UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
Letter of Authorization

Empire Offshore Wind, LLC, (Empire Wind), and those persons it authorizes or funds to conduct activities on its behalf in the specified geographical region described herein, are authorized to take marine mammals incidental to construction of the Empire Wind Project (hereafter known as the "Project"), located in state and Federal waters offshore New York, subject to the provisions of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*; MMPA) of 1972, as amended, and the applicable regulations (50 CFR §§ 217.280 - 217.289), provided they are in compliance with all terms, conditions, and requirements described herein.

Effective Dates

This Letter of Authorization (LOA) is effective for a period of five years, beginning on February 22, 2024 and expiring after February 21, 2029.

Specified Geographical Region

The specified geographical region is the Mid-Atlantic Bight[1], which includes, but is not limited to, the Bureau of Ocean Energy Management (BOEM) Lease Area Outer Continental Shelf (OCS)-A 0512 Commercial Lease of Submerged Lands for Renewable Energy Development, two export cable routes leading to two sea-to-shore transition points located at South Brooklyn Marine Terminal in Brooklyn, New York (Empire Wind 1) and Long Island, New York (Empire Wind 2)(see Figure 1).

Specified Activities

The specified activities are impact pile driving of wind turbine generator (WTG; monopiles) and offshore substation (OSS) foundations (pin piles for jacket foundations); impact and vibratory pile driving associated with cable landfall construction and marina construction; site characterization surveys using high-resolution geophysical (HRG) acoustic sources; vessel transit within the specified geographical region to transport crew, supplies, and materials; WTG operation; fishery and ecological monitoring surveys; placement of scour protection; and

[1] The Mid-Atlantic Bight spans from Cape Hatteras, North Carolina to Cape Cod, Massachusetts and continues to extend into the west Atlantic to the 100-m isobath.

trenching, laying, and burial activities associated with the installation of the export cable route from OSSs to shore-based converter stations and inter-array cables between turbines.

1. **Permissible Methods of Taking:**

Empire Wind may incidentally, but not intentionally, take marine mammals within the specified geographical region in the course of conducting the specified activities, provided Empire Wind is in complete compliance with all terms, conditions, and requirements described herein.

(a) Permissible methods of taking consist of:

(1) Level B harassment associated with the acoustic disturbance of marine mammals by impact pile driving for WTG monopile and OSS foundation installation, impact and vibratory pile driving during cable landfall and marina activities, and HRG site characterization surveys; and

(2) Level A harassment associated with the acoustic disturbance of marine mammals by impact pile driving of WTG and OSS foundations.

(b) Take by mortality (death) or serious injury of any marine mammal species is not authorized.

(c) The incidental taking of marine mammals by the specified activities described above is limited to only the species and stocks found in Table 1 below.

2. **Prohibitions:**

Except for the takings described under **Permissible Methods of Taking**, it is unlawful for any person to do any of the following in connection with the specified activities described herein:

(a) Violate or fail to comply with the terms, conditions, and requirements of this LOA or the regulations;

(b) Take any marine mammal not specified in Table 1 below;

(c) Take any marine mammal in Table 1 in any manner other than those specified in **Permissible Methods of Taking** above or number greater than those specified in Table 1; and

(d) Take any marine mammal in Table 1 after NMFS determines such takings results in more than a negligible impact on the species or stocks.

Pursuant to 16 U.S.C. 1371(a)(5)(B), NMFS shall withdraw or suspend this authorization to take marine mammals, if, after notice and opportunity for public comment[2], it finds that:

(1) The methods of taking or the mitigation, monitoring, or reporting measures are not being substantially complied with, or

(2) The taking authorized in the regulations and this LOA is having, or may have, more than a negligible impact on an affected species or stock.

3. Mitigation Requirements:

When conducting the specified activities in the specified geographic region, Empire Wind must implement the following mitigation measures:

(a) *General conditions.* Empire Wind must comply with the following general measures:

(1) A copy of any issued LOA must be in the possession of Empire Wind and its designees, all vessel operators, visual protected species observers (PSOs), passive acoustic monitoring (PAM) operators, pile driver operators, and any other relevant designees operating under the authority of the issued LOA;

(2) Empire Wind must conduct training for construction, survey, and vessel personnel and the marine mammal monitoring team (PSO and PAM operators) prior to the start of all in-water construction activities in order to explain responsibilities, communication procedures, marine mammal detection and identification, mitigation, monitoring, and reporting requirements, safety and operational procedures, and authorities of the marine mammal monitoring team(s). This training must be repeated for new personnel who join the work during the project. A description of the training program must be provided to NMFS at least 60 days prior to the initial training before in-water activities begin. Confirmation of all required training must be documented on a training course log sheet and reported to NMFS Office of Protected Resources prior to initiating project activities;

(3) Prior to and when conducting any in-water construction activities and vessel operations, Empire Wind personnel and contractors (*e.g.*, vessel operators, PSOs) must use available sources of information on North Atlantic right whale presence in or near the Project Area including daily monitoring of the Right Whale Sightings Advisory System, and monitoring of U.S. Coast Guard VHF Channel 16 throughout the day to receive notification of any sightings and/or information associated with any Slow Zones (*i.e.*, Dynamic Management Areas (DMAs) and/or acoustically-triggered slow zones) to provide situational awareness for both vessel operators, PSO(s), and PAM operator(s). The marine mammal monitoring team must monitor these systems no less than every 4 hours;

[2] If NMFS determines an emergency exists that poses a significant risk to the well-being of a species or stock, the notice and comment requirement is waived (see 16 U.S.C. 1371(a)(5)(C)(i)).

(4) Any marine mammal observed by project personnel must be immediately communicated to any on-duty PSOs, PAM operator(s), and all vessel captains. Any large whale observation or acoustic detection by PSOs or PAM operators must be conveyed to all vessel captains;

(5) For North Atlantic right whales, any visual detection by a PSO or acoustic detection by PAM operators at any distance (where applicable for the specified activities) must trigger a delay to the commencement of pile driving and HRG surveys;

(6) In the event that a large whale is sighted or acoustically detected that cannot be confirmed as a non-North Atlantic right whale, it must be treated as if it were a North Atlantic right whale for purposes of mitigation, unless a PSO or PAM operator confirms it is another type of whale;

(7) Empire Wind must instruct all vessel personnel regarding the authority of the PSO(s). If a delay to commencing an activity is called for by the Lead PSO or PAM operator, Empire Wind must take the required mitigative action. If a shutdown of an activity is called for by a Lead PSO or PAM operator, Empire Wind must take the required mitigative action unless shutdown would result in imminent risk of injury or loss of life to an individual, pile refusal, or pile instability. Any disagreements between the Lead PSO, PAM operator, and the activity operator regarding delays or shutdowns must only be discussed after the mitigative action has occurred;

(8) If an individual from a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized take number has been met, is observed entering or within the relevant clearance zone prior to beginning a specified activity, the activity must be delayed. If an activity is ongoing and individual from a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized take number has been met, is observed entering or within the relevant shutdown zone, the activity must be shut down (*i.e.*, cease) immediately, unless shutdown would result in imminent risk of injury or loss of life to an individual, pile refusal, or pile instability. The activity must not commence or resume until the animal(s) has been confirmed to have left the clearance or shutdown zones and is on a path away from the applicable zone or after 15 minutes with no further sightings for small odontocetes and pinnipeds or 30 minutes with no further sightings for all other species;

