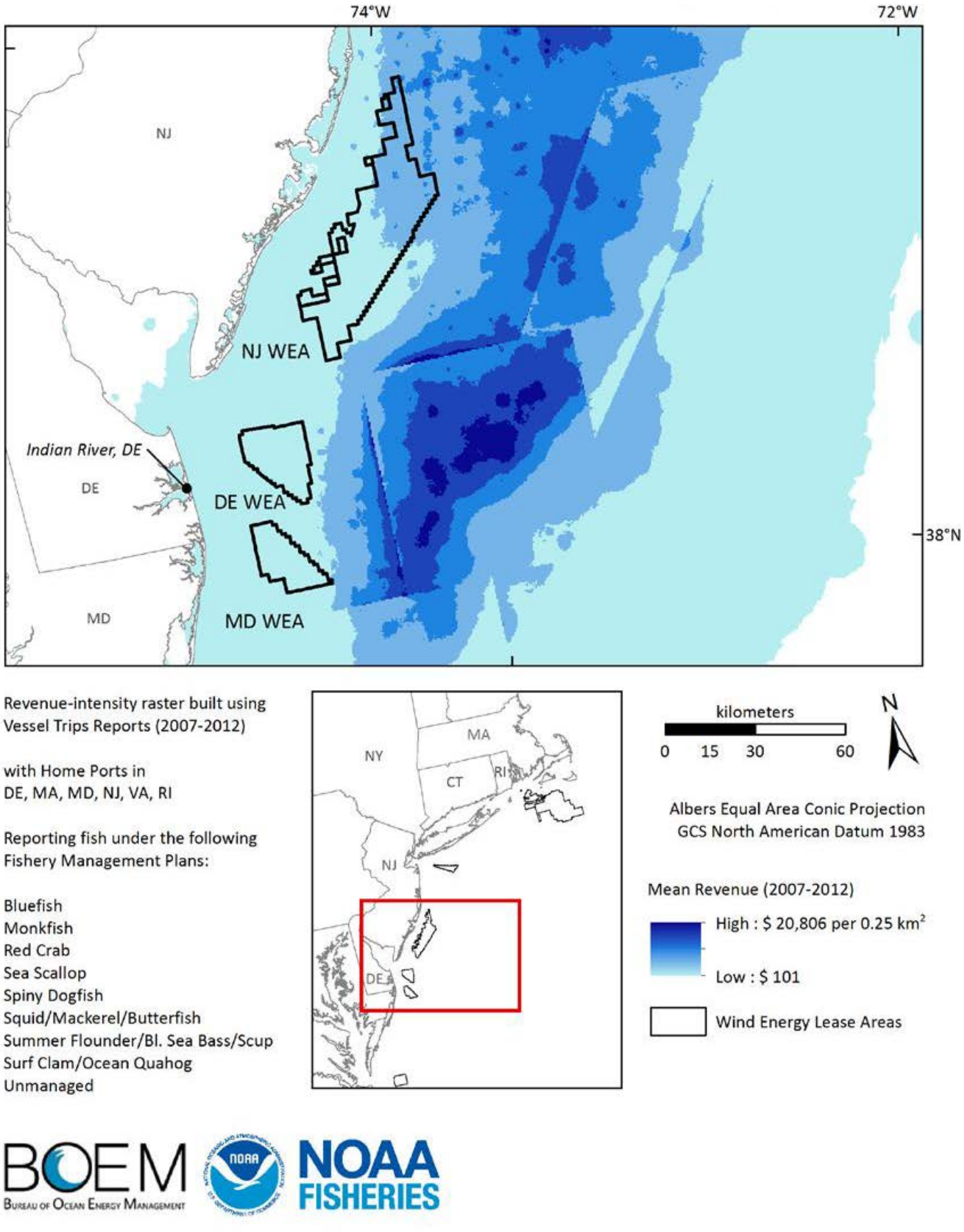
A recent BOEM report (Kirkpatrick et al. 2015) assessed existing fisheries-related activities in the Mid-Atlantic region for exposure to Maryland WEA (MD WEA) development activities. It also assessed exposure of shoreside dependents, which include businesses that directly support (e.g. gas stations, bait and ice dealers, transportation, etc.) and/or use the landings of commercial and recreational fisheries (e.g. first point of sale dealers, etc.). Exposed activities and stakeholders have the potential to be affected by WEA development. Impacts associated with exposure are varied and depend on additional factors, such as the extent of the WEA developed, type of development, and the fishery exposed. Overall, the report finds the MD WEA is best characterized as being lightly fished commercially The report concludes that generally, neither commercial and recreational fisheries nor their shoreside dependents, are highly exposed to development of the MD WEA (Kirkpatrick et al. 2015).

