MAYFLOWER WIND

A Shell and EDP Renewables Joint Venture

SITE ASSESSMENT PLAN

Mayflower Wind Lease OCS – A 0521

Massachusetts Offshore Wind Energy Area

SUBMITTED TO:

Bureau of Ocean Energy Management
Office of Renewable Energy
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July 29, 2019

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1.0 INTRODUCTION

1.1 Project Information (30 CFR § 585.610(a))

This section describes basic project information.

1.1.1 Contact Information (§ 585.610(a)(1))

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1.1.2 Site Assessment Concept (§ 585.610(a)(2))

The general concept is to install and maintain one (1) meteorological and oceanographic buoy, hereafter referred to as metocean buoy, within the Massachusetts Wind Energy Area (WEA) of the Atlantic Ocean, as designated by the Bureau of Ocean Energy Management (BOEM) and leased to Mayflower Wind LLC (Mayflower Wind).

The device to be deployed is a floating Light Detection and Ranging (LiDAR) buoy, which will float on the surface and be moored to the seafloor. The proposed location for the metocean buoy is shown in Figure 1.2.1 Location Plat; coordinates and water depth are:

E: 386938.58
N: 4517685.79
Latitude: 40° 48’ 08.627’’ N
Longitude: 70° 20’ 25.192’ W
NAD83, UTN 19N [EPSG 26919]
Depth: 46.6 meters (153 feet, 25.5 fathoms)
Anchor sediment penetration depth : 1 meter
Mooring chain sweep: 131ft. (40 meters)
Anchor sweep: N/A

The information collected from the metocean buoy will be used during the pre-installation, installation, construction and operations to supplement existing metocean measurement data available in Massachusetts WEA and Northeast Atlantic.

Installation of the metocean buoy is planned for late October 2019. The installation process is expected to take less than one week, from arrival of the work platform in the port of operations to the time the buoy enters the water and mooring weight is placed on the seafloor. The total duration of the metocean buoy deployment for data collection is anticipated to be approximately one (1) year.

The buoy is considered a non-complex ocean buoy as it is a proven and widely used technology and many similar systems are deployed on the U.S. Outer Continental Shelf (OCS). Mayflower sponsor, Shell, deploys similar metocean buoys in the Gulf of Mexico in waters deeper (up to 2900 meters). This buoy uses industry standard materials and anchors and has a minimal seabed footprint (~3 meters diameter) and very small penetration depth into the seafloor (1 meter or less). The installation, operation, and decommissioning of the metocean buoy will have negligible or less than negligible impacts on the affected environment.

The following table (Table 1.1.2) summarizes the potential environmental impacts specific to the proposed Site Assessment Plan (SAP) activities; this impact assessment factors in the implementation of mitigation measures proposed in Section 3.3. For the purposes of this document, only resources with negligible impacts or greater will be described in Appendix A. Summaries of environmental resources within the SAP area may be found in Section 3.0.

Table 1.1.2. Summary of Impacts

Project Activity	Geologic Resources	Coastal Habitats & Terrestrial Mammals	Water Quality	Benthic Resources	Fisheries & Essential Fish Habitat	Marine Mammals & Sea Turtles	Coastal & Marine Birds & Bats	Air Quality	Archaeological Resources	Visual Resources	Navigation, Transportation & Military Activities	Commercial & Recreational Fishing	Socioeconomics
Installation													
Vessels	NA	N	NA	NA	NA	N	NA	N	NA	NA	N	NA	NA
Anchor Deployment	N	NA	NA	N	N	NA	NA	NA	NA	NA	N	NA	NA
Operation													
Service Vessels	NA	N	NA	NA	NA	N	NA	N	NA	NA	N	NA	NA
Buoy (incl. anchor & chain sweep)	N	NA	NA	N	N	N	NA	NA	NA	NA	N	NA	NA
Lighting	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N	NA	NA
Decommissioning													
Vessels	NA	N	NA	NA	NA	N	NA	N	NA	NA	N	NA	NA
Anchor Removal	N	NA	NA	N	N	NA	NA	NA	NA	NA	N	NA	NA

N = Negligible
NA = Not applicable or less than negligible

1.1.3 Designation of Operator (§ 585.610(a)(3))

Mayflower Wind intends to be the sole operator of the metocean buoy in compliance with the stipulations stated in the Lease and described in Section 1.1.4, as they relate to the SAP and SAP activities.

1.1.4 Lease Stipulations and Compliance (§ 585.610(a)(4))

The lease issued to Mayflower Wind for the Massachusetts Wind Energy Area is posted on the BOEM website at https://www.boem.gov/MA-LEASE-OCS-A-0521-package/. On May 14, 2019, Mayflower Wind Energy, LLC submitted a 2019 Geophysical & Geotechnical Survey Plan in accordance with stipulation 2.1.1 of Addendum C of commercial leases OCS-A 0521. BOEM issued approval to conduct the G&G surveys on July 30, 2019 and surveys will start on July 31, 2019. Mayflower Wind conducted a tribal pre-survey meeting, as specified in the lease prior to conducting SAP survey activities and anticipates consultations to occur in Fall 2019 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 Narragansett Bay operating area (OPAREA) and ensures events are de-conflicted.

Mayflower Wind conducted a tribal pre-survey meetings, as specified in the lease prior to conducting SAP activities and anticipates consultations to occur in Fall 2019 with United States Coast Guard and 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 Narragansett Bay operating area (OPAREA) and ensures events are de-conflicted.

Mayflower Wind will conduct the geophysical surveys and archaeological reviews as approved by BOEM and in accordance with its lease stipulations. SAP activities will be conducted in a manner that conforms to Mayflower Wind's responsibilities pursuant to 30 CFR § § 585.105(a) and 606. Measures that will be implemented to avoid, minimize, and/or mitigate potential impacts associated with SAP activities, as required by the lease, are described in Section 2.0 and 3.0.

Mayflower Wind will comply with the Federal regulations and associated SAP Guidelines regarding the items listed in Table 1.1.4 below, as stated in the table and outlined in this SAP.

Table 1.1.4. Compliance with BOEM Regulations

Regulation	Description	Compliance Statement
585.105(a)	Design your project and conduct all activities in a manner that ensures safety,	Mayflower Wind will comply with the requirements specified under 585.105(a). Project design standards and company health and safety policies are in place to ensure safe working conditions for people, *in situ* equipment, and all activities occurring within the Lease Area and for the project.
	and will not cause undue harm or damage to natural resources, including their physical, atmospheric, and biological components to the extent practicable;	Mayflower Wind's activities have been designed to minimize or avoid impacts to the environment. See Section 3.3 (Mitigation Measures) for further details of specific environmental resources.

Regulation	Description	Compliance Statement
	and take measures to prevent unauthorized discharge of pollutants including marine trash and debris into the offshore environment.	Mayflower Wind will enforce operational rules and safeguards, including any required permit conditions, against discharge from vessels working on the project, in the Lease Area, and within surrounding waterways connecting to the port.
585.606(a)	(1) Conforms to all applicable laws, regulations, and lease provisions of your commercial lease	Mayflower Wind will comply with the requirements specified under 585.606(a). Mayflower Wind will follow applicable laws, regulations, and provisions specified in Lease OCS-A-0521. Standard Operating Conditions are addressed in Section 3.3 (Mitigation Measures).
	(2) Is safe	Mayflower Wind has planned and is prepared to conduct all SAP activities in a safe manner following company's (Mayflower Wind's and subcontractor's) health and safety policies and any applicable laws.
	(3) Does not unreasonably interfere with other uses of the OCS, including those involved with National security or defense	SAP activities will not interfere with other uses of the OCS and Lease Area. Mayflower Wind and its contractors will continue to communicate with USCG, appropriate entities, and other users of the OCS; and obtain approval from Navy Fleet Forces Atlantic that the OCS is clear for SAP activities. See Section 3.1.10.
	(4) Does not cause undue harm or damage to natural resources; life (including human and wildlife); property; the marine, coastal, or human environment; or sites, structures, or objects of historical or archaeological significance	Mayflower Wind has and will continue to conduct due diligence efforts to protect the environment during offshore and upland project activities, as well as any cultural resources identified within the project area. See Appendix A and Section 3.3 (Mitigation measures) for analysis of site characteristics, potential impacts, and avoidance and mitigation measures.
	(5) Uses best available and safest technology	Metocean buoy equipment and associated mooring are widely used, standard technology that are used for other offshore wind SAP monitoring and represent the best available and safest technologies for the environment at the time of this submittal.

Regulation	Description	Compliance Statement
	(6) Uses best management practices	Mayflower Wind will continue to use best management practices (BMPs) regarding all project tasks. Some of the BMPs specific to the SAP activities include, but are not limited to: • avoid impacts to benthic and nektonic habitats, • avoid, minimize, and mitigate impacts to marine mammals, seals, and turtles, • installation activities only during approved months to avoid, minimize, and mitigate impacts to fisheries and marine mammals, • avoid any bottom disturbance during installation except the weight for the mooring itself, • use of approved USCG lighting and marking of mooring buoys to avoid impacts to the commercial fishing industry, • design of the buoy to minimize avian perching, • design of the mooring to avoid entanglement by marine mammals, turtles, and seals, • routine inspection of the moorings to ensure structural integrity and minimal seabed disturbance, • combine vessel trips for inspection, maintenance, and data downloads to minimize environmental impact, • prepare and execute an oil spill response plan, • exercise responsible and safe behavior during all site activities.
	(7) Uses properly trained personnel	Mayflower Wind will ensure that suitably trained and experienced personnel will be employed for all SAP activities, meeting company and health and safety standards for the work to be performed.