(9) Any marine mammals observed within a clearance or shutdown zone must be allowed to remain in the area (*i.e.*, must leave of their own volition) prior to commencing pile driving activities or HRG surveys;

(10) For in-water construction heavy machinery activities listed in section 1(a)(1), if a marine mammal is on a path towards or comes within 10 meters (m; 32.8 feet (ft)) of equipment, Empire Wind must cease operations until the marine mammal has

moved more than 10 m on a path away from the activity to avoid direct interaction with equipment;

(11) All vessels must be equipped with a properly installed, operational Automatic Identification System (AIS) device and Empire Wind must report all Maritime Mobile Service Identify (MMSI) numbers to NMFS Office of Protected Resources;

(12) By accepting the LOA, Empire Wind consents to on-site observation and inspections by Federal agency personnel (including NOAA personnel) during activities described in this subpart, for the purposes of evaluating the implementation and effectiveness of measures contained within the LOA and this subpart; and

(13) It is prohibited to assault, harm, harass (including sexually harass), oppose, impede, intimidate, impair, or in any way influence or interfere with a PSO, PAM operator, or vessel crew member acting as an observer, or attempt the same. This prohibition includes, but is not limited to, any action that interferes with an observer's responsibilities, or that creates an intimidating, hostile, or offensive environment. Personnel may report any violations to the NMFS Office of Law Enforcement.

(b) *Vessel strike avoidance measures.* Empire Wind must comply with the following vessel strike avoidance measures while in the specific geographic region, unless an emergency situation presents a threat to the health, safety, or life of a person, or when a vessel is actively engaged in emergency rescue or response duties, including vessel-in-distress or environmental crisis response, requires speeds in excess of 10 knots (kn) (11.5 miles per hour (mph)) to fulfill those responsibilities. An emergency is defined as a serious event that occurs without warning and requires immediate action to avert, control, or remedy harm. All vessel speeds are referenced to speed over ground:

(1) Prior to the start of the Project's activities involving vessels, all vessel personnel must receive a protected species training that covers, at a minimum, identification of marine mammals that have the potential to occur where vessels would be operating; detection and observation methods in both good weather conditions (*i.e.*, clear visibility, low winds, low sea states) and bad weather conditions (*i.e.*, fog, high winds, high sea states, with glare); sighting communication protocols; all vessel speed and approach limit mitigation requirements (*e.g.*, vessel strike avoidance measures); and information and resources available to the project personnel regarding the applicability of Federal laws and regulations for protected species. This training must be repeated for any new vessel personnel who join the Project. Confirmation of the vessel personnels' training and understanding of the Incidental Take Authorization (ITA) requirements must be documented on a training course log sheet and reported to NMFS within 30 days of completion of training;

(2) All vessel operators must maintain a vigilant watch for all marine mammals and slow down, stop their vessel, or alter course to avoid striking any marine mammal;

(3) All underway vessels operating at any speed, transiting within the specified geographic area (*i.e.*, the Mid-Atlantic Bight) must have a dedicated visual observer on duty at all times to monitor for marine mammals within a 180° direction of the forward path of the vessel (90° port to 90° starboard) located at an appropriate vantage point for ensuring vessels are maintaining appropriate separation distances. Dedicated visual observers may be third-party observers (*i.e.*, NMFS-approved PSOs; see section 4(a)) or trained crew members (see (b)(1) of this subsection). Dedicated visual observers must be equipped with alternative monitoring technology (*e.g.*, night vision devices, infrared cameras) for periods of low visibility (*e.g.*, darkness, rain, fog, *etc.*). The dedicated visual observer must not have any other duties while observing and must receive prior training on protected species detection and identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements in this subpart;

(4) All vessel operators and/or the dedicated visual observers on each transiting vessel must continuously monitor the U.S. Coast Guard VHF Channel 16 at the onset of transiting through the duration of transiting, over which North Atlantic right whale sightings are broadcasted. At the onset of transiting and at least once every 4 hours, vessel operators and/or trained crew member(s) must also monitor the project's Situational Awareness System (if applicable), WhaleAlert, and relevant NOAA information systems such as the Right Whale Sighting Advisory System (RWSAS) for the presence of North Atlantic right whales;

(5) Any large whale sighting by any project personnel must be immediately communicated to all project-associated vessels;

(6) All vessel operators must abide by existing applicable vessel speed regulations (*see* 50 CFR 224.105). Nothing in this subpart exempts vessels from any other applicable marine mammal speed or approach regulations.

(7) Vessels must not travel over 10 kn (11.5 mph) from November 1st through April 30th, annually, in the specified geographic region, and within any active North Atlantic right whale Slow Zone (*i.e.*, Dynamic Management Areas (DMAs) or acoustically-triggered slow zone);

(8) If vessel(s) are traveling at speeds greater than 10 kn (11.5 mph) (*i.e.*, no speed restrictions are enacted) in the transit corridor (defined as from a port to the Lease Area or return), in addition to the required dedicated visual observer, Empire Wind must monitor the transit corridor in real-time with PAM prior to and during transits. If a North Atlantic right whale is detected via visual observation or PAM detection within or approaching the transit corridor, all vessels in the transit corridor must travel at 10 kn (11.5 mph) or less for 24 hours following the detection. Each subsequent detection shall trigger a 24-hour reset. A slowdown in

the transit corridor expires when there has been no further visual or acoustic detection in the transit corridor in the past 24 hours;

(9) All vessel operators, regardless of their vessel's size, must immediately reduce speed to 10 kn (11.5 mph) or less for at least 24 hours when a North Atlantic right whale is sighted at any distance by any project-related personnel or acoustically detected by any project-related PAM system. Each subsequent observation or acoustic detection in the Project area shall trigger an additional 24-hour period. If a North Atlantic right whale is reported via any of the monitoring systems (refer back to (b)(4) of this section) within 10 km of a transiting vessel(s), that vessel must operate at 10 kn (11.5 mph) or less for 24 hours following the reported detection;

(10) All vessels, regardless of size, must immediately reduce speed to 10 kn or less when any large whale (other than a North Atlantic right whale, refer back to (b)(7) of this section), mother/calf pairs, or large assemblages of cetaceans are sighted within 500 m (0.31 mi) of an transiting vessel;

(11) All vessels must maintain a minimum separation distance of 500 m from North Atlantic right whales. If underway, all vessels must steer a course away from any sighted North Atlantic right whale at 10 kn (11.5 mph) or less such that the 500-m minimum separation distance requirement is not violated. If a North Atlantic right whale is sighted within 500 m of an underway vessel, that vessel must turn away from the whale(s), reduce speed and shift the engine to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 500 m.