Data in the report specific to fisheries activities conducted and/or related to fishing within the MD WEA are summarized below. Note that this data identifies exposure and potential impacts based on all WEA activities, including full lease buildout, not just MET tower activities.

Fishing Revenue for the MD WEA

Annual fishing revenue associated with the MD WEA is estimated at $185,741 annually, equal to $575 per km^2 as illustrated in Figure 3.13-1. (Kirkpatrick et al. 2015).

Figure 3.13-1 MD WEA and Revenue-Intensity Raster from Commercial Fishing Activity



(Source: Kirkpatrick et al 2015)

Exposure of Commercial Species Revenues

As indicated in Table 3.13-1, annual revenues associated with resources managed by the New England and Mid-Atlantic Fisheries Management Councils (NEFMC/ MAFMC) may be exposed due to development of the MD WEA. This exposure represents less than one percent of total revenues (Kirkpatrick et al 2015).

Table 3.13-1 Annual Revenue Exposed to MD WEA Development, 2007-2012

Fishery Management Plan	Jurisdiction	Average Annual Exposed Revenue	Average Annual Total Revenue	Percent Exposed
Summer Flounder, Scup, Black Seabass	MAFMC	$89,110	$33,166,172	0.3
Spiny Dogfish	NEFMC, MAFMC	$5,302	$2,172,246	0.2
Bluefish	MAFMC	$1,091	$1,578,705	0.1
Red Crab	NEFMC	Not Disclosable	Not Disclosable	Not Disclosable
Skate	NEFMC	$1,893	$7,796,915	~0
Unmanaged		$35,087	$248,316,185	~0
Monkfish	NEFMC, MAFMC	$2,237	$19,759,447	~0
Sea Scallop	NEFMC	$40,202	$428,413,267	~0
Squid, Mackerel, Butterfish	MAFMC	$3,806	$40,849,295	~0
Surf Clam & Ocean Quahog	MAFMC	$5,797	$64,967,095	~0

Source: Kirkpatrick et al. 2015

Exposure of Fisheries by Gear Type

Table 3.13-2 identifies the number of permit holders, by gear type, fishing within the MD WEA. For dredgers, Cape May, NJ; and Ocean City, MD are the primary landing locations and sea scallops are the primary dredge-landed species, though sea scallop landings from the MD WEA average only $40,202 per year. For pot fishers, Indian River, DE; Ocean City, MD; and Cape May, NJ are the primary landing locations. Bottom trawl vessels tend to land in Ocean City, MD; Cape May, NJ; and Chincoteague, VA. Black sea bass and summer flounder (fluke) are the primary species landed by pot and trawl gears. For all gear types, average annual Maryland WEA-sourced revenues are less than one percent of the total annual revenues.

Table 3.13-2 Number of Permits, By Gear, Exposed to Development of the MD WEA, 2007-2012