1.2 Proposed Activity

1.2.1 General Structure and Project Design, Fabrication, and Installation (§ 585.610(a)(6))

As outlined in Section 1.1.2, one floating metocean buoy (SEAWATCH Wind LiDAR Buoy, SWLB) moored to the bottom is proposed to be installed within the Massachusetts WEA during the development and installation period of the wind farm. The device will be installed in Latitude: 40° 48' 08.627'' N Longitude: 70° 20' 25.192' W in approximately 153 feet (46.6 m) of water (see location Figure 1.2.1, (585.610(a)(5))).

Duration for the buoy will be approximately one (1) year from the date of deployment, anticipated from approximately October 1, 2019 to October 1, 2020 as shown in Table 1.2.1-1 below. This instrument is an off-the-shelf product and is widely applied in the offshore industry. The measurement device and its components are briefly described in Table 1.2.1-2. Components of the buoy include the gravity-based anchor and the chain that affixes the buoy to the anchor, as further described below. Detailed technical information about the SWLB is provided in Table 1.2.1-2 and Appendix B.

Table 1.2.1-1. LiDAR Buoy Proposed Schedule

1 Year Campaign	Estimated days	Estimated Dates
Contract Signature	0	11-Jul-19
Manufacturing	60	9-Sep-19
Factory Acceptance Test (FAT)	1	10-Sep-19
Pre-Deployment Validation in Norway	30	10-Oct-19
Pre-Deployment Validation Report (Concurrent with below operations)	30	10-Oct-19
Disassembly for transport	1	11-Oct-19
Transport from Norway to Mob Port	5	16-Oct-19
Assembly after arrival in Mob Port	1	17-Oct-19
Site Assembly Test (SAT)	1	18-Oct-19
Deployment	3	21-Oct-19
Measurement Campaign	365	20-Oct-20
Maintenance Service 01 - 3 days	183	21-Apr-20
Decommissioning - 1 day	181	19-Oct-20

The SWLB will be mounted to the seafloor using a steel chain mooring connected to a gravity-based anchor weight. The SWLB mooring components would comprise 19 mm and 11 mm chain, certified terminations, shackles and other consumables. All strops and terminations would be weight-tested and prepared in accordance with the industry standards. All shackles and other mooring components would be Safe Working Load (SWL) certified and galvanized. Any mixed metal contacts would be insulated to prevent electrolytic corrosion. The SWLB anchor weight would consist of stacked railroad wheels. For this specific work, two stacks of five railroad wheels are proposed to be used.

The mooring design and materials will be site specific, and take the following factors into consideration:

- Water depth
- Current speeds
- Tides
- Waves
- Winds
- Type of deployment vessel and equipment available on board
- Desired length of life of the mooring
- Vessel traffic in the vicinity of the mooring

The buoy will be equipped with the proper safety lighting, markings and signal equipment per United States Coast Guard (USCG) Private Aids to Navigation (PATON) requirements. Notification to the USCG is presently underway.

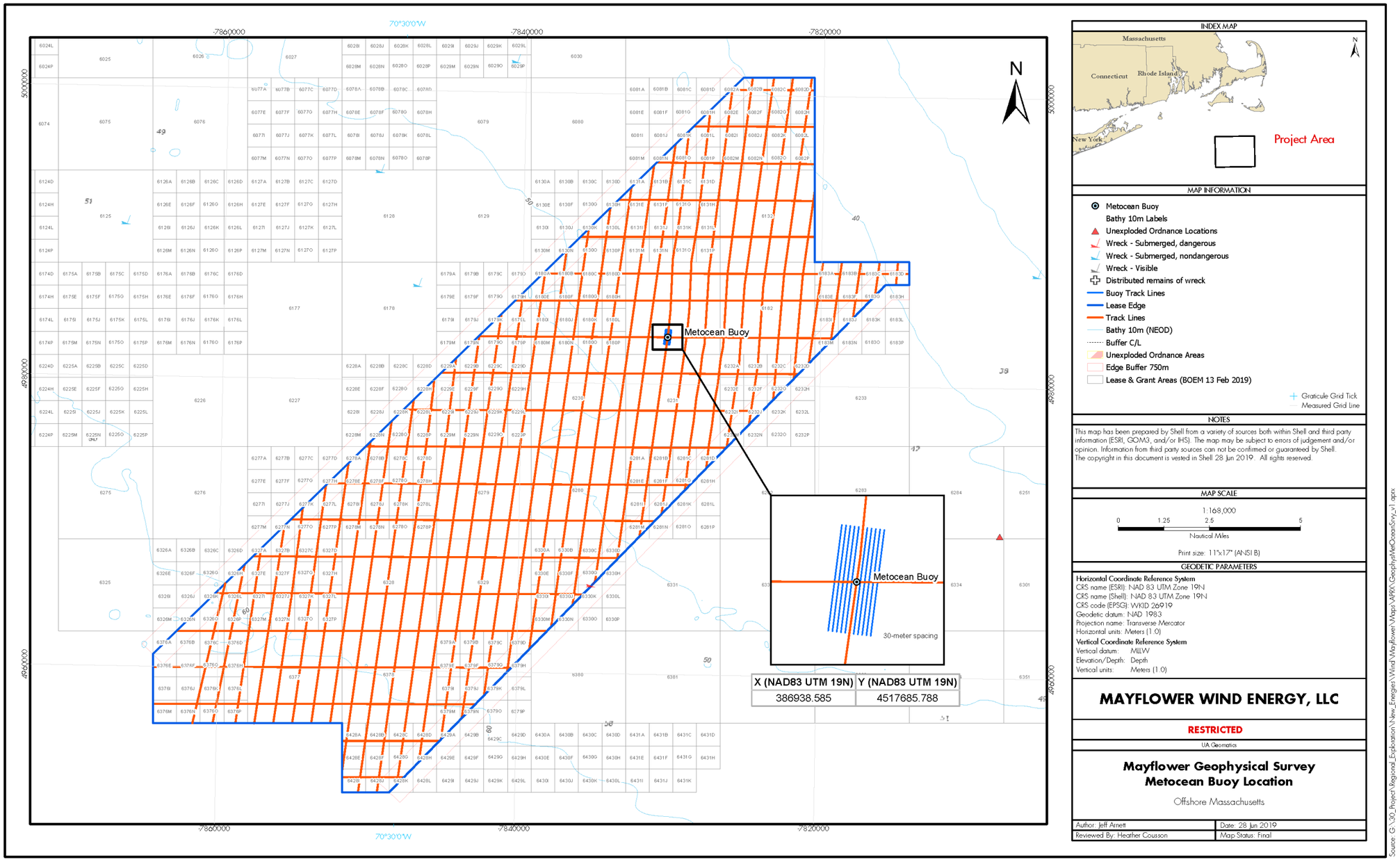
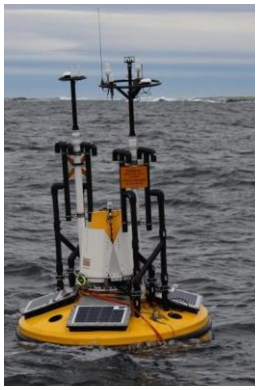


Figure 1.2.1. Location of SAP Area (§ 585.610(a)(5))

Table 1.2.1-2. Summary Description of Measuring Device for Deployment

SEAWATCH Wind LiDAR Buoy	
	A SEAWATCH Wind LiDAR Buoy (SWLB) is a marine buoy specifically suited for marine conditions. The SWLB can measure the wind profile from 10m to 300m (validated to 200m) above the sea level. Additionally, the system can measure wind speed and direction at 4m above the sea level from the wind sensor located at the mast of the buoy and measure sea state characteristics (directional waves, current profile, water level, conductivity) and meteorological parameters (air temperature/humidity, air pressure, solar radiation, precipitation). The SWLB has the following characteristics: • Dimensions: 9.2 ft. (2.8 m) diameter, 13.1 ft. (4m) above sea level • Weight: 2.4 tons (2,200kg) • Mounting: A single weight at seafloor approximately 3,000kg with 16mm link anchor chain approximately 278 ft (85m) in length. • Mooring chain sweep: 131ft. (40m) • Anchor sweep: N/A • Excursion box area: 250 m x 250 m • Sediment penetration: 1m

The technical diagrams and potential vessels considered for deployment for the SWLB are included in Appendix B.

1.2.2 Deployment Activities (§ 585.610 (a)(7))

Installation of the buoy will happen over a two-day period. The instrument would be mobilized on either New Bedford Port or Port Jefferson, dependent on vessel availability. The potential vessels that will be contracted to conduct the work are described in Appendix B. Once prepared, the buoy would be towed to the work site at approximately 5 knots vessel speed, depending on the sea conditions. Once on site, the vessel would deploy the system using the "anchor last" method, in which the instrumentation is deployed over the stern while the vessel maintained slow speed ahead. The anchor weight would be chained to the stern of the vessel using certified components prior to commencement of the deployment. The mooring would be deployed in reverse order, commencing with the SWLB already in the water. The mooring line would be attached to the anchor weight and, once on position, the anchor would be released using a SeaCatch release. The anchor weights would then free-fall to the bed, bringing the buoy into the vertical position. Specifications of potential deployment vessels are provided in Appendix B. Mayflower Wind will notify BOEM when the final vessel is confirmed.