(12) All vessels must maintain a minimum separation distance of 100 m (328 ft) from sperm whales and non-North Atlantic right whale baleen whales. If one of these species is sighted within 100 m of a transiting vessel, the vessel must turn away from the whale(s), reduce speed, and shift the engine(s) to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 100 m;

(13) All vessels must maintain a minimum separation distance of 50 m (164 ft) from all delphinid cetaceans and pinnipeds with an exception made for those that approach the vessel (*i.e.*, bow-riding dolphins). If a delphinid cetacean or pinniped is sighted within 50 m of a transiting vessel, the vessel must turn away from the animal(s), reduce speed, and shift the engine to neutral, with an exception made for those that approach the vessel (*e.g.*, bow-riding dolphins). Engines must not be engaged until the animal(s) has moved outside of the vessel's path and beyond 50 m;

(14) When a marine mammal(s) is sighted while the vessel(s) is transiting, the vessel must take action as necessary to avoid violating the relevant separation distances (*e.g.*, attempt to remain parallel to the animal's course, slow down, and avoid abrupt changes in direction until the animal has left the area). This measure does not apply to any vessel towing gear or any situation where respecting the relevant

separation distance would be unsafe (*i.e.*, any situation where the vessel is navigationally constrained);

(15) All vessels underway must not divert or alter course to approach any marine mammal;

(16) Vessel operators must check, daily, for information regarding the establishment of mandatory or voluntary vessel strike avoidance areas (*i.e.*, DMAs, Seasonal Management Areas, Slow Zones) and any information regarding North Atlantic right whale sighting locations; and

(17) Empire Wind must submit a North Atlantic Right Whale Vessel Strike Avoidance Plan to NMFS Office of Protected Resources for review and approval at least 180 days prior to the planned start of vessel activity. The plan must provide details on the vessel-based observer and PAM protocols for transiting vessels. If a plan is not submitted and approved by NMFS prior to vessel operations, all project vessels must travel at speeds of 10 kn (11.5 mph) or less. Empire Wind must comply with any approved North Atlantic Right Whale Vessel Strike Avoidance Plan.

(c) *WTG and OSS foundation installation*. The following requirements apply to impact pile driving activities associated with the installation of WTG and OSS foundations:

(1) Foundation pile driving of foundation piles must not occur January 1st through April 30th, annually. Foundation pile driving must not be planned and must be avoided to the maximum extent practicable in December; however, it may occur if necessary to complete the Project with prior approval by NMFS. Empire Wind must notify NMFS in writing by September 1 of that year that circumstances are expected to necessitate pile driving in December;

(2) Monopiles must be no larger than 11-m in diameter. Hammer energies must not exceed 5,500 kilojoules (kJ) for monopile installation. No more than two monopiles may be installed per day. Pin piles must be no larger than 2.5-m in diameter. Hammer energies must not exceed 3,200 kilojoules (kJ) for pin pile installation. No more than three pin piles may be installed per day;

(3) Empire Wind must only perform foundation pile driving during daylight hours, defined as no later than 1.5 hours prior to civil sunset and no earlier than 1 hour after civil sunrise, and may only continue into darkness if stopping operations represents a risk to human health, safety, and/or pile stability and an Alternative Monitoring Plan, as part of the Pile Driving and Marine Mammal Monitoring Plan for Nighttime Pile Driving that reliably demonstrates the efficacy of their night vision methods, has been approved by NMFS. No new pile driving may begin when pile driving continues into darkness;

(4) Empire Wind will utilize a soft-start protocol for all monopile and jacket foundation impact pile driving by performing no more than 6 strikes per 1 minute using hammer energies not to exceed 5 percent for at least the first three minutes; followed by no more than 60 strikes per minute not to exceed 20% hammer

energy for at least the next 11 minutes and no more than 60 strikes per minute at hammer energies not to exceed 50% for at least the next 6 minutes. In total, the soft start procedure for each foundation pile will be no less than 20 minutes. Soft-start must occur at the beginning of impact driving and at any time following a cessation of impact pile driving of 30 minutes or longer;

(5) Empire Wind must establish clearance and shutdown zones, which must be measured using the radial distance around the pile being driven. PSOs must visually monitor clearance zones for marine mammals for a minimum of 60 minutes prior to commencing pile driving. At least one PAM operator must review data from at least 24 hours prior to pile driving and actively monitor hydrophones for 60 minutes prior to pile driving, at all times during pile driving, and for 30 minutes after pile driving. The entire minimum visibility zone must be visible (*i.e.*, not obscured by dark, rain, fog, etc.) for a full 60 minutes immediately prior to commencing impact pile driving. All clearance zones must be confirmed to be free of marine mammals for 30 minutes immediately prior to the beginning of soft-start procedures. PAM operators must immediately communicate all detections of marine mammals at any distance to the Lead PSO, including any determination regarding species identification, distance, and bearing and the degree of confidence in the determination. If a marine mammal is detected within or about to enter the applicable clearance zones, during this 30 minute time period, impact pile driving must be delayed until the animal has been visually observed exiting the clearance zone or until a specific time period has elapsed with no further sightings. The specific time periods are 15 minutes for small odontocetes and pinnipeds, and 30 minutes for all other species;

(6) For North Atlantic right whales, any visual observation by a protected species observer at any distance or acoustic detection within the PAM Monitoring Zone must trigger a delay to the commencement of pile driving. The North Atlantic right whale clearance zone may only be declared clear if no North Atlantic right whale acoustic or visual detections have occurred within the clearance zone during the 60-minute monitoring period. Any large whale sighting by a PSO or detected by a PAM operator that cannot be identified as a non-North Atlantic right whale must be treated as if it were a North Atlantic right whale;

(7) Empire Wind must deploy at least two functional noise abatement systems that reduce noise levels to the modeled harassment isopleths, assuming 10-dB attenuation, during all foundation pile driving and comply with the following measures:

(i) A single bubble curtain must be not be used;

(ii) The bubble curtain(s) must distribute air bubbles using an air flow rate of at least 0.5 m^3/(minute*m). The bubble curtain(s) must surround 100 percent of the piling perimeter throughout the full depth of the water column. In the unforeseen event of a single compressor malfunction, the offshore personnel operating the bubble curtain(s) must adjust the air

supply and operating pressure such that the maximum possible sound attenuation performance of the bubble curtain(s) is achieved;

(iii) The lowest bubble ring must be in contact with the seafloor for the full circumference of the ring, and the weights attached to the bottom ring must ensure 100-percent seafloor contact;

(iv) No parts of the ring or other objects may prevent full seafloor contact with a bubble curtain ring;

(v) Construction contractors must train personnel in the proper balancing of airflow to the bubble curtain ring. Empire Wind must provide NMFS Office of Protected Resources with a bubble curtain performance test and maintenance report to review within 72 hours after each pile using a bubble curtain is installed. Additionally, a full maintenance check (*e.g.*, manually clearing holes) must occur prior to each pile being installed;

(vi) Corrections to the bubble ring(s) to meet the performance standards in this paragraph (c)(7) must occur prior to pile driving of foundation piles. For any noise mitigation device in addition to the bubble curtain, Empire Wind must inspect and carry out appropriate maintenance on the system and ensure the system is functioning properly prior to every pile driving event.