Gear	Permits	Average Annual Revenue	Average Annual WEA-sourced Revenue	Percent of Average Annual	Top 4 Fishery Management Plans	Top 5 Port Groups
Dredge	179	$486,160,813	$45,331	~0	Sea Scallop[1]; Surf Clam Ocean Quahog[2]; Monkfish[3]; Summer Flounder, Scup, Black Seabass[2]	Cape May, NJ; Ocean City, MD; New Bedford, MA; Seaford, VA; Other York, VA
Gillnet	30	$34,164,385	$18,314	~0	Unmanaged[4]; Spiny Dogfish[3]; Monkfish[3]; Bluefish[2]	Ocean City, MD; Chincoteague, VA; Long Beach, NJ; Greenbackville, VA; Barnegat, NJ
Hand	9	$8,339,830	$2,578	~0	Summer Flounder, Scup, Black Seabass; Unmanaged[4]; Bluefish2; Highly Migratory Species[5]	Chincoteague, VA; Indian River, DE; Wildwood, NJ; Ocean City, MD; Long Beach, NJ
Longline	4	$7,399,976	$269	~0	Spiny Dogfish[3]; Unmanaged[4]; Skate1; Bluefish[2]	Ocean City, MD; Cape May County, NJ
Pot	29	$11,071,430	$53,757	0.5	Summer Flounder, Scup, Black Seabass[2]; Unmanaged[4]; Red Crab[1]; Large Mesh Multispecies[1]	Indian River, DE; Ocean City, MD; Cape May, NJ; Lewes, DE; New Bedford, MA
Lobster Pot	8	$213,321,675	$5,748	~0	Summer Flounder, Scup, Black Seabass[2]; Unmanaged Large Mesh Multispecies[1]; Small Mesh Multispecies[1];	Indian River, DE; Ocean City, MD; Cape May, NJ
Seine	10	$10,258,052	$6,532	~0	Unmanaged[4]	Cape May, NJ; Gloucester, MA
Bottom Trawl	144	$174,094,198	$53,071	~0	Summer Flounder, Scup, Black Seabass[2]; Unmanaged[4]; Squid, Mackerel, Butterfish[2]; Skate[1]	Ocean City, MD; Cape May, NJ; Chincoteague, VA; Hampton, VA; North Kingstown, RI
Midwater Trawl	6	$21,384,152	$142	~0	Atlantic Herring[1]; Squid, Mackerel, Butterfish[2]; Unmanaged[4]	Cape May, NJ; Worcester County, MD; Sussex County, DE; Cape May County, NJ

1 NEFMC management
2 MAFMC management
3 Joint NEFMC and MAFMC management
4 Unmanaged species
5 AHMS management

Source: Kirkpatrick et al. 2015

Exposure of Recreational Fishery Activity

Table 3.13-3 summarizes recreational fishery activity exposure by state in terms of for-hire boat trips, for-hire angler trips, private angler trips, and total expenditures. Recreational fishing activity was considered exposed if it occurs on or near the MD WEA. Shore-based fishing is not included as these anglers will not, most likely, be exposed to WEA development activities (Kirkpatrick et al. 2015). Recreational fishing activity exposure, attributable to the MD WEA, range from less than one percent to less than seven percent of activity totals in each category.

Table 3.13-3 State-Level Average Annual Exposure of Recreational Fishery to MD WEA, 2007-2012

State	Total For-Hire Boat Trips	Percent Total For-Hire Boat Trips Exposed	Total For-Hire Angler Trips	Percent Total For-Hire Angler-Trips Exposed	Total Private Boat Angler-Trips	Percent Total Private-Boat Angler-Trips Exposed	Total Expenditures (private boat and for-hire)	Percent Total Expenditures Exposed
MD	696	6.3	12,422	6.6	1,704,515	0.36	$16,122,478	2.9
DE	1,093	1.7	12,512	2.6	522,766	4.53	$19,771,177	5.0
NJ	8,177	0	153,989	0	3,028,511	1.56	$44,135,406	6.8

Source: Kirkpatrick et al. 2015

Exposure of Recreational Fishery Ports

Table 3.13-4 shows that Ocean City, MD and Indian River, DE, the ports closest to the Project area, had the highest number of for-hire boat trips exposed to the MD WEA per year during the BOEM report study period. For both ports, these exposed trips were a small percentage of total for-hire trips. Cape May, NJ had the highest exposure for angler trips (both for-hire and private) and angler expenditures (Kirkpatrick et al. 2015).