The device will digitally collect data and a subset will be sent to shore using satellite transmission. This device will need scheduled and may need unscheduled service during the deployment period. Planned service visits will occur every 4 – 6 months. Unscheduled service visits will occur when an instrument(s) requires immediate servicing, weather and conditions permitting. Such service activities will be made with service vessels with sufficient crane capacity. If the device suffers from malfunction or collision, it will be replaced with the same device.

1.2.2 Deployment Activities (§ 585.610 (a)(7))

As noted in the BOEM Commercial Wind Lease Issuance and, Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment (EA) and FONSI "the disturbance to the seabed during construction and deployment of towers and buoys would cause small, localized impacts on the water quality in the vicinity of the structures. The weight and area of anchor resting on the sea floor is generally consistent with what was assessed in the EA. Due to the mooring design, there is not expected to be an anchor sweep associated with the mooring. These small, localized impacts would cease during operation of the buoys. The deployment of the buoy and testing of the equipment is estimated to be less than 1 day.

Vertical penetration of the heavy steel anchor chain depends on the weight, outer dimensions and seabed conditions. A total seafloor penetration during the deployment period for the chain is anticipated to be approx. 1.0 m (3.3 ft). Only very limited scour development is expected due to minimal currents and relatively cohesive seabed conditions. These conditions have been considered as part of the planning of the installation, operations and decommissioning.

Total suspended sediment (TSS) exposure for deployment will be acute and low level in offshore due to sand bottom. Since a vessel will deploy the buoy system over the stern while the vessel while maintaining a slow speed ahead there is no vessel anchoring involved during deployment. The only potential impacts to water quality will be from the buoy anchor weight during deployment and minor chain sweep. The seabed would be temporarily disturbed for a few minutes once the weight is dropped and this disturbance is only localized to the installation process. Deployment will result in minor effects to water quality turbidity in the immediate vicinity of the anchor disturbance that would settle out relatively shortly.

1.2.3 Mitigation Measures (§ 585.610 (a)(8))

The Project will implement best practices and comply with all applicable regulations and lease stipulations to avoid, minimize, reduce, eliminate and monitor environmental impacts during buoy installation, operation, and decommissioning (see Table 1.1.4.). Mayflower Wind will comply with 30 Part 585 Subpart H. This will include measures to avoid and prevent accidental events. There will be no vessel discharges. These measures will ensure that any unavoidable impacts are negligible. Mitigation and monitoring measures are described in detail in Section 3.3.

1.2.4 CVA nomination (§ 585.610 (a)(9))

The installation, operation, and decommissioning of a standard metocean buoy does not quality as a complex or significant activity; therefore, nomination of a Certified Verification Agent (CVA) is not required.

1.2.5 Reference Information ((§ 585.610 (a)(10))

A list of all documents and published sources referenced throughout this SAP is included in Section 4.0 at the end of this document.

1.2.6 Decommissioning and Site Clearance Procedures (§ 585.610 (a)(11))

Decommissioning and site clearance procedures will be conducted pursuant to the applicable sections of 30 CFR Part 585, Subpart I. In general, device recovery will be undertaken by vessels similar to those used

during commissioning. For the metocean buoy recovery activities during the maintenance and demobilization operations, lifting equipment of minimum 3.5 tons, such as an A-Frame or stern Crane, would be needed for the retrieval of the buoy. Once on site, the vessel would back up to the buoy and a line would be secured to the lifting point. The buoy would be lifted by the A-Frame/Crane to the deck of the boat and the mooring line chain would be attached to a tugger winch. The buoy then would be disconnected from the mooring line and returned to the water for towing back to port.

For the maintenance visits, the spare buoy unit would be reconnected to the mooring line chain attached to the tugger winch and released in the water. For the demobilization visit, the mooring line would be lifted to the deck of the boat, including the anchor weight, for return to port. This method leaves no materials on the seafloor.

After the conclusion of the campaign, the buoy would be moved to shore and decommissioned. As part of the decommissioning process, local authorities (Coast Guard, maritime authorities) will be advised of the removal of the devices from the area.

1.2.7 Air Quality Information (§§ 585.610(a)(12) and 585.659)

Given the minimal air emissions associated with SAP activities, a United States Environmental Protection Agency (USEPA) air permit is not required for SAP activities. Potential impacts associated with SAP activities are expected to be negligible. See Section 3.3.7 for air quality mitigation measures.

1.3 Regulatory Framework (§ 585.610(a)(13))

1.3.1 List of Permits/Authorizations

Mayflower Wind will apply for approvals and/or authorizations as shown in Table 1.3.1 to conduct site assessments activities (metocean buoy installation, operation, and decommissioning):

Table 1.3.1. Mayflower Wind SAP Permitting Plan

Agency	Permit / Approval	Statutory Basis	Regulations	Expected Filing Date
Bureau of Offshore Energy Management (BOEM)	Site Assessment Plan (SAP) • National Environmental Policy Act (NEPA) • MA Coastal Zone Management (CZM) Consistency • National Historic Preservation Act Review & State Historic Preservation Act Consultation	Coastal Zone Management Act NHPA 16 U.S.C. 470	15 CFR 930 Subpart C 36 CFR Part 60, Part 800	Submitted July 2019
National Oceanic and Atmospheric Administration National Marine Fisheries Service	Section 7 Biological Opinion	Endangered Species Act	50 CFR 402.14	Completed (Agency issued April 10, 2013, amended September 7, 2017)
US Army Corps of Engineers (USACE)	Section 10/404 Permit (via Massachusetts General Permit 18 – Scientific Collection Device)	Clean Water Act 33 U.S.C. 134	33 CFR 320 *et seq.*	Filed December 2019

Agency	Permit / Approval	Statutory Basis	Regulations	Expected Filing Date
US Coast Guard (USCG)	Private Aid to Navigation Local Notice to Mariners	14 U.S.C.81	33 CFR Part 66	Submitted Winter 2019
US Environmental Protection Agency (EPA)	Outer Continental Shelf Air Permit	Clean Air Act 42 U.S.C. § 7401	40 CFR Part 55	Completed October 2019

Mayflower Wind has submitted a request to National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) for a Marine Mammal Protection Act (MMPA) Letter of Concurrence for the upcoming geophysical surveys to be conducted within the Lease Area in support of lease site reconnaissance and data collection for this SAP. NMFS issued concurrence on July 26, 2019.

1.3.2 Completed and Anticipated Agency Correspondence (§ 585.610(a)(14))

Mayflower Wind has conducted or will conduct outreach with the following local, State, and Federal agencies via meetings and/or correspondence. This outreach will address planned SAP and development activities for the Mayflower Wind Offshore Wind Project. These agencies include:

- BOEM
- NOAA NMFS
- USACE
- USCG, District Commander
- MA CZM
- US Navy – Fleet Forces
- USEPA
- NOAA

Mayflower Wind will continue to provide notifications as required (i.e. to BOEM, USACE, USCG) during deployment and operation of the metocean buoy, and prior to decommissioning.

1.4 Financial Assurance Information (§ 585.610(a)(15))

In compliance with BOEM regulations (30 CFR § 585.610(a)(15)), before the commencement of the deployment of any devices, Mayflower Wind will provide Surety Bond, 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 Information (§ 585.610(a)(16)) – *As requested by BOEM*

No other information has been requested by BOEM at this time relative to the proposed SAP activities.

2.0 SURVEY RESULTS (§ 585.610(b))

Mayflower conducted geophysical surveys starting in late July. Per conversations with BOEM during Geological and Geophysical (G&G) Survey Plan meeting (June 18, 2019), independent biological surveys will not need to be conducted for this proposed metocean buoy deployment given its small footprint and penetration depth. The necessary G&G data (i.e., geological, shallow hazards, and geophysical), analysis and report were provided

to BOEM on October 25, 2019. Mayflower Wind's contracted Qualified Marine Archaeologist (QMA, Terrasond) reviewed the data and prepared a report from the proposed SAP location data. The draft version of the report was provided to BOEM on September 9, 2019. After consultations with BOEM, revisions were made to the archaeological report. The revised report, and the G&G report, are included in Appendix C.

TerraSond acquired the high-resolution geophysical survey data aboard the M/V Geosea from August 15 to September 17, 2019. Geophysical data were acquired using a Sub-bottom Profiler (SBP), Multichannel High-Resolution Seismic (MHRS) System, Side Scan Sonar (SSS), Multibeam Echosounder (MBES), and Magnetometer/Transverse Gradiometer (MAG/TVG). The survey covered the 240-meter x 240-meter square survey area around the center point of the metocean LIDAR buoy placement location. . Ten lines and one crossline were run to acquire coverage of 30-meters around the area of potential effect (APE) of the metocean LIDAR buoy placement location for SAP purposes. The full report is included in Appendix C. In summary, no interpreted significant hazards were identified within the survey area.

Based on the results of the 2019 archeological assessment (Appendix C), no potential submerged cultural or archaeological resources were identified within the proposed buoy deployment area. Thus, the installation and operation of the proposed metocean buoy would result in no impacts to marine archaeological resources. Due to the height of the buoy (~4m) from the sea surface to the top of the hull and the distance from shore, the operation of the system will not result in any visual impacts.

2.1 Geotechnical Survey (§ 585.610(b)(1))

Geotechnical survey data have not been collected and are not considered necessary for the installation of a metocean buoy as agreed by BOEM in consultations (June 18, 2019 Mayflower Wind Geophysical and Geological Pre-Survey Meeting).