(8) Empire Wind must utilize NMFS-approved PAM systems, as described in paragraph (c)(15) of this section. The PAM system components (*i.e.*, acoustic buoys) must not be placed closer than 1 km (0.6 mi) to the pile being driven so that the activities do not mask the PAM system. Empire Wind must demonstrate and prove the detection range of the system they plan to deploy while considering potential masking from concurrent pile-driving and vessel noise. The PAM system must be able to detect a vocalization of North Atlantic right whales up to 10 km (6.2 mi);

(9) Empire Wind must utilize PSO(s) and PAM operator(s), as described in paragraph (c)(15). At least three on-duty PSOs must be on the pile driving platform(s);

(10) If a marine mammal is detected (visually or acoustically) entering or within the respective shutdown zone after pile driving has begun, the PSO or PAM operator must call for a shutdown of pile driving and Empire Wind must stop pile driving immediately, unless shutdown is not practicable due to imminent risk of injury or loss of life to an individual or risk of damage to a vessel that creates risk of injury or loss of life for individuals, or the lead engineer determines there is risk of pile refusal or pile instability. If pile driving is not shutdown due to one of these situations, Empire Wind must reduce hammer energy to the lowest level practicable and the reason(s) for not shutting down must be documented and reported to NMFS Office of Protected Resources within the applicable monitoring reports (*e.g.*, weekly, monthly) (see section 4(g));

(11) A visual observation or acoustic detection of a North Atlantic right whale at any distance by foundation installation PSOs or an acoustic detection within 10 km

triggers shutdown requirements under paragraph (c)(10) of this section. If pile driving has been shut down due to the presence of a North Atlantic right whale, pile driving may not restart until the North Atlantic right whale has neither been visually or acoustically detected by pile driving PSOs and PAM operators for 30 minutes;

(12) If pile driving has been shut down due to the presence of a marine mammal other than a North Atlantic right whale, pile driving must not restart until either the marine mammal(s) has voluntarily left the specific clearance zones and has been visually or acoustically confirmed beyond that clearance zone, or, when specific time periods have elapsed with no further sightings or acoustic detections have occurred. The specific time periods are 15 minutes for small odontocetes and pinnipeds, and 30 minutes for all other marine mammal species. In cases where these criteria are not met, pile driving may restart only if necessary to maintain pile stability at which time Empire Wind must use the lowest hammer energy practicable to maintain stability;

(13) Empire Wind must conduct sound field verification (SFV) measurements during pile driving activities associated with the installation of, at minimum, the first three monopile foundations. SFV measurements must continue until at least three consecutive piles demonstrate noise levels are at or below those modeled, assuming 10 decibels (dB) of attenuation. Subsequent SFV measurements are also required should larger piles be installed or if additional monopiles are driven that may produce louder sound fields than those previously measured (*e.g.*, higher hammer energy, greater number of strikes, *etc.*). In addition to this SFV monitoring, which will follow a specific comprehensive methodology agreed upon in the the SFV Plan required in (13)(1) below, Empire Wind also must conduct abbreviated SFV for all other foundations, using at least one acoustic recorder for every foundation for which thorough SFV monitoring is not conducted. SFV measurements must be conducted as follows:

(i) Thorough SFV measurements must be made at a minimum of four distances from the pile(s) being driven, along a single transect, in the direction of lowest transmission loss (*i.e.*, projected lowest transmission loss coefficient), including, but not limited to, 750 m (2,460 ft) and three additional ranges, including, at least, the modeled Level B harassment isopleth assuming 10 dB attenuation. At least one additional measurement at an azimuth 90 degrees from the array at 750 m must be made. At each location, there must be a near bottom and mid-water column hydrophone (measurement system);

(ii) The recordings must be continuous throughout the duration of all pile driving of each foundation;

(iii) The SFV measurement systems must have a sensitivity appropriate for the expected sound levels from pile driving received at the nominal ranges throughout the installation of the pile. The frequency range of SFV measurement systems must cover the range of at least 20 hertz (Hz) to 20

kilohertz (kHz). The SFV measurement systems must be designed to have omnidirectional sensitivity so that the broadband received level of all pile driving exceeds the system noise floor by at least 10 dB. The dynamic range of the SFV measurement system must be sufficient such that at each location, and the signals avoid poor signal-to-noise ratios for low amplitude signals and avoid clipping, nonlinearity, and saturation for high amplitude signals;

(iv) All hydrophones used in SFV measurements systems are required to have undergone a full system, traceable laboratory calibration conforming to International Electrotechnical Commission (IEC) 60565, or an equivalent standard procedure, from a factory or accredited source to ensure the hydrophone receives accurate sound levels, at a date not to exceed 2 years before deployment. Additional *in-situ* calibration checks using a pistonphone are required to be performed before and after each hydrophone deployment. If the measurement system employs filters via hardware or software (*e.g.*, high-pass, low-pass, *etc*.), which is not already accounted for by the calibration, the filter performance (*i.e.*, the filter's frequency response) must be known, reported, and the data corrected before analysis;

(v) Empire Wind must be prepared with additional equipment (hydrophones, recording devices, hydrophone calibrators, cables, batteries, *etc*.), which exceeds the amount of equipment necessary to perform the measurements, such that technical issues can be mitigated before measurement;

(vi) Empire Wind must submit interim reports within 48 hours after each foundation is measured (see section 4(g) for interim and final reporting requirements);

(vii) If any of the interim SFV reports submitted indicate that SFV measurements exceed the modeled distances to NMFS marine mammal Level A harassment and Level B harassment thresholds assuming 10-dB attenuation, then Empire Wind must implement additional measures on all subsequent foundations to ensure the measured Level A and Level B harassment isopleths do not exceed those modeled for foundation installation, assuming 10dB attenuation. Empire Wind must also increase clearance and shutdown zone sizes to those identified by NMFS until SFV measurements on at least three additional foundations demonstrate acoustic distances to harassment thresholds meet or are less than those modeled assuming 10-dB of attenuation. Empire Wind must optimize the sound attenuation systems (*e.g.*, ensure hose maintenance, pressure testing, *etc*.) to, at least, meet noise levels modeled, assuming 10-dB attenuation, within three piles or else foundation installation activities must cease until NMFS and Empire Wind can evaluate the situation and ensure future piles will not exceed noise levels modeled assuming 10-dB attenuation;

(viii) If, after additional measurements conducted pursuant to requirements of paragraph (13)(vii) of this section, acoustic measurements indicate that ranges to isopleths corresponding to the Level A harassment and Level B harassment thresholds are less than the ranges predicted by modeling (assuming 10-dB attenuation), Empire Wind may request to NMFS Office of Protected Resources a modification of the clearance and shutdown zones. For NMFS Office of Protected Resources to consider a modification request for reduced zone sizes, Empire Wind must have conducted SFV measurements on an additional three WTG monopile foundations and ensure that subsequent foundations would be installed under conditions that are predicted to produce smaller harassment zones than those modeled assuming 10-dB of attenuation;

(ix) Empire Wind must conduct SFV measurements upon commencement of turbine operations to estimate turbine operational source levels and transmission loss rates, in accordance with a NMFS-approved Foundation Installation Pile Driving SFV Plan. SFV must be conducted in the same manner as previously described in paragraph (c)(13) of this section, with appropriate adjustments to measurement distances, number of hydrophones, and hydrophone sensitivities being made, as necessary; and

(x) Empire Wind must submit a SFV Plan to NMFS Office of Protected Resources for review and approval at least 180 days prior to planned start of foundation installation activities and abide by the Plan if approved. At minimum, the SFV Plan must describe how Empire Wind would ensure that the first three monopile foundation installation sites selected for SFV measurements are representative of the rest of the monopile installation sites such that future pile installation events are anticipated to produce similar sound levels to those piles measured. In the case that these sites/scenarios are not determined to be representative of all other pile installation sites, Empire Wind must include information in the SFV Plan on how additional sites/scenarios would be selected for SFV measurements. This SFV Plan must also include methodology for collecting, analyzing, and preparing SFV measurement data for submission to NMFS Office of Protected Resources and describe how the effectiveness of the sound attenuation methodology would be evaluated based on the results. SFV for pile driving may not occur until NMFS approves the SFV Plan for this activity.