Table 3.13-4 MD WEA Average Annual Private Boat and For-Hire Recreational Exposure by Port Group, 2007-2012

Port Group	Exposed For-Hire Boat Trips	Percent For-Hire Boat Trips Exposed	Exposed For-Hire Angler-Trips	Exposed Private Boat Angler-Trips	Percent Total Angler-Trips Exposed	Total Expenditures (Private Boat And For-Hire)	Percent Total Expenditures Exposed
MD							
Ocean City	44	6.3	823	4,364	2.3	$12,328,325	3.1
Pocomoke City	0	0	0	1,767	2.0	$3,794,153	2.0
DE							
Indian River	18	5.2	316	5,512	6.0	$4,473,090	6.1
Lewes	~0	~0	2	8,424	5.7	$6,813,618	4.9
Milford	~0	7.7	1	0	~0	$2,092,891	~0
Other Sussex	~0	1.0	~0	9,726	6.0	$6,391,579	6.0
NJ							
Cape May	1	~0	7	47,348	9.7	$32,011,401	9.4
Ocean City	~0	0.1	2	0	~0	$1,646,222	~0
Sea Isle City	~0	0.1	10	0	~0	$2,373,273	~0
Wildwood	~0	0.1	8	0	~0	$8,104,510	~0
Total	**63**	**0.4**	**1,168**	**77,141**	**5.4**	**$80,029,061**	**5.6**

Source: Kirkpatrick et al. 2015

3.13.2 Potential Impacts

Kirkpatrick et al. (2015) concluded that the development of the MD WEA is expected to create negligible impacts on commercial fisheries and their shoreside dependents and a slightly negative to neutral impact on recreational fisheries. Impacts associated with MET tower development will have even fewer impacts than full WEA development.

MET Tower Installation

<u>Fishing Activity Displacement</u>

It is anticipated that during installation and decommissioning of the MET tower, a limited area, approximately 300 m radius around the site, would be needed for the movement and anchoring of support vessels. During these phases of the Project, fishing vessels (primarily recreational party and recreational charter vessels) could be displaced from fishing grounds in this area for short durations in order to avoid conflicts with construction vessels. However, recreational anglers in both for-hire and private boats have a great variety of options for offshore fishing destinations, and thus should have suitable alternatives to fish while temporarily displaced from within the MD WEA (Kirkpatrick et al. 2015).

<u>Disturbances to Fish Resources</u>

Fish resources could be temporarily affected by pile-driving activities associated with installation of the MET tower. Fish in the immediate area of pile driving are expected to flee upon commencement of activities. However, if fish do not flee the area during the soft start pile driving procedure there could be limited mortality or disturbance due to exposure to noise suspended sediments. (see Section 3.5 for additional detail).

MET Tower Operation

It is expected that installation of the MET tower would introduce an artificial hard substrate that opportunistic benthic species prefer and could colonize. Certain fish species would likely be attracted to the newly formed habitat complex, and fish population numbers in the immediate vicinity of the anchors and foundations are likely to be higher than in surrounding waters away from the structures. This may create new fishing opportunities, primarily for recreational fishermen.

MET Tower Decommissioning

During MET tower decommissioning, fishing vessels could be temporarily displaced from fishing grounds in the immediate area in order to avoid conflicts with construction vessels. Fish in the vicinity of the MET tower may also be temporarily affected by noise produced by pile cutting equipment during tower removal. These potential disturbances to fishing activity during decommissioning are expected to be minor resulting in negligible impacts to commercial and recreational fishing.

Non-Routine Events

Impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels during MET tower installation, operation, and decommissioning activities are expected to be minor.

Collisions and allisions are considered unlikely. However in the event that a vessel allision or collision were to occur, and result in a diesel spill, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days. Impacts are expected to be minor, temporary, and localized and not result in population level effects.

Fish could also be adversely impacted by the ingestion of, or entanglement with, accidentally released solid debris. Such discharge of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEM and the USCG and would not be expected during normal operations. Any accidental discharge would likely be localized and of limited volume.