2.2 Geological Survey and Shallow Hazards (§§ 585.610(b)(4) and 585.610(b)(2))

Geophysical surveys will be conducted in accordance with the Mayflower Wind 2019 Geophysical and Geological Survey Plan approved by BOEM on June 30, 2019. Data to be acquired will include bathymetry, side scan sonar, magnetometer, sparker, and shallow and medium penetration sub-bottom profiler data.

To meet the requirements in 30 CFR § 585.610(b), the first activity in Mayflower Wind's geophysical survey will be to collect geophysical data in the proposed buoy deployment site. Seven (7) 30m offset lines will be added for the site clearance of a LIDAR metocean buoy. These lines are 725m in length and are shown in Figure 2.2.1. BOEM regulations at §585.610 require that a SAP include the results and supporting data of an archaeological survey to identify potential resources within the Area of Potential Effects (APE) that may be impacted by the site assessment activities proposed. Mayflower Commercial Lease OCS-A 0521 stipulation 4.3.1 further indicates that the results of an archaeological survey are required to be provided with a lessee's SAP. The geophysical data and report, generated by TerraSond QMA, will be done according to BOEM's Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR 585, which details the recommended methods for conducting these surveys and the requested format for providing the results and supporting data to the BOEM to complete the review of Mayflower's SAP under the National Historic Preservation Act.

Existing, publicly-available data was used to characterize the geological environment as summarized in Section 3.1.1

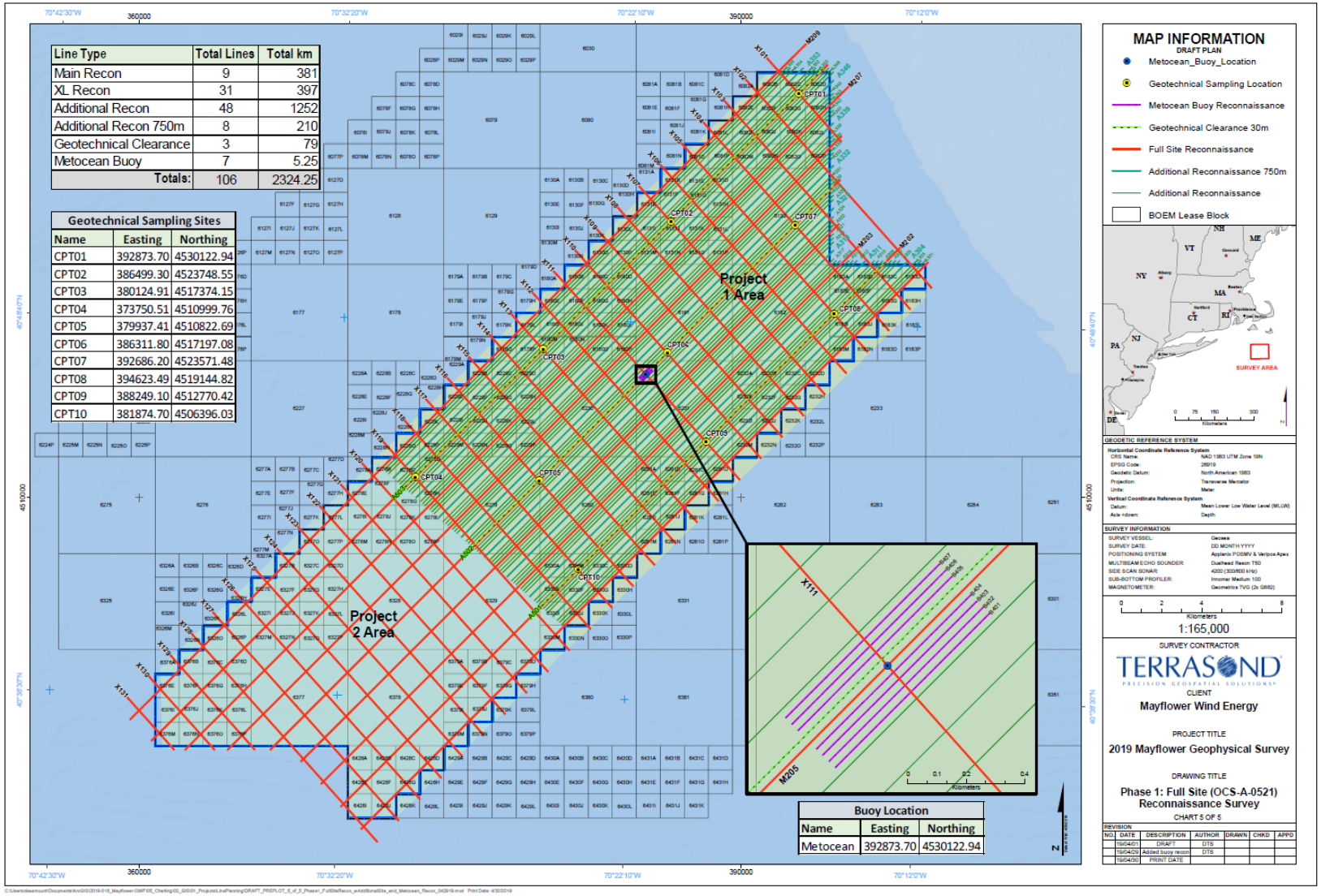


Figure 2.2.1 *LIDAR Metocean Buoy Clearance Area & Proposed Phase 2 Lines.*

2.3 Archaeological Resources (§ 585.610(b)(3))

SEARCH utilized existing, publicly-available information for a desktop sensitive assessment for historic and archaeological resources in the vicinity of the buoy deployment which is provided in Section 3.1.8 and Appendix D.

2.4 Biological Survey (§ 585.610(b)(5))

The biological surveys have not been conducted at this time. The resource sections described below were prepared using existing, publicly-available data and reports. Biological surveys will not be conducted during the geophysical surveys to support this SAP submission.

3.0 AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES (§ 585.611(b))

3.1 Environmental Baseline

BOEM has previously conducted evaluations of similar types of activities and environmental effects on the MA WEA, and therefore, it is Mayflower Wind's position that the proposed activities and effects described in its SAP are well within the scope of BOEM's prior MA WEA analyses (e.g., the Massachusetts/Rhode Island Environmental Assessment and Lease Sale NEPA document) and are not significantly different. Nevertheless, Mayflower Wind has included a summary-level discussion of the types of information contained in 585.611(b)(1) through (10) to facilitate BOEM's review. A more detailed discussion of existing environmental conditions is included as Appendix A.

3.1.1 Geologic Setting

The proposed metocean buoy location will be located within the Massachusetts WEA, located on the Atlantic Outer Continental Shelf (OCS). The sediments found along the OCS are recently deposited and re-worked glacial materials (i.e., Pleistocene and Holocene in age) that were formerly exposed during lower sea-level stages. These outwash plains were extensively re-worked by meltwater discharges while a rising sea-level would ultimately drown the outwash plains (BOEM 2012, 2014). Based on available literature, the geological setting in the SAP Area is characterized as a depositional environment dominated by extensively re-worked Late Pleistocene and Holocene sediments that are now transported almost exclusively by currents and tides due to the depth of water (BOEM 2014).

3.1.1.1 Hazard Assessment (§ 585.611(b)(1))

The presence of potential seafloor, subsurface, and man-made hazards (i.e., shipwrecks, debris, cables, pipelines, and ordnance) within the SAP Area will be determined by the hazards survey. Seafloor and subsurface hazards include steep slopes, bedforms, rock/hard-bottom, diapiric structures, faults, gas or fluid expulsion, scour, and channels. Wave-like sand features of varying scales are found throughout the MA WEA. Throughout the Nantucket Shoals and along the eastern margin of the WEA there are sand ridges and sand waves. However, these features are not found throughout most of the WEA and are unlikely to be found within the metocean buoy Area and are not anticipated to pose a risk to metocean buoy installation or operation (BOEM 2014).

3.1.1.2 Metocean Criteria Assessment

Mayflower conducted a meteorological and oceanographic (metocean) criteria assessment to support the proposed activity operations. The assessment utilizes existing observed and numerical model data in and around Lease Area A – 0521. The full study is provided in Appendix E.

3.1.2 Coastal Habitats

The metocean buoy will be located approximately 63 km (39 nm) offshore of Martha's Vineyard and therefore is not likely to affect coastal habitats. Increased vessel traffic associated with SAP activities could affect coastal habitats and terrestrial animals due to wake erosion and associated sediment disturbance; however, this is unlikely, as described in Section 3.2.1.

3.1.3 Water Quality (§ 585.611(b)(2))

Water quality in coastal waters is controlled primarily by the anthropogenic inputs of land runoff, land point source discharges, and atmospheric deposition. Regionally, the condition of Northeast coastal waters (Maine to Virginia), as measured by the EPA water quality index (WQI), is good to fair, based on results of the 2010 National Coastal Condition Assessment (USEPA 2010). The coastal waters of Massachusetts (south of Cape Cod) and nearby waters in Rhode Island (Block Island Sound) are generally in good condition, as measured by the WQI. More specifically, nitrogen, chlorophyll *a*, dissolved oxygen, and transparency levels are assessed as good, while phosphorus levels are considered to be fair.

With increasing distance from shore (including marine waters of the OCS), oceanic circulation patterns play an increasingly larger role in dispersing and diluting anthropogenic contaminants and determining water quality. Water quality data available for OCS marine waters in and near the MA WEA include chlorophyll *a*, turbidity, temperature, and salinity. Further details are included in Appendix A.

The metocean buoy may have minor disturbance in the immediate vicinity during construction and deployment of the buoy and cause small, localized impacts on the water quality in the vicinity of the structures. These small, localized impacts would cease during operation of the towers and buoys (BOEM 2014).