(14) Empire Wind must submit a Foundation Installation Pile Driving Marine Mammal Monitoring Plan to NMFS Office of Protected Resources for review and approval at least 180 days prior to planned start of foundation pile driving and abide by the Plan if approved. Empire Wind must obtain both NMFS Office of Protected Resources and NMFS Greater Atlantic Regional Fisheries Office Protected Resources Division's concurrence with this Plan prior to the start of any pile driving. The Plan must include a description of all monitoring equipment and PAM operator and PSO protocols (including number and location of PSOs and

PAM operators) for all foundation pile driving. No foundation pile installation can occur without NMFS' approval of the Plan; and

(15) Empire Wind must submit a Passive Acoustic Monitoring Plan (PAM Plan) to NMFS Office of Protected Resources for review and approval at least 180 days prior to the planned start of foundation installation activities and abide by the Plan if approved. The PAM Plan must include a description of all proposed PAM equipment, address how the proposed passive acoustic monitoring must follow standardized measurement, processing methods, reporting metrics, and metadata standards for offshore wind. The Plan must describe all proposed PAM equipment, procedures, and protocols including proof that vocalizing North Atlantic right whales will be detected within the clearance and shutdown zones. No pile installation can occur if Empire Wind's PAM Plan does not receive approval from NMFS Office of Protected Resources and NMFS Greater Atlantic Regional Fisheries Office Protected Resources Division.

(d) *Cofferdam and goal post installation and removal.* The following requirements apply to the cable landfall and marina construction activities:

(1) Installation and removal of cofferdams and goal posts must not occur during nighttime hours (defined as the hours between 1.5 hours prior to civil sunset and 1 hour after civil sunrise);

(2) Empire Wind must establish and implement clearance zones for the installation and removal of cofferdams and goal posts using visual monitoring. These zones must be measured using the radial distance from the cofferdam and goal post being installed and/or removed;

(3) Empire Wind must utilize NMFS-approved PSO(s), as described in section 4(d);

(4) If a marine mammal(s) is observed entering or is observed within the clearance zones, before vibratory or impact pile driving has begun, the activity must not commence until the animal(s) has exited the zone or a specific amount of time has elapsed since the last sighting. The specific time periods are 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other marine mammal species;

(5) If a marine mammal is observed entering or within the respective shutdown zone after vibratory or impact pile driving has begun, the PSO must call for a shutdown of pile driving. Empire Wind must stop pile driving immediately unless shutdown is not practicable due to imminent risk of injury or loss of life to an individual or if there is a risk of damage to the vessel that would create a risk of injury or loss of life for individuals or if the lead engineer determines there is refusal or instability. In any of these situations, Empire Wind must document the reason(s) for not shutting down and report the information to NMFS Office of Protected Resources in the annual report (as described in section 4(g)). In cases where shutdown is not feasible, pile driving may restart only if necessary to maintain pile stability at which time Empire Wind must use the lowest hammer energy practicable to maintain stability;

(6) Pile driving must not restart until either the marine mammal(s) has voluntarily left the specific clearance zones and has been visually or acoustically confirmed beyond that clearance zone, or, when specific time periods have elapsed with no further sightings or acoustic detections have occurred. The specific time periods are 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other marine mammal species. In cases where these criteria are not met, pile driving may restart only if necessary to maintain pile stability at which time Empire Wind must use the lowest hammer energy practicable to maintain stability; and

(7) Empire Wind must employ a soft-start for all impact pile driving of goal posts. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced-energy strike sets.

(e) *HRG surveys*. The following requirements apply to HRG surveys operating sub-bottom profilers (SBPs) (*i.e.*, boomers, sparkers, and Compressed High Intensity Radiated Pulse (CHIRPS)):

(1) Empire Wind must establish and implement clearance and shutdown zones for HRG surveys using visual monitoring (see Table 9 for zone sizes);

(2) Empire Wind must utilize NMFS-approved PSO(s), as described in section 4(e);

(3) Empire Wind must abide by the relevant Project Design Criteria (PDCs 4, 5, and 7) of the programmatic consultation completed by NMFS' Greater Atlantic Regional Fisheries Office on June 29, 2021 (revised September 2021), pursuant to section 7 of the Endangered Species Act (ESA) or otherwise updated. To the extent that any relevant Best Management Practices (BMPs) described in these PDCs are more stringent than the requirements herein, those BMPs supersede these requirements;

(4) SBPs (hereinafter referred to as "acoustic sources") must be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing. Acoustic sources must be used at the lowest practicable source level to meet the survey objective, when in use, and must be turned off when they are not necessary for the survey;

(5) Prior to starting the survey and after receiving confirmation from the PSOs that the clearance zone is clear of any marine mammals, Empire Wind is required to ramp-up acoustic sources to half power for 5 minutes prior to commencing full power, unless the equipment operates on a binary on/off switch (in which case ramp-up is not required). Empire Wind must also ensure visual clearance zones are fully visible (*e.g.*, not obscured by darkness, rain, fog, *etc.*) and clear of marine mammals, as determined by the Lead PSO, for at least 30 minutes immediately prior to the initiation of survey activities using acoustic sources;

(6) Ramp-up and activation must be delayed if a marine mammal(s) enters its respective shutdown zone. Ramp-up and activation may only be reinitiated if the animal(s) has been observed exiting its respective shutdown zone or until 15

minutes for small odontocetes and pinnipeds, and 30 minutes for all other species, has elapsed with no further sightings;

(7) Prior to a ramp-up procedure starting or activating acoustic sources, the acoustic source operator (operator) must notify a designated PSO of the planned start of ramp-up as agreed upon with the Lead PSO. The notification time should not be less than 60 minutes prior to the planned ramp-up or activation in order to allow the PSOs time to monitor the clearance zone(s) for 30 minutes prior to the initiation of ramp-up or activation (pre-start clearance). During this 30-minute pre-start clearance period, the entire applicable clearance zones must be visible, except as indicated in paragraph (e)(12) of this section;

(8) Ramp-ups must be scheduled so as to minimize the time spent with the source activated;