Conclusion

Localized fishing displacement and/or changes in target species availability due to MET tower activities would be of short duration and limited in area. These impacts would result in negligible impacts to commercial or recreational fishing and total catch of fish and shellfish from the WEA and vicinity.

3.13.3 Mitigation Measures (585.610(a)(8))

The following proposed mitigation measures are intended to reduce or eliminate the potential for adverse impacts to commercial and recreational fishing.

To reduce potential economic impacts on commercial and recreational fishermen, US Wind will notify fishermen of construction and decommissioning activities via the USCG Local Notice to Mariners and daily broadcasts on Marine Channel 16. These notifications will allow fishermen to plan fishing trips to avoid the area of MET tower activity. This measure would save both time and fuel, and reduce the potential of any site use conflicts.

During planning for the Project, US Wind met with commercial and recreational fishing stakeholders (see Section 1.3.3) to inform fishermen and shoreside dependents about the Project and identify stakeholder concerns. US Wind will continue to communicate with fishermen and fishing interests through these stakeholder groups during the MET tower construction, operation, and decommissioning phases of the Project.

To facilitate and guide this communication, US Wind developed a *Commercial and Recreational Fishing Outreach Plan* in accordance with BOEM guidelines (http://www.boem.gov/Social-and-Economic-Conditions-Fishery-Communication-Guidelines/) (Appendix V). The Outreach Plan identifies a Fisheries Liaison who will serve as US Wind's outreach representative to the fishing industry and two Fisheries Representatives who will work to represent the local fishing community.. Additional detail regarding the roles of the Fisheries Liaison and Representatives, outreach and communications already conducted on behalf of the Project, and outreach and communication planned during construction and operations can be found in the Outreach Plan.

3.14 Socioeconomics (585.611(b)(6))

3.14.1 Baseline Conditions

3.14.1.1 Economics and Employment

As posted on the state website *maryland.gov*, Maryland's economy continues to outperform the country as a whole. The leading forces behind Maryland's economic growth are information technology, telecommunications, and aerospace and defense. Maryland's unemployment was 5.1% in September 2015, the same as the national average. Employers in professional and business services, education and health services, and leisure and hospitality reported employment gains over the past year despite national economic stresses.

Maryland's workforce was more than 2.5 million in 2014 and is among the best educated in the nation. Over 38.2% of its population aged 25 or older holds a bachelor's degree or higher (3rd among all states), while 17.5% have a graduate or professional degree (2nd highest nationally). Most Marylanders work in the service-providing sector. Jobs cover a wide spectrum: from government positions to transportation-related professions, from wholesale trade to the finance and insurance industry. In 2014, 19% of the workforce was employed by federal, State and local governments, while professional and business services accounted for 16.6% of employment. Nonetheless, 81% of workers are employed in the private sector with 10.2% (259,619) employed in goods-producing business establishments. In 2014, Maryland ranked first in the country for its high percentage of professional and technical workers (28.3%) in the workforce (maryland.gov 2015)

The U.S. Department of Commerce ranked Maryland first in the nation in "Entrepreneurship and Innovation" in 2014 for the third year in a row. Maryland also ranked first for concentration of businesses and jobs in science, technology, engineering, and mathematics (maryland.gov 2015).

To prepare the State for growth in sectors requiring highly educated workers, Maryland continues to invest in education. In the nation, Maryland ranks first in its percentage of professional and technical workers, an advantage for both defense and nondefense contracts in medical research, aircraft development, and security (maryland.gov 2015).

3.14.1.2 Land Use

As described in Section 3.11, low, medium and high intensity developed areas are found along the Maryland and Delaware shorelines closest to the MD WEA and MET tower site. The high intensity areas are generally clustered along the outer beaches (Ocean City and Bethany Beach) and then become increasingly less developed to the west. Along major road routes, such as, Route 28 in Bethany Beach and Route 20 in Fenwick Island, there are some additional pockets of high intensity development surrounded by medium and low intensity.

As described in Section 3.12 some of the existing developed areas include small and major ports with related shipping and marine transportation infrastructure.