3.1.4 Benthic Resources (§ 585.611(b)(3-5))

Benthic habitat in the Massachusetts WEA is generally characterized by fine - and medium-grained sand (BOEM 2014). No state-managed artificial reefs have been documented within the MA WEA and other types of potentially sensitive or unique benthic habitat types, such as hard bottom, live bottom, and submerged aquatic vegetation (SAV), are unlikely to be present.

The benthic community in the region of the MA WEA includes amphipods and other crustaceans, polychaetes, bivalves, sand dollars, burrowing anemones, and sea cucumbers (BOEM 2014). If the geological and geophysical surveys show the presence of benthic habitats, the buoy location will be shifted to within the block with supporting geophysical data. See Appendix A for additional benthic information.

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

The MA WEA is located in the northern Mid-Atlantic Bight (MAB) of the Northeast U.S. Shelf Ecosystem, also referred to as the Southern New England-New York Bight (Stevenson et al. 2004). The diverse and

abundant fish in this region are generally categorized according to preferred habitat associations, such as pelagic, demersal, and highly migratory. Common species in each assemblage are tabulated in Appendix A.

3.1.5.1 Threatened and Endangered Fish

There are three fish species that are Federally-listed as threatened or endangered that may occur off the northwestern Atlantic coast, including the shortnose sturgeon (*Acipenser brevirostrum*), Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), and Atlantic salmon (*Salmo salar*) (Table 3.1.5). Profiles of these species are included in Appendix A. All three are anadromous species that ascend coastal rivers in spring to spawn in freshwater, but primarily reside in shallow coastal waters. Atlantic sturgeon move to deeper waters in winter and early spring (December to March) (Dunton et al. 2010).

Threatened or endangered fish species are unlikely to be found in the Massachusetts WEA. Atlantic sturgeon have been captured in offshore trawl and gillnet fisheries in Massachusetts waters, but this species is rarely seen in State or Federal fishery-independent surveys. Only certain Gulf of Maine populations of Atlantic salmon are listed as endangered, and Gulf of Maine salmon are unlikely to be encountered south of Cape Cod. Because of their preference for fresh and estuarine waters, shortnose sturgeon are unlikely to be found in the vicinity of the MA WEA (BOEM 2014).

Additional species that have been petitioned for endangered or threatened status and not yet deemed candidates—or are currently candidates for listing and the status determination has not been made yet—are considered as Federal "species of concern" and are included in Table 3.1.5.

Table 3.1.5. List of Threatened and Endangered Species and Species of Special Concern

Species (Scientific Name)	ESA Status
Atlantic salmon (*Salmo salar)*	Endangered
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)	Endangered/ Threatened
Atlantic Bluefin tuna (*Thunnus thynnus*)	Species of concern
Atlantic Halibut (*Hippoglossus hippoglossus*)	Species of concern
Atlantic wolfish (*Anarhichas lupus*)	Species of concern
Dusky shark (*Carcharhinus obscurus*)	Species of concern
Rainbow smelt (*Osmerus mordax*)	Species of concern
Sand tiger shark (*Carcharias taurus*)	Species of concern
Thorny skate (*Amblyraja radiata*)	Species of concern
Alewife (*Alosa pseudoharengus*)	Candidate species/ Species of concern
Blueback herring (*Alosa aestivalis*)	Candidate species/ Species of concern
Cusk (*Brosme brosme*)	Candidate species/ Species of concern

3.1.5.2 Commercially and Recreationally-Important Fish

Many of the fish species found off the Massachusetts coast are important due to their value as commercial and/or recreational fisheries. U.S. fisheries landings data from 2017 indicate that the following species were the top valued commercial finfish in Massachusetts: goosefish, haddock, Atlantic herring, redfish, winter flounder, silver hake, pollock, Atlantic cod, bluefin tuna, and white hake. Massachusetts recreational fishery landings from 2017 were dominated by striped bass, Atlantic mackerel, haddock, tautog, and scup (NMFS 2019). A detailed description of fishing activities and the economic value of fisheries is provided in Section 3.1.9.2, Commercial and Recreational Fisheries.

3.1.5.3 Essential Fish Habitat (EFH)

The Magnuson-Stevens Act requires Federal agencies to consult NMFS on activities that may adversely affect EFH designated in Federal fishery management plans. EFH has been designated within the MA WEA for one or more life stages of 43 fish species. EFH species and applicable life stages are tabulated in Appendix A. Additionally, fishery management councils identify habitat areas of particular concern (HAPCs) within fishery management plans. There are no HAPCs within the Massachusetts WEA.

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

3.1.6.1 Marine Mammals

There are approximately 41 species of marine mammal known to occur in the waters of the Atlantic OCS (USDOI and BOEM 2013, 2014). All of these species are protected under the MMPA, and several are listed as endangered under the Endangered Species Act (ESA). A total of 5 sea turtles could occur in Northwestern Atlantic OCS waters, all of which are protected under the ESA.

The marine mammal species that are most likely to be in the region and may be impacted by SAP activities include:

- North Atlantic right whale
- fin whale
- humpback whale
- minke whale
- sei whale
- Atlantic white-sided dolphin
- bottlenose dolphin
- long-finned pilot whales
- Risso's dolphins
- short-beaked common dolphin
- sperm whale
- harbor porpoise
- harbor seal
- gray seal

Of the 14 species listed above, 5 are baleen whales, 7 are toothed whales, and 2 are seals. A table summarizing the status, distribution, and density of these species is included in Appendix A. See Appendix A for detailed information about the abundance, distribution, and habitat use patterns for the North Atlantic right whale, fin whale, sei whale, and sperm whale. Refer to BOEM 2013 and 2014 for detailed information on other marine mammal species.

3.1.6.2 Sea Turtles

Of the 5 species of sea turtles that may occur in the Northwest Atlantic OCS, only 4 species are likely to be encountered in the Massachusetts WEA. These species include the loggerhead, green, Kemp's ridley,

and leatherback. The hawksbill is not likely to occur in the vicinity of the project area and is therefore not addressed further (USDOI and BOEM 2013). See Appendix A for detailed information about the abundance, distribution, and habitat use patterns for loggerhead, leatherback, Kemp's ridley, and green sea turtles.

3.1.7 Coastal and Marine Birds and Bats (§ 585.611(b)(3-5))

Numerous marine and coastal bird species are known to occur in the Massachusetts WEA, many of which are protected under the Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. §§ 703–712). Three of these species are also protected under the ESA. ESA-listed species that may be present within the SAP Area include piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and roseate tern (*Sterna dougallii*). Additionally, the northern long-eared bat (*Myotis septentrionalis*) (ESA-listed) has the potential to occur in waters of the Massachusetts WEA. Appendix A describes these species.

3.1.8 Archaeological Resources (§ 585.611(b)(6))

SEARCH completed a desktop sensitivity assessment for the buoy and prepared a technical memorandum which is provided in Appendix C. The direct area of potential effect (APE) based on buoy specifications and construction plans was defined to include the proposed 250-meter (m) (820-foot [ft]) X 250-m (820-ft) anchor drop location plus a maximum mooring chain sweep of 40 m (131 ft), with up to 0.2 m (0.7 ft) of sediment penetration. Due to the buoy's distance from shore (54 kilometers (km) (34 miles [mi]) and height above the water (<4.0 m [13 ft]), placement of the buoy poses no potential for visual effects to onshore resources. SEARCH's sensitivity assessment utilized resources from its archives and those available on-line; including, several desktop and cultural resources reconnaissance studies. Reported shipwrecks within 1.6 km (1.0 mi) of the buoy's direct APE were also reviewed. Although no shipwrecks have been reported within this distance, the intensity of regional maritime activity indicates that new or unknown shipwrecks could be documented. SEARCH determined that the buoy direct APE is sensitive for pre-Contact resources based on previous paleolandscape reconstructions and post-Contact resources based on the density of reported shipwrecks and their location accuracy. The data will be analyzed and a Marine Archaeological Resources Assessment (MARA) report submitted prior to buoy deployment. Mayflower will provide the required historical and archaeological information report on or around August 26, 2019 pending the geophysical data collection occurring at the start of August is completed (*see Section 2.0 and 2.2)*.

3.1.9 Social and Economic Resources (§ 585.611(b)(7))

For the purposes of this project, social and economic data from Dukes County, Barnstable County, and Nantucket County were utilized. Land uses along the coasts of all of three counties are primarily low-density residential with a few high-density developed town centers (Cape Cod Chamber of Commerce 2019, Martha's Vineyard Online 2019, Town of Nantucket 2019).

The populations of all of these counties swell during summer months with the influx of vacation-home residents and other tourists. All of these counties are highly dependent on summer tourism and consider road congestion during the tourism season to be a significant concern (Cape Cod Chamber of Commerce 2019, Martha's Vineyard Online 2019, Town of Nantucket 2019).

3.1.9.1 Coastal Industries & Employment

In 2016, ocean-related businesses provided 16-17% of total jobs in Barnstable and Dukes Counties and 21% of total jobs in Nantucket County; 94-99% of ocean-related jobs were related to tourism and recreation (NOEP 2018). Dukes and Nantucket Counties have seasonal, visitor-based economies. With the exception of some remaining commercial fishing industry employing a small number of people, there are no significant exports of goods or services. The driving force of the economy is visitors and especially second homeowners who purchase goods and services during their stay (Martha's Vineyard Commission 2008, Data USA 2017). Barnstable County's economy is also a seasonal, visitor-based economy; however, there are more health, social service, and professional, management, and administrative employment opportunities (Data USA 2017).