(9) A PSO conducting pre-start clearance observations must be notified again immediately prior to reinitiating ramp-up procedures and the operator must receive confirmation from the PSO to proceed;

(10) Empire Wind must implement a 30-minute clearance period of the clearance zones immediately prior to the commencing of the survey or when there is more than a 30-minute break in survey activities or PSO monitoring. A clearance period is a period when no marine mammals are detected in the relevant zone;

(11) If a marine mammal is observed within a clearance zone during the clearance period, ramp-up or acoustic surveys may not begin until the animal(s) has been observed voluntarily exiting its respective clearance zone or until a specific time period has elapsed with no further sighting. The specific time period is 15 minutes for small odontocetes and pinnipeds, and 30 minutes for all other species;

(12) In any case when the clearance process has begun in conditions with good visibility, including via the use of night vision equipment (infrared (IR)/thermal camera), and the Lead PSO has determined that the clearance zones are clear of marine mammals, survey operations may commence (*i.e.*, no delay is required) despite periods of inclement weather and/or loss of daylight. Ramp-up may occur at times of poor visibility, including nighttime, if appropriate visual monitoring has occurred with no detections of marine mammals in the 30 minutes prior to beginning ramp-up;

(13) Once the survey has commenced, Empire Wind must shut down acoustic sources if a marine mammal enters a respective shutdown zone, except in cases when the shutdown zones become obscured for brief periods due to inclement weather, survey operations may continue (*i.e.*, no shutdown is required) so long as no marine mammals have been detected. The shutdown requirement does not apply to small delphinids of the following genera: *Delphinus, Stenella, Lagenorhynchus,* and *Tursiops*. If there is uncertainty regarding the identification of a marine mammal species (*i.e.*, whether the observed marine mammal belongs to one of the delphinid genera for which shutdown is waived), the PSOs must use their best

professional judgment in making the decision to call for a shutdown. Shutdown is required if a delphinid that belongs to a genus other than those specified in this paragraph (e)(13) of this section is detected in the shutdown zone;

(14) If an acoustic source has been shut down due to the presence of a marine mammal, the use of an acoustic source may not commence or resume until the animal(s) has been confirmed to have left the Level B harassment zone or until a full 15 minutes for small odontocetes and seals or 30 minutes for all other marine mammals have elapsed with no further sighting;

(15) Empire Wind must immediately shut down any acoustic source if a marine mammal is sighted entering or within its respective shutdown zones. If there is uncertainty regarding the identification of a marine mammal species (*i.e.*, whether the observed marine mammal belongs to one of the delphinid genera for which shutdown is waived), the PSOs must use their best professional judgment in making the decision to call for a shutdown. Shutdown is required if a delphinid that belongs to a genus other than those specified in paragraph (e)(13) of this section is detected in the shutdown zone;

(16) If an acoustic source is shut down for a period longer than 30 minutes, all clearance and ramp-up procedures must be initiated. If an acoustic source is shut down for reasons other than mitigation (*e.g.*, mechanical difficulty) for less than 30 minutes, acoustic sources may be activated again without ramp-up only if PSOs have maintained constant observation and no additional detections of any marine mammal occurred within the respective shutdown zones; and

(17) If multiple HRG vessels are operating concurrently, any observations of marine mammals must be communicated to PSOs on all nearby survey vessels.

(f) *Fisheries monitoring surveys*. The following requirements apply to fishery monitoring surveys:

(1) Survey gear must be deployed as soon as possible once the vessel arrives on station. Gear must not be deployed if there is a risk of interaction with marine mammals. Gear may be deployed after 15 minutes of no marine mammal sightings within 1 nautical mile (nmi; 1,852 m) of the sampling station;

(2) Empire Wind and/or its cooperating institutions, contracted vessels, or commercially hired captains must implement the following "move-on" rule: If marine mammals are sighted within 1 nautical mile (nmi (1.2 mi)) of the planned location and 15 minutes before gear deployment, then Empire Wind and/or its cooperating institutions, contracted vessels, or commercially hired captains, as appropriate, must move the vessel away from the marine mammal to a different section of the sampling area. If, after moving on, marine mammals are still visible from the vessel, Empire Wind and its cooperating institutions, contracted vessels, or commercially hired captains must move again or skip the station;

(3) If a marine mammal is at risk of interacting with deployed gear, all gear must be immediately removed from the water. If marine mammals are sighted before the

gear is fully removed from the water, the vessel must slow its speed and maneuver the vessel away from the animals to minimize potential interactions with the observed animal;

(4) Empire Wind must maintain visual marine mammal monitoring effort during the entire period of time that gear is in the water (*i.e.*, throughout gear deployment, fishing, and retrieval). If marine mammals are sighted before the gear is fully removed from the water, Empire Wind will take the most appropriate action to avoid marine mammal interaction;

(5) All fisheries monitoring gear must be fully cleaned and repaired (if damaged) before each use/deployment;

(6) Trawl tows must be limited to a maximum of a 20-minute trawl time;

(7) All gear must be emptied as close to the deck/sorting area and as quickly as possible after retrieval;

(8) During trawl surveys, vessel crew must open the codend of the trawl net close to the deck in order to avoid injury to animals that may be caught in the gear;

(9) All in-water survey gear, including buoys, must be properly labeled with the scientific permit number or identification as Empire Wind's research gear. All labels and markings on the gear, buoys, and buoy lines must also be compliant with the applicable regulations, and all buoy markings must comply with instructions received by the NOAA Greater Atlantic Regional Fisheries Office Protected Resources Division;

(10) All captains and crew conducting fishery surveys will be trained in marine mammal detection and identification. Marine mammal monitoring will be conducted by the captain and/or a member of the scientific crew before (within 1 nautical mile (nmi) (1.85 km) and 15 minutes prior to deploying gear), during, and after haul back;

(11) All survey gear must be removed from the water whenever not in active survey use (*i.e.*, no wet storage);

(12) All reasonable efforts, that do not compromise human safety, must be undertaken to recover gear; and

(13) Any lost gear associated with the fishery surveys must be reported to the NOAA Greater Atlantic Regional Fisheries Office Protected Resources Division within 24 hours.