3.14.1.3 Recreation

Maryland's coastline and beach recreation areas attract many local citizens, as well as out of state visitors. Popular recreational activities include swimming, boating, fishing, and sunbathing. There are 68 beaches along the coast in the coastal counties of Anne Arundel, Baltimore, Calvert, Cecil, Kent, Queen Anne's, Somerset, St. Mary's, and Worcester (EA 2012).

Delaware's Sussex County has 26 miles of Atlantic Ocean coastline. Shorefronts in this area include 21 beaches, and a diversity of natural and developed landscapes that host substantial recreation, particularly in connection with marine fishing and beach-related activities (EA 2012).

Additional recreation areas and sites of public interest are shown in Table 3.11-2 and Figures 3.11-4 to 3.11-17.

3.14.1.4 Environmental Justice / Minority and Lower Income Groups

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629 (February 11, 1994)), requires Federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations. The Maryland Department of the Environment (MDE) is also legally obligated to enforce these requirements (Maryland Department of the Environment 2015b).

Low-income and minority communities are most vulnerable to Environmental Justice issues. Often these communities do not have an organized community group that can serve as a point of contact. Additionally, these communities may house a disproportionate amount of polluting facilities putting residents at a much higher risk for health problems from environmental exposures (Maryland Department of the Environment 2015a).

U.S. Census Bureau data (Table 3.14-1) indicates that communities in the Project area have a lower percentage of minority populations than the Delaware and Maryland State averages. The poverty rate in the Project area in general, is close to the respective state averages for Delaware and Maryland. However, the poverty rates for some minority communities are higher than the state averages.

Table 3.14-1 2010-2014 American Community Survey 5-Year Estimates

Subject	Delaware	Delaware (Sussex County)	Maryland	Maryland (Worcester County)
Race				
White	70%	81%	58%	83%
Black or African American	22%	13%	30%	14%
American Indian and Alaska Native	0%	0%	0%	0%
Asian	4%	1%	6%	1%
Native Hawaiian and Other Pacific Islander	0%	0%	0%	0%
Some other race	2%	2%	3%	0%
Two or more races	3%	2%	3%	1%
Hispanic or Latino origin (of any race)	9%	9%	9%	3%
Percent Below Poverty Level				
Population for whom poverty status is determined	12%	13%	10%	11%
White	9%	11%	7%	9%
Black or African American	19%	25%	15%	24%
American Indian and Alaska Native	21%	23%	15%	12%
Asian	7%	4%	8%	0%
Native Hawaiian and Other Pacific Islander	3%	0%	13%	0%
Some other race	27%	37%	16%	35%
Two or more races	19%	24%	13%	16%
Hispanic or Latino origin (of any race)	24%	31%	14%	27%