3.1.9.2 Commercial & Recreational Fisheries

Vessel activity (recreational angling and charter/party trips) within the MA WEA is confined primarily to the northern and western portion of the area. Commercial fishing effort is considered "low" to "medium" in State waters south of Martha's Vineyard, adjacent to the location of the WEA. Species considered most important from this area are striped bass, fluke (summer flounder), black sea bass, and scup. The same areas are considered of "medium" and "high" importance to Massachusetts fisheries resources based on State survey data. Commercial otter trawl trips recorded in federally-mandated vessel trip reports show that fishing effort inside the WEA is concentrated in the central and western regions. This effort is small compared to that in the regional fishing grounds located outside the WEA. Commercial scallop dredge vessel trip reports also show very little effort in the WEA. However, vessels likely cross the WEA in transit between scallop fishing grounds on George's Bank and the major scallop port of New Bedford MA (BOEM 2014).

3.9.1.3 Recreational Use

All three counties are predominantly visited for their sandy beaches, which are considered some of the premiere summer beach destinations in the country. They attract beachgoers looking to swim, surf, beachcomb, and sunbathe. Barnstable County's 885-km (550-mi) coastline offers public access to a significant number of public beaches, as does Dukes County, and the entire 180-km (110-mi) coast of Nantucket is open to the public. Nationally-protected lands include Noman's Land Island National Wildlife Refuge, the Nantucket Wildlife Refuge, and three national parks. Diving and boat- and shore fishing are also very popular activities. The three counties offer off-shore recreation through their harbors, yacht clubs, and marinas.

3.1.9.4 Environmental Justice

In all three counties, the percentage of the population represented by minority groups is lower than the Massachusetts state average (USEPA 2017). The Wampanoag Tribe of Gay Head (Aquinnah) land trust is located in the southwest portion of Martha's Vineyard Island in the town of Gay Head (USDOI, BOEM, and MMS 2009). The Tribe uses Vineyard Sound and surrounding water for subsistence harvesting (USDOI, BOEM, and MMS 2009).

3.1.9.5 Visual Resources

The metocean buoy will at most be approximately 4 m (13.1ft.) tall, and, therefore, will only be visible from approximately 6.7 km (3.6 nm). As the metocean buoy will be more than 50 km (27 nm) from the closest land on Nantucket, it will not be visible from shore. Although there are several historic and culturally significant resources on Nantucket, the presence of a buoy more than 50 km away will not create any visual impact. Boaters and tourists traveling offshore may be able to see the buoy; however, due to the existing conditions (presence of other buoys, boaters, ships, etc.), it is unlikely that the presence of a relatively small buoy will significantly alter or diminish the visual aesthetic. Furthermore, because boats/ships are generally moving, close-up views of the buoy, and any associated impacts, would be brief (BOEM 2014).

3.1.10 Coastal and Marine Uses (§ 585.611(b)(8))

The Atlantic OCS in the vicinity of the MA WEA supports a variety of coastal and marine uses. Aside from commercial and recreational fishing, which is described in Section 3.1.9, Social and Economic Resources, uses include shipping and marine transportation, air traffic and airports, and military activities.

The Northeast Ocean Data Portal summarizes vessel traffic data for the Northeast Atlantic waters, including the MA WEA (which includes the Mayflower Wind Project Area). Vessel traffic within the region of the MA WEA is relatively low compared to regional marine traffic hotspots. Tow-tug and passenger vessel density within the region is very low, and though tanker and cargo vessels occur at greater densities than other identified vessel types, these primarily occur along the southern and western regions of the WEA. Much of the marine traffic within the WEA is not attributed to the above vessel types, and is likely due to fishing, recreation, or other marine activities (Fontenault 2018).

In 2009, a total of 1207 transits occurred through the MA WEA. Though the number of unique vessels traveling within the MA WEA could not be determined with certainty, a total of 373 unique Maritime Mobile Service Identities (a proxy for individual vessels) transited the WEA during this time. Vessel traffic density was greatest in the southern and western portions of the WEA, and cargo ships were the most frequently observed vessel type (USCG 2016).

Approaches to Nantucket Memorial airport, and two airports on Martha's Vineyard, are located over the WEA. There are no military training routes in the airspace over the WEA and closest restricted airspace occurs around a small island that is approximately 5.2 km (2.8 nm) south of the western end of Martha's Vineyard and approximately 12 km (6.5 nm) north of the WEA. Similarly, there are no danger zones or restricted areas within the WEA; the closest danger zone/restricted area is the restricted air space over Nomans Land Island that is approximately 55.5 km (30 nm) northwest of the lease area. Nomans Land Island is also designated as a danger zone for naval operations (33 CFR 334.70) because unexploded ordnance is suspected to be present (NOAA Office of Coast Survey 2017) and public access is not permitted. The WEA is within the Narragansett Bay OPAREA, and a U.S. Navy aviation warning area occurs over the majority of the area. Though vessel traffic is generally dispersed throughout the WEA, it remains low (BOEM 2014).

3.1.11 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 Rhode Island and Massachusetts WEAs, including the installation, operation and decommissioning of meteorological towers and buoys, are consistent with the provisions of the Coastal Management Programs of the State of Rhode Island and Commonwealth of Massachusetts (USDOI and BOEM 2013). The SAP activities proposed by Mayflower Wind are consistent with the activities anticipated in the BOEM consistency review; therefore, no further consistency review certification should be required.

3.1.12 Air Quality

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).

Ambient air quality concentrations of criteria pollutants are determined using data collected by monitoring stations that are mainly operated by the states. These monitoring sites provide long-term assessment of pollutant levels by measuring the quantity and types of certain pollutants in the surrounding, outdoor air. When the monitored pollutant levels in an area exceed the NAAQS for any pollutant, the area is classified as “nonattainment” for that pollutant. All counties in Massachusetts and Rhode Island are presently “in attainment” (or compliant with) with the NAAQS. Dukes County is classified as Marginal nonattainment for the 2008 ozone standard.

The SWLB Power System is an integrated system featuring primary and secondary battery banks, solar, wind and fuel cell charging capabilities. The buoy has several power systems, managed by a power management system. Each independent system contributes a certain amount of watt-hours over the deployment life cycle. The buoy metocean system (wave, current and metrological sensors) is self-sustained through the four solar panels and rechargeable batteries. A lithium battery is included to provide backup power to critical functions such as metocean system, communication and flash lamp in case of low energy level on main batteries. Together with solar panels there are four methanol fuel cells providing energy to the LIDAR where each fuel cell has the capacity to power the entire buoy for approx. 70 days, being 280 days in total.

There is no discharge from the solar panels and lithium batteries power system into the environment.

The exhaust gases produced during the run of the LiDAR fuel cell power system is composed of water and carbon dioxide, with significantly lower concentrations of other emissions such as methanol, methyl

formate, formic acid and formaldehyde. There is no amount of NOx or CO emitted by the fuel cells. The table below shows the results from the maximum emmission mass flow concentration values of a fuel cell system.

Table 3.1.12 Maximum Emission Mass Flow Concentration Values of a Fuel Cell System

Components	Max. emission mass flow [mg/h]	Concentration at an ACH[1] of 1h^{-1} [mg/m^3]	OEL[2] according to TRGS 900 [mg/m^3]
Methanol	87	2.6	270
Methyl formate	56	1.7	120
Formic acid	17	0.5	9.5
Formaldehyde	2	0.06	0.37

1 – Air change rate per hour

2 – Occupational exposure limits for the four components under investigation according to work place limits of German technical regulation TRGS 900.

It is important to emphasize that these maximum concentration values are minimal compared to diesel fuel systems or other fluid-based fuel systems that may be used on similar technologies. The footprint of these sources is low and unlikely to cause impacts to the environment. It is also important to note that these fuel systems are commonly used on all types of metocean buoys deployed globally by Fugro and other technology companies, energy industry, and government science agencies, including NOAA and BOEM. these fuel systems are commonly used on all types of metocean buoys deployed globally by Fugro and other technology companies, energy industry, and government science agencies, including NOAA and BOEM.

3.2 Potential Impacts

To assess the SAP activities described in Section 1.0, impacts have been classified into one of four levels – negligible, minor, moderate, or major, according the MMS Programmatic Environmental Impact State for Alternative Energy as described below (USDOI and MMS 2007).

The impact levels are defined as follows:

- Negligible: No measurable impacts.
- Minor: Most impacts to the affected resource could be avoided with proper mitigation. If impacts occur, the affected resource will recover completely without any mitigation once the impacting agent is eliminated.
- Moderate: Impacts to the affected resource are unavoidable. The viability of the affected resource is not threatened although some impacts may be irreversible, OR The affected resource would recover completely if proper mitigation is applied during the life of the project or proper remedial action is taken once the impacting agent is eliminated.
- Major: Impacts to the affected resource are unavoidable. The viability of the affected resource may be threatened, AND The affected resource would not fully recover even if proper mitigation is applied during the life of the project or remedial action is taken once the impacting agent is eliminated.

3.2.1 Vessel Related Potential Impacts

The vessel activities necessary to install, operate, and remove a metocean buoy have the potential to affect coastal habitats and terrestrial animals, marine mammals and sea turtles, air quality, and navigation, transportation, and military operations. Potential impacts to these resources are described below.