4. Monitoring and Reporting Requirements:

Empire Wind must implement the following monitoring and reporting requirements when conducting the specified activities (see also 50 CFR § 217.285):

(a) *Protected species observer (PSO) and passive acoustic monitoring (PAM) operator qualifications.* Empire Wind must implement the following measures applicable to PSOs and PAM operators:

(1) Empire Wind must use independent, NMFS-approved PSOs and PAM operators, meaning that the PSOs and PAM operators must be employed by a third-party observer provider, must have no tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant crew with regard to the presence of protected species and mitigation requirements;

(2) All PSOs and PAM operators must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO or PAM operator has acquired the relevant skills through a suitable amount of alternate experience. Requests for such a waiver must be submitted to NMFS Office of Protected Resources and must include written justification containing alternative experience. Alternate experience that may be considered includes, but is not limited to: previous work experience conducting academic, commercial, or government-sponsored marine mammal visual and/or acoustic surveys; or previous work experience as a PSO/PAM operator. All PSOs and PAM operators should demonstrate good standing and consistently good performance of all assigned duties;

(3) PSOs must have visual acuity in both eyes (with correction of vision being permissible) sufficient enough to discern moving targets on the water's surface with the ability to estimate the target size and distance (binocular use is allowable); ability to conduct field observations and collect data according to the assigned protocols; sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations; writing skills sufficient to document observations, including but not limited to, the number and species of marine mammals observed, the dates and times of when in-water construction activities were conducted, the dates and time when in-water construction activities were suspended to avoid potential incidental take of marine mammals from construction noise within a defined shutdown zone, and marine mammal behavior; and the ability to communicate orally, by radio, or in-person, with project personnel to provide real-time information on marine mammals observed in the area;

(4) All PSOs must be trained in northwestern Atlantic Ocean marine mammal identification and behaviors and must be able to conduct field observations and collect data according to assigned protocols. Additionally, PSOs must have the ability to work with all required and relevant software and equipment necessary during observations (as described in paragraphs (b)(5) and (b)(6) of this section);

(5) All PSOs and PAM operators must successfully complete a relevant training course within the last 5 years, including obtaining a certificate of course completion;

(6) PSOs and PAM operators are responsible for obtaining NMFS' approval. NMFS may approve PSOs and PAM operators as conditional or unconditional. A conditionally-approved PSO or PAM operator may be one who has completed training in the last 5 years but has not yet attained the requisite field experience. An unconditionally approved PSO or PAM operator is one who has completed training within the last 5 years and attained the necessary experience (*i.e.*, demonstrate experience with monitoring for marine mammals at clearance and shutdown zone sizes similar to those produced during the respective activity). Lead PSO or PAM operators must be unconditionally approved and have a minimum of 90 days in a northwestern Atlantic Ocean offshore environment performing the role (either visual or acoustic), with the conclusion of the most recent relevant experience not more than 18 months previous. A conditionally approved PSO or PAM operator must be paired with an unconditionally approved PSO or PAM operator;

(7) PSOs for cable landfall construction, marina activities, and HRG surveys may be unconditionally or conditionally approved. PSOs and PAM operators for foundation installation must be unconditionally approved;

(8) At least one on-duty PSO and PAM operator, where applicable, for each activity (*e.g.*, foundation installation, cable landfall construction, and HRG surveys) must be designated as the Lead PSO. The Lead PSO should be unconditionally approved for Tiers 1-3;

(9) Empire Wind must submit NMFS previously approved PSOs and PAM operators to NMFS Office of Protected Resources for review and confirmation of their approval for specific roles at least 30 days prior to commencement of the activities requiring PSOs/PAM operators or 15 days prior to when new PSOs/PAM operators are required after activities have commenced;

(10) For prospective PSOs and PAM operators not previously approved, or for PSOs and PAM operators whose approval is not current, Empire Wind must submit resumes for approval at least 60 days prior to PSO and PAM operator use. Resumes must include information related to relevant education, experience, and training, including dates, duration, location, and description of prior PSO or PAM operator experience. Resumes must be accompanied by relevant documentation of successful completion of necessary training and include which specific roles and activities the PSOs/PAM operators are being requested for. PAM operator experience must also include the information described in paragraph a(11) of this section;

(11) PAM operators are responsible for obtaining NMFS approval. To be approved as a PAM operator, the person must meet the following qualifications: The PAM operator must demonstrate that they have prior large whale PAM experience with

real-time acoustic detection systems and/or have completed specialized training for operating PAM systems that will be used for the Project; PAM operators must demonstrate that they are able to detect and identify Atlantic Ocean marine mammals sounds, in particular: North Atlantic right whale sounds, humpback whale sounds, and that they are able to deconflict humpback whale sounds from similar North Atlantic right whale sounds, and other co-occurring species' sounds in the area including sperm whales; must be able to distinguish between whether a marine mammal or other species sound is detected, possibly detected, or not detected and similar terminology must be used across companies/projects; where localization of sounds or deriving bearings and distance are possible, the PAM operators must have demonstrated experience in the localization of sounds or deriving bearings and distance; PAM operators must be independent observers (*i.e.*, not construction personnel); PAM operators must demonstrate experience with relevant acoustic software and equipment; PAM operators must have the qualifications and relevant experience/training to safely deploy and retrieve equipment and program the software, as necessary; PAM operators must be able to test software and hardware functionality prior to operation; and PAM operators must have evaluated their acoustic detection software using the PAM Atlantic baleen whale annotated data set available at National Centers for Environmental Information (NCEI) and provide evaluation/performance metric;

(12) PAM operators must be able to review and classify acoustic detections in near real-time (prioritizing North Atlantic right whales and noting detection of other cetaceans) during the real-time monitoring periods; and

(13) PSOs may work as PAM operators and vice versa, pending NMFS approval; however, they may only perform one role at any one time and must not exceed work time restrictions, which must be tallied cumulatively.

(b) *General PSO and PAM operator requirements.* The following measures apply to PSOs and PAM operators and must be implemented by Empire Wind:

(1) PSOs must monitor for marine mammals prior to, during, and following all impact pile driving, cable landfall activities, and HRG surveys that use sub-bottom profilers (with specific monitoring durations and needs described in paragraphs (c) through (f) of this section, respectively). Monitoring must be done while free from distractions and in a consistent, systematic, and diligent manner;

(2) All PSOs must be located at the best vantage point(s) on any platform, as determined by the Lead PSO, in order to obtain 360-degree visual coverage of the entire clearance and shutdown zones around the activity area, and as much of the Level B harassment zone as possible. PAM operators may be located on a vessel or remotely on-shore. The PAM operator(s) must assist PSOs in ensuring full coverage of the clearance and shutdown zones. The PAM operator must monitor to and past the clearance zone for large whales;

(3) All on-duty PSOs must remain in real-time contact with the on-duty PAM operator(s). PAM operators must immediately communicate all acoustic

detections of marine mammals to PSOs, including any determination regarding species identification, distance, and bearing (where relevant) relative to the pile being driven and the degree of confidence (*e.g.*, detected, possibly detected, not detected) in the determination. All on-duty PSOs and PAM operator(s) must remain in contact with the on-duty construction personnel responsible for implementing mitigations (*e.g.*, delay to pile driving) to ensure communication on marine mammal observations can easily, quickly, and consistently occur between all on-duty PSOs, PAM operator(s), and on-water Project personnel;

(4) The PAM operator must inform the Lead PSO(s) on duty of animal detections approaching or within applicable ranges of interest to the activity occurring via the data collection software system, (*e.g.*, Mysticetus or similar system) who must be responsible for requesting that the designated crewmember implement the necessary mitigation procedures (*i.e.*, delay);

(5) PSOs must use high magnification (25x) binoculars, standard handheld (7x) binoculars, and the naked eye to search continuously for marine mammals. During foundation installation, at least three PSOs on the pile driving and any dedicated PSO vessel that may be used must be equipped with functional Big Eye binoculars (*e.g.*, 25 x 150; 2.7 view angle; individual ocular focus; height control). These must be pedestal mounted on the deck at the best vantage point that provides for optimal sea surface observation and PSO safety. A minimum of 3 PSOs must be active on a dedicated PSO vessel or an alternate monitoring technology (*e.g.*, UAS) must be used that has been demonstrated as having greater visual monitoring capability compared to 3 PSOs on a dedicated PSO vessel and is approved by NMFS. PAM operators must have the appropriate equipment (*i.e.*, a computer station equipped with a data collection software system available wherever they are stationed) and use a NMFS-approved PAM system to conduct monitoring. PAM systems are approved through the PAM Plan as described in section 3(c)(15);

(6) During periods of low visibility (*e.g.*, darkness, rain, fog, poor weather conditions, *etc.*), PSOs must use alternative technology (*i.e.*, infrared or thermal cameras) to monitor the clearance and shutdown zones as approved by NMFS;

(7) PSOs and PAM operators must not exceed 4 consecutive watch hours on duty at any time, must have a 2-hour (minimum) break between watches, and must not exceed a combined watch schedule of more than 12 hours in a 24-hour period;

(8) Any PSO has the authority to call for a delay or shutdown of project activities;

(9) Any visual observations of ESA-listed marine mammals must be communicated immediately to PSOs and vessel captains associated with other vessels to increase situational awareness; and

(10) Empire Wind and PSOs are required to use available sources of information on North Atlantic right whale presence to aid in monitoring efforts. These include daily monitoring of the Right Whale Sightings Advisory System, consulting of the

WhaleAlert app, and monitoring of the Coast Guard's VHF Channel 16 throughout the day to receive notifications of any sightings and information associated with any Dynamic Management Areas, to plan construction activities and vessel routes, if practicable, to minimize the potential for co-occurrence with North Atlantic right whales.

(c) *PSO and PAM operator requirements during WTG and OSS foundation installation*. The following measures apply to PSOs and PAM operators during WTG and OSS foundation installation and must be implemented by Empire Wind:

(1) PSOs and PAM operator(s), using a NMFS-approved PAM system, must monitor for marine mammals 60 minutes prior to, during, and 30 minutes following all pile-driving. If PSOs cannot visually monitor the minimum visibility zone prior to pile driving at all times using the equipment described in paragraphs (b)(5) and (6) of this section, pile-driving operations must not commence or must shutdown if they are currently active. Foundation pile driving may only commence when the minimum visibility zone is fully visible (*e.g.*, not obscured by darkness, rain, fog, etc.) and the clearance zones are clear of marine mammals for at least 30 minutes, as determined by the Lead PSO, immediately prior to the initiation of impact pile driving;

(2) At least three on-duty PSOs must be stationed on each vessel-based observer platform during pile driving. If an aerial platform is used, at least two on-duty PSOs must be actively searching for marine mammals. Concurrently, at least one PAM operator per acoustic data stream (equivalent to the number of acoustic buoys) must be actively monitoring for marine mammals 60 minutes before, during, and 30 minutes after foundation pile driving in accordance with a NMFS-approved PAM Plan; and

(3) Empire Wind must conduct PAM for at least 24 hours immediately prior to pile driving activities. The PAM operator must review all detections from the previous 24-hour period immediately prior to pile driving.

(d) *PSO requirements during cable landfall construction*. The following measures apply to PSOs during cable landfall construction and marina activities and must be implemented by Empire Wind:

(1) At least two PSOs must be on active duty during all activities related to the cable landfall construction and marina activities. These PSOs must be located at the best vantage points for observing marine mammals;

(2) PSOs must ensure that there is appropriate visual coverage for the entire clearance and shutdown zones and as much of the Level B harassment zone as possible; and

(3) PSOs must monitor the clearance zone for the presence of marine mammals for 30 minutes before and throughout pile driving activities, and for 30 minutes after all pile driving activities have ceased. Pile driving activities must only commence when visual clearance zones are fully visible (*e.g.*, not obscured by darkness, rain,

fog, *etc*.) and clear of marine mammals, as determined by the Lead PSO, for at least 30 minutes immediately prior to initiation of pile driving.

(e) *PSO requirements during HRG surveys*. The following measures apply to PSOs during HRG surveys using Compressed High Intensity Radiated Pulse (CHIRPs), boomers, and sparkers and must be implemented by Empire Wind:

(1) At least one PSO must be on active duty monitoring during HRG surveys conducted during daylight (*i.e.*, from 30 minutes prior to civil sunrise through 30 minutes following civil sunset) and at least two PSOs must be on active duty monitoring during HRG surveys conducted at night;

(2) PSOs on HRG vessels must begin monitoring 30 minutes prior to activating acoustic sources, during the use of these acoustic sources, and for 30 minutes after use of these acoustic sources has ceased;

(3) Any observations of marine mammals must be communicated to PSOs on all nearby survey vessels during concurrent HRG surveys; and

(4) During daylight hours when survey equipment is not operating, Empire Wind must ensure that visual PSOs conduct, as rotation schedules allow, observations for comparison of sighting rates and behavior with and without use of the specified acoustic sources. Off-effort PSO monitoring must be reflected in the monthly PSO monitoring reports.

(f) *Reporting*. Empire Wind must comply with the following reporting measures:

(1) Prior to initiation of any specified activities, Empire Wind must demonstrate in a report submitted to NMFS Office of Protected Resources that all required training for Empire Wind personnel (including the vessel crews, vessel captains, PSOs, and PAM operators) has been completed;

(2) Empire Wind must use a standardized reporting system during the effective period of the LOA. All data collected related to the Project must be recorded using industry-standard software that is installed on field laptops and/or tablets. Unless stated otherwise, all reports must be submitted to NMFS Office of Protected Resources (*PR.ITP.MonitoringReports@noaa.gov*), dates must be in MM/DD/YYYY format, and location information must be provided in Decimal Degrees and with the coordinate system information (*e.g.*, NAD83, WGS84, *etc*.);

(3) For all visual monitoring efforts and marine mammal sightings, the following information must be collected and reported to NMFS Office of Protected Resources: the date and time that monitored activity begins or ends; the construction activities occurring during each observation period; the watch status (*i.e.*, sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform); the PSO who sighted the animal; the time of sighting; the weather parameters (*e.g.*, wind speed, percent cloud cover, visibility); the water conditions (*e.g.*, Beaufort sea state, tide state, water depth); all marine mammal sightings, regardless of distance from the construction activity; species (or lowest

possible taxonomic level possible); the pace of the animal(s); the estimated number of animals (minimum/maximum/high/low/best); the estimated number of animals by cohort (*e.g.*, adults, yearlings, juveniles, calves, group composition, *etc*.); the description (*i.e.*, as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics); the description of any marine mammal behavioral observations (*e.g.*, observed behaviors such as feeding or traveling) and observed changes in behavior, including an assessment of behavioral responses thought to have resulted from the specific activity; the animal's closest distance and bearing from the pile being driven or specified HRG equipment and estimated time entered or spent within the Level A harassment and/or Level B harassment zone(s); the activity at time of sighting (*e.g.*, pile driving, construction surveys), use of any noise attenuation device(s), and specific phase of activity (*e.g.*, ramp-up of HRG equipment, HRG acoustic source on/off, soft-start for pile driving, active pile driving, *etc*