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

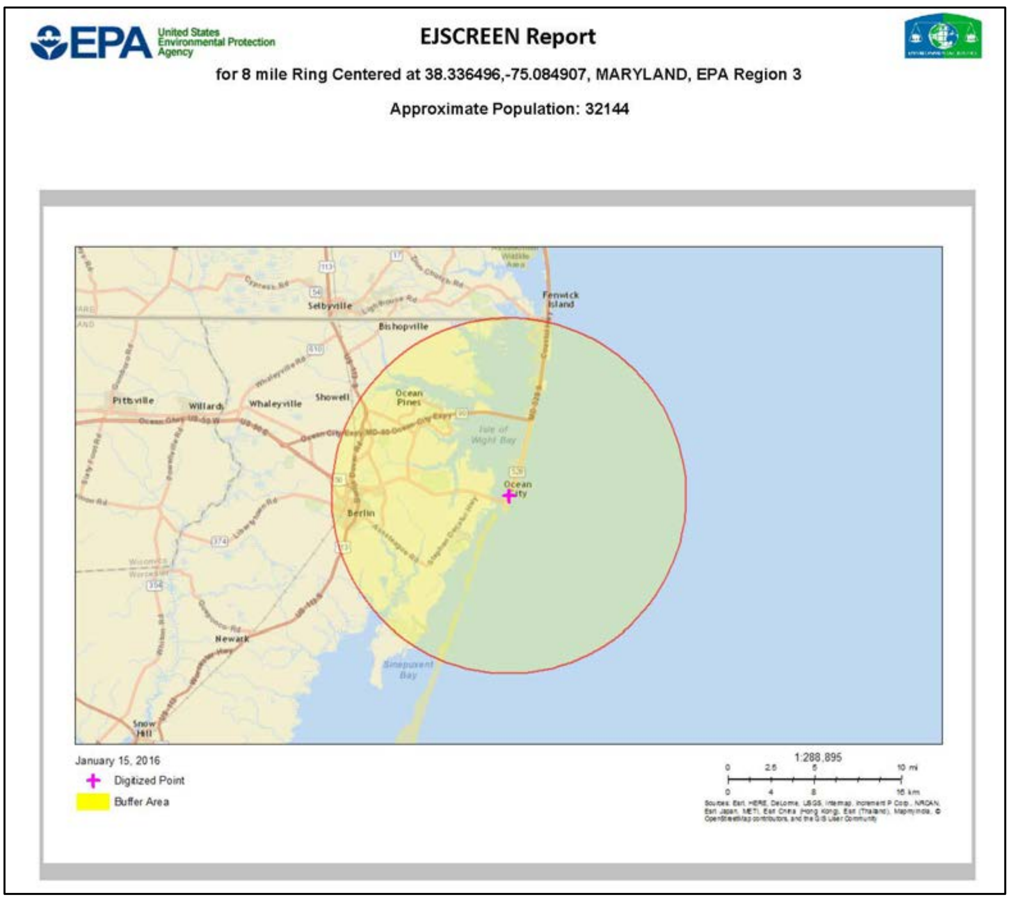
The study area has a lower percentage of minority populations than the Delaware and Maryland State averages as noted in U.S. Census Bureau data in Table 3.14-1.The poverty rate in the study area in general, is close the respective state averages for Delaware and Maryland. However the poverty rates for some minority communities are higher than the state averages.

3.14.1.5 Environmental Justice Screening

An environmental justice screening was conducted to determine potential environmental and demographic issues in the area using the Environmental Justice and Screening Tool (EJSCREEN). USEPA uses EJSCREEN to identify areas that may have higher environmental burdens and vulnerable populations as it develops programs, policies and activities that may affect communities. There are 12 EJ Indexes in EJSCREEN reflecting environmental indicators. EJSCREEN also uses demographic factors as general indicators of a community's potential susceptibility to the types of environmental factors.

For the Project, the EJSCREEN analysis centered on Ocean City, MD, the community closest to the MET tower's offshore location (Figure 3.14-1).

Figure 3.14-1 Environmental Justice Screening Area



Source: United States Environmental Protection Agency. 2016. EJSCREEN. Retrieved: 01/15/2016, from www.epa.gov/ejscreen.

The EJSCREEN results shown in Figure 3.14-2 compare the communities in the Project area to the rest of the state, EPA region, and nation using percentiles. These percentiles are a way to see how local residents compare to everyone else in the United States. For example, the national percentile indicates what percent of the US population has an equal or lower potential for exposure, risk or proximity to certain facilities, or a lower percent minority exposure.

Figure 3.14-2 Environmental Justice Screening Report

EJSCREEN Report

for 8 mile Ring Centered at 38.336496,-75.084907, MARYLAND, EPA Region 3

Approximate Population: 32144

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	33	39	29
EJ Index for Ozone	29	31	22
EJ Index for NATA Diesel PM*	N/A	N/A	N/A
EJ Index for NATA Air Toxics Cancer Risk*	N/A	N/A	N/A
EJ Index for NATA Respiratory Hazard Index*	N/A	N/A	N/A
EJ Index for NATA Neurological Hazard Index*	N/A	N/A	N/A
EJ Index for Traffic Proximity and Volume	31	29	22
EJ Index for Lead Paint Indicator	38	54	37
EJ Index for Proximity to NPL sites	42	46	32
EJ Index for Proximity to RMP sites	6	10	9
EJ Index for Proximity to TSDFs	45	58	44
EJ Index for Proximity to Major Direct Dischargers	21	27	19

Source: United States Environmental Protection Agency. 2016. EJSCREEN. Retrieved: 01/15/2016, from www.epa.gov/ejscreen.