Although other resources (i.e., commercial and recreational fishing, water quality, birds) could experience minor side effects from vessel related activities, due to the very limited number of vessels and vessel trips associated with the SAP activities, those effects are expected to be less than negligible; and therefore, will not be described further.

Certain non-routine events associated with vessel activities, although unlikely, include collisions and spills. Vessels associated with installation, operation, and decommissioning could collide with other vessels and experience accidental capsizing or result in a diesel spill. Collisions are considered unlikely since vessel traffic is controlled by multiple routing measures, such as safety fairways, Traffic Separation Schemes, and anchorages. These higher traffic areas were excluded from the WEAs, as described in BOEM (2014). A diesel spill could also occur as a result of accidents or natural events. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills.

3.2.1.1 Coastal Habitats and Terrestrial Mammals

Increased minimal vessel traffic associated with SAP activities could impact coastal habitats and terrestrial mammals due to wake erosion and associated sediment disturbance. However, given the existing volume and commercial/industrial nature of existing vessel traffic in the SAP Area, only a negligible increase, if any, to wake induced erosion may occur around smaller, non-armored, waterways used by project vessels. Therefore, potential impacts are expected to be negligible, if any.

3.2.1.2 Marine Mammals and Sea Turtles

Increased vessel traffic associated with SAP activities could impact marine mammals and sea turtles due to the noise from work boats. Vessel noise is primarily composed of low-frequency components caused by propeller cavitation, though rotational and reciprocal machinery movement, and hydrodynamic water movement over the boat hull also contribute to sound generation (Hildebrand 2009). As the intensity of vessel noise is largely related to ship size and speed (Hildebrand 2009), exposure of marine mammals and sea turtles to noise from construction and installation vessels would be variable. 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). Recent research has indicated that porpoises can exhibit behavioral response to low levels of high frequency sound present in vessel noise (Dyndo et al. 2015), and NARW are vulnerable to communication masking due to low frequency vessel traffic (Hatch et al. 2012). Similarly, high levels of vessel traffic (e.g. from whale watching operations) have been noted to cause behavior changes in many cetacean species (reviewed in Parsons 2012). However, because the SAP Area and adjacent waters are well-traveled and host active fishing (recreational and commercial) and commercial shipping industries, marine mammals and sea turtles in the area are likely habituated to these existing conditions. Increases in vessel noise in the area due to SAP activities are expected to be insignificant. Any impacts to marine mammals or sea turtles would be temporary,

with behavior rapidly returning to normal following passage of a vessel, and it is unlikely that such short-term effects would result in long-term population-level impacts.

Vessels associated with the SAP activities could collide with marine mammals or sea turtles during transit. Vessel collisions with marine mammals can cause serious injury or death and are a leading cause of mortality for certain species. Baleen whales are most at risk from ship strikes, and species including fin whale, North Atlantic right whale, humpback whale, and sperm whale are particularly vulnerable (Laist et al. 2001). Most ship strikes resulting in severe injury or death occur from ships traveling at 14 kn or faster, and strikes from larger vessels (>80 m) are more likely to result in mortality (Laist et al. 2001).

The highly endangered NARW experiences the most numerous per capita vessel strikes (Vanderlaan and Taggart 2007) and is especially vulnerable because it primarily utilizes busy coastal areas, swims slowly, and congregates at or just below the water surface (NOAA Fisheries 2018). This species also shows no avoidance response when exposed to approaching vessels (Nowacek, Johnson, and Tyack 2003), perhaps indicating habituation to ubiquitous vessel noise in its habitat. However, vessel speed restrictions are very effective in decreasing NARW ship strikes; vessel speed limits of 10 knots have been shown to reduce ship strike mortality risk by 80-90% (Conn and Silber 2013). All SAP vessels will follow NOAA NMFS collision avoidance guidance, including vessel speed restrictions to minimize the risks to NARW and other marine mammals. Due to the implementation of vessel strike avoidance measures, and the limited intermittent nature of SAP activities, impacts to marine mammals from vessel strikes are expected to be negligible.

3.2.1.3 Air Quality

There are no emissions from the solar panels and batteries that power the buoy and emissions from the fuel cell are comprised almost exclusively to carbon dioxide with significantly lower concentrations of other emissions as described above. Due to the low level of additional vessel traffic that will be traversing the metocean buoy Area at any one time over the course of the installation, operation and removal of the metocean buoy, 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, and the mitigation measures described in Section 3.3, the potential impacts to ambient air quality are expected to be negligible, if any.

3.2.1.4 Navigation, Transportation, and Military Operations

There will be a very limited increase in vessel traffic associated with SAP activities, and only limited potential for impacts to navigation, transportation and military activities. SAP activities, in accordance with the Lease, are subject to restrictions imposed by military and NASA needs, rules, and regulations. To address the requirements of its Lease and avoid such interference, coordination between the Department of Defense (DoD) and vessel operators and contractors will be required, as needed throughout SAP activities, to ensure there are not conflicts with and/or adverse impacts to military activities in the SAP Area. Thus, potential impacts to navigation, transportation, and military operations are expected to be negligible, if any.

3.2.2 Buoy-Related Potential Impacts

The presence of a metocean buoy, and its components, have the potential to affect geologic resources, benthic resources, fisheries and essential fish habitat, marine mammals and sea turtles, navigation, and transportation and military operations. Potential impacts to these resources are described below.

Although other resources could experience minor effects from the buoy presence, due to the very small size of the buoy and temporary existence, those effects are expected to be less than negligible and therefore, will not be described further.

3.2.2.1 Geologic Resources

It is anticipated that deployment of the metocean buoy would impact a small area of seafloor, approximately 250-meter (m) (820-foot [ft]) X 250-m (820-ft) excursion box (anchor drop location) plus a maximum mooring chain sweep of 40 m (131 ft) due to placement of the weights to secure the buoy. Thus, potential impacts to geologic resources are expected to be negligible, if any.

3.2.2.2 Water Quality

Buoy deployment will influence turbidity in the immediate vicinity. As the metocean buoy is bottom-moored, there will be a localized turbidity increase.

Installation of the metocean buoy is not anticipated to have any impact on water temperature or salinity levels.

3.2.2.2 Benthic Resources

Slow-moving or sessile organisms inhabiting benthic sediments in areas directly within the footprint of the anchor and chain sweep area will suffer mortality from crushing or burial. Although motile organisms, including crabs, lobsters, and sea scallops, may be able to vacate this area and avoid direct mortality, these organisms could be displaced by installation and operation activities. Though benthic communities will experience localized mortality and habitat disturbance during construction, these impacts are expected to be temporary and spatially limited (chain sweep is expected to disturb an area with a radius of 40 m (131 feet) around the weight.

Habitat alteration will be associated with the introduction of hard substrate (concrete slab anchors and chains) in an area currently consisting of unconsolidated sands. Fouling organisms, including tunicates, sponges, bryozoans, algae, mussels, barnacles, and hydroids, are anticipated to colonize the new areas of hard substrate created by the buoy anchoring system. Removal of the buoy will result in mortality of these organisms. However, as the area of hard substrate associated with buoy structures is small, impacts on local benthic resources are expected to be negligible.

Indirect impacts from suspended sediments and sediment deposition resulting from buoy installation and operation are possible, but expected to be extremely limited, due to the small size and temporary nature of the Metocean buoy and anchoring system.

The area disturbed by buoy installation activities will constitute a very small percentage of benthic habitats in the region, and organisms are expected to rapidly recolonize these locations from

surrounding undisturbed habitats once the buoy has been removed. Examinations of monitoring results from the Block Island Wind Farm indicate that areas of seafloor disturbance associated with turbine installation, primarily caused by contact with lift boat spud legs and anchors, are likely to physically recover over a short time period; approximately 46% of disturbance areas had completely healed within one year of construction activities (HDR 2018). Physical seafloor recovery was more rapid in areas of fine-grained sand than in areas of medium to coarse grained sand (HDR 2018). Benthic communities in mobile sand habitats, like those of the MA WEA, have also been observed to recover from natural sediment movement in less than a year (Lindholm, Auster, and Valentine 2004), though the rate of recovery can vary due to local species diversity and organism density. Studies examining dredging impacts have suggested benthic recovery times ranging from 3 months to 2.5 years (Brooks et al. 2006), 1.5 to 2.5 years (Wilber and Clarke 2007), and up to 3.0 years (Wilber and Clarke 2007). Recovery times are impacted by the size of the disturbed areas and the composition of the benthic community in surrounding habitats (Wilber and Clarke 2007), but community composition may not return to baseline conditions until three or more years after the disturbance event (BOEM 2016). As the area of seafloor that will be disturbed by the metocean buoy anchor and chain sweep is very small, the estimated recovery rates presented above are likely conservative. Thus, impacts to benthic resources from SAP activities are anticipated to be negligible.

3.2.2.3 Fisheries and Essential Fish Habitat

The presence of metocean buoy would result in some loss of habitat as a result of the anchor and cause some sediment to become suspended around the anchor chain sweep. 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 SAP Area, it is expected that the SAP activities would have negligible effects that could impact fish resources or habitat, if any.

3.2.2.4 Marine Mammals and Sea Turtles

Installation of the metocean buoy would result in the disturbance of small areas of the seafloor and the addition of a man-made structure to the marine habitat. 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 the availability of similar benthic habitats adjacent to the SAP Area, impacts are expected to be negligible, if any. Additionally, as the metocean buoy will not physically restrict marine mammal movement, its presence will have negligible, if any, impacts on marine mammals and sea turtles.

3.2.2.5 Navigation, Transportation and Military Operations

The presence of a metocean buoy has the potential to interfere with existing vessel traffic and military operations. The mitigation measures described in Section 3.3 will significantly reduce any potential impacts to navigation, transportation and military operations. Thus, potential impacts to navigation, transportation and military operations are expected to be negligible, if any.

3.3 Mitigation Measures

In accordance with the Lease and BOEM's 2014 EA, the following subsections describe the Standard Operating Conditions (SOCs) pertinent to the installation, operation, and removal of a temporary metocean buoy.

For cultural resources and biologically sensitive habitats, the primary mitigation strategy is avoidance. The exact location of the meteorological buoy would be adjusted to avoid adverse effects to offshore cultural resources or biologically sensitive habitats, if present.

BOEM has developed several measures, called SOCs, to minimize or eliminate impacts on protected species. These SOCs were developed through consultation with other Federal and State agencies. The following mitigation measures are derived from BOEM's SOCs and supplemented with additional measures to ensure protection to the affected resources.

3.3.1 Vessel Strike Avoidance Measures

The measures in this section are quoted directly from the Lease and are applicable to the preparation of a SAP and a Construction and Operations Plan (COP).

The Lessee must ensure that all vessels conducting activities in support of plan (i.e., SAP and COP) submittal, including those transiting to and from local ports and the lease area, comply with the vessel strike avoidance measures specified in stipulations 3.3.1.1 through 3.3.1.8.3, except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk.

3.3.1.1 The Lessee must ensure that vessel operators and crews maintain a vigilant watch for marine mammals (whales, dolphins, porpoises, seals), sea turtles, and giant manta rays, and slow down or stop their vessel to avoid striking these protected species.

3.3.1.2 The Lessee must ensure that vessels 19.8 meters (m) (65 feet [ft]) in length or greater that operate between November 1 through July 31, operate at speeds of 10 knots (11.5 miles per hour [mph]) or less.

3.3.1.3 The Lessee must ensure that vessel operators monitor NMFS North Atlantic Right Whale reporting systems (e.g., the Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System) from November 1 through July 31 and whenever a Dynamic Management Area (DMA) is established within any area vessels operate.

3.3.1.4 The Lessee must ensure that all vessel operators comply with 10 knot (18.5 kilometers per hour [km/hr]) speed restrictions in any DMA.

3.3.1.5 The Lessee must ensure that all vessel operators reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of marine mammals are observed near an underway vessel.

3.3.1.6 North Atlantic Right Whales:

3.3.1.6.1 The Lessee must ensure all vessels maintain a separation distance of 500 m (1,640 ft) or greater from any sighted North Atlantic right whale or unidentifiable large marine mammal.

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

3.3.1.6.2.1 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 m (1,640 ft) minimum separation distance has been established (except as provided in 3.3.1.6.2.2)

3.3.1.6.2.2 If a North Atlantic right whale is sighted within 100 m (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 m (328 ft), at which point the Lessee must comply with 3.3.1.6.2.1.

3.3.1.6.2.3 If a vessel is stationary, the vessel must not engage engines until the North Atlantic right whale has moved beyond 100 m (328 ft), at which point the Lessee must comply with 3.3.1.6.2.1.

3.3.1.7 Large Whales other than the North Atlantic Right Whale

3.3.1.7.1 The Lessee must ensure all vessels maintain a separation distance of 100 m (328 ft) or greater from any sighted Endangered Species Act (ESA)-listed whales or humpback whales.

3.3.1.7.2 The Lessee must ensure that the following avoidance measures are taken if a vessel comes within 100 m (328 ft) of whale:

3.3.1.7.2.1 If underway, the vessel must reduce speed and shift the engine to neutral, and must not engage the engines until the whale has moved beyond 100 m (328 ft).

3.3.1.7.2.2 If stationary, the vessel must not engage engines until the whale has moved beyond 100 m (328 ft).

3.3.1.8 Small Cetaceans (Dolphins and Porpoises), Seals, Giant Manta Rays, and Sea Turtles

3.3.1.8.1 The Lessee must ensure that all vessels underway do not divert to approach any small cetacean, seal, sea turtle, or giant manta ray.

3.3.1.8.2 The Lessee must ensure that all vessels maintain a separation distance of 50 meters (164 ft) or greater from any sighted small cetacean, seal, sea turtles, or giant manta ray, except when a small cetacean or seal approaches the vessel, in which case, the Lessee must follow 3.3.1.8.3 below.

3.3.1.8.3 If a small cetacean or seal approaches any vessel underway, the vessel underway must avoid excessive speed or abrupt changes in direction to avoid injury to the animal.

3.3.1.9 Vessel Operator Briefing. The Lessees must ensure that all vessel operators are briefed to ensure they are familiar with the requirements specified in 3.3.1.

3.3.2 Marine Trash and Debris Prevention

The measures in this section are quoted directly from the Lease.

The Lessee must ensure that vessel operators, employees, and contractors actively engage in activity in support of a plan (i.e., SAP and COP) submittal are briefed on marine trash and debris awareness and elimination, as described in the BSEE Notices to Lessees and Operators (NTL) No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination") or any NTL, except that the Lessor will not require the Lessee to post placards. The Lessee must ensure that these vessel operator employees and contractors receive training on 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. Briefing materials on marine debris awareness, elimination, and protected species are available at http://oocmain.theooc.us/page41.html.

3.3.3. Fisheries Communications Plan (FCP) and Fisheries Liaison

Per Section 4.1.3 of Mayflower Commercial Lease OCS-A 0521 Addendum C, Mayflower is in the process of developing a Fisheries Communications Plan (FCP). This plan will be made publicly available on a project website 30 days in advance of the survey start date and BOEM will be notified once the FCP is available. If the project website is not established by the start date of the survey, Mayflower will make the FCP available to BOEM and the public upon request.

Independent of the website release, Mayflower intends to distribute the FCP through various fisheries stakeholder networks and associations including, but not limited, to the Mid-Atlantic and New England Fisheries Management Councils, Regional Associations of NOAA Integrated Ocean Observing Network, Responsible Offshore Development Alliance (RODA), independent Associations (Massachusetts Lobsterman's Association, New Bedford Port Authority, Rhode Island Commercial Fisheries Center, etc.).

Mayflower is currently finalizing a contract for a Fisheries Liaison Officer (FLO) at the time of this submission. The FLO will be hired in Q1 2020. In the interim, Mayflower Wind scientist, Dr. Ruth Perry, will serve as the primary point of contact with fisheries stakeholders for Mayflower. In addition, Mayflower will have another environmental project staff member as secondary point of contact assisting the FLO during the duration of the survey.

The vessel crew and Fugro staff will be provided with contact numbers for the FLO and Mayflower staff member. This group will also be provided with general information about potential fishing vessels and equipment types in the area based on consultations with fisheries stakeholders prior to the survey start. Since Fugro has conducted similar surveys in the area, Mayflower is confident in the crew's ability to recognize and communicate with fishing vessels in the area.

As stated previously, Mayflower and Fugro will submit a Local Notice to Mariners (LNTM) for the proposed work in planned survey areas and expected timing to the US Coast Guard. The schedule of activities and an outline of the survey area will also be submitted to U.S. Navy Fleet Forces.

3.3.4 Entanglement Avoidance

The measures in this section are quoted directly from the Lease.

3.3.4.1 The Lessee must ensure that any structures or devices attached to the seafloor for continuous periods greater than 24 hours use the best available mooring systems for minimizing the risk of entanglement or entrainment of marine mammals, manta rays and sea turtles, while still ensuring the safety and integrity of the structure or device. The best available mooring system may include, but is not limited to, vertical and float lines (chains, cables, or coated rope systems), swivels, shackles, and anchor designs.

3.3.4.2 All mooring lines and ancillary attachment lines must use one or more of the following measures to reduce entanglement risk: shortest practicable line length, rubber sleeves, weak-links, chains, cables or similar equipment types that prevent lines from looping or wrapping around animals or entrapping protected species.

3.3.4.3 Any equipment must be attached by a line within a rubber sleeve for rigidity. The length of the line must be as short as necessary to meet its intended purpose.

3.3.4.4 If an entangled live or dead marine protected species is reported, the Lessee must provide any assistance to authorized stranding response personnel as requested by BOEM or NMFS.

3.3.5 Buoy Markings and Lighting

Navigation lights for the buoy will be in compliance with the USCG requirements. In addition, support vessels will be used only when necessary and vessel lighting will be hooded and directed downward, when possible, to reduce upward illumination and illumination of adjacent waters.

3.3.6 Buoy Notifications

Mayflower Wind will communicate the exact GPS location of the buoy with the USCG, DoD, BOEM, and all other pertinent agencies.

3.3.7 Air Quality Control Measures

Given the minimal air emissions associated with SAP activities, the appropriate mitigation measures are consistent with industry standard, area-wide measures for marine vessels. This includes existing fleet wide requirements for engine certifications (for 40 CFR Part 89, Tier 3 engines typical), emissions control equipment, and regular maintenance along with the use of ultra-low sulfur diesel fuel.

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Appendix A

Environmental Conditions within the SAP Area Mayflower Wind Lease OCS-A 0521

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Appendix B

Metocean Buoy Diagrams & Deployment Procedure
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Appendix C

Buoy Site Geophysical Report & Archaeological Report Mayflower Wind Lease OCS-A 0521

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Appendix D

SEARCH Cultural Resource Desktop Sensitivity Assessment Mayflower Wind Lease OCS-A 0521

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Appendix E

Metocean Criteria Assessment
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