EJSCREEN results shown in Figure 3.14-2 indicate that in general, the study area percentiles range from 6%-54% and indicate that the study area has lower potential for exposure, risk or proximity to environmental justice issues than Maryland and Delaware, EPA Region 3 and the U.S. For example, the 33rd Percentile in the state, means the average person in the study area has a block group score greater than, or equal to that of 33% of the state population. These indicators included traffic proximity and volume, lead paint in housing, EPA National Priorities List sites, EPA hazardous chemical waste Treatment, Storage, Disposal Facilities and Water Discharge Facilities.

3.14.2 Potential Impacts

The Project is expected to have negligible but positive impacts on economy and employment in Maryland related to the acquisition of various support services, primarily within the coastal counties. Due to the short duration of construction and decommissioning activities, any benefit to the population and economy would be short-term. Construction and decommissioning activities are not expected to employ many workers relative to the existing employment numbers. Similarly, little activity would be associated with the maintenance and operation of the MET Tower.

The MET tower will be located more than 14 nm from the coast. Upland areas in Maryland will not be directly impacted by MET Tower activities except during fabrication/assembly of MET Tower components.

It is expected that the MET Tower foundation components will be fabricated in an existing industrial waterfront site in the Port of Baltimore, then transported directly to the Lease Area. The MET Tower mast will be fabricated and/or assembled at an existing industrial waterfront site in the Port of

Baltimore, then transported via water to the Lease Area. No new port or upland facilities will be required; therefore, no significant impact on land use or coastal infrastructure is expected due to MET tower fabrication and construction. The Project will not introduce a major demand for local public services, energy, and/or water supplies.

The use of existing ports and their associated shore bases during MET tower operations is expected to have no or negligible land use conflicts with current land uses and land use plans. Smaller vessels used for MET tower maintenance would typically return to their shore bases daily, averaging less than three trips/month over the two-year period. These trips may be divided among ports in Maryland, but most are expected to originate from Ocean City or the Port of Baltimore. Crews on these vessels may range from 2-6 people.

There will be no direct impacts to recreational facilities. Potential indirect coastal resources and visual impacts in these areas will be negligible, as discussed in Section 3.2 and Section 3.11, respectively, and the small amount of vessel traffic associated with MET tower activities might be present in recreational areas would have negligible impacts, particularly given existing recreational and commercial vessel activity along the Maryland coast.

Similarly, due to the primarily offshore nature of project activities and limited need for upland resources, MET tower activities would not have disproportionately high or adverse environmental or health effects on minority or low-income populations. Upland/coastal activities, which could have the potential to impact minority or low-income populations, will be conducted at existing fabrication sites, staging areas, and ports without the need for expansion or significant changes in use relative to existing operations. There are not anticipated to be any Project impacts that would add exposure risk, risk of release, or increase proximity risk to environmental justice communities in the Project area.

Non-Routine Events

Collisions and allisions are considered unlikely. However in the event that a vessel allision or collision were to occur, and result in a diesel spill, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days. Impacts are expected to be minor, temporary, and localized and not result in impacts to land uses, local communities, or recreational facilities.

Discharge of liquid wastes or solid debris from vessels and OCS structures is prohibited by BOEM and the USCG and would not be expected during normal operations. Any accidental discharge would likely be localized and of limited volume.

3.14.3 Mitigation Measures

As described in preceding sections, the Project will implement best practices and comply with all applicable regulations to eliminate or minimize the potential for adverse environmental impacts during MET tower construction, operation, and decommissioning. This will include measures to avoid conflict with existing uses and prevent accidental events such as spills. These measures will ensure that any unavoidable impacts to the state economy, land uses, and recreational areas are negligible. There are not anticipated to be any Project impacts that would add exposure risk, risk of release, or increase proximity risk to environmental justice communities in the Project area.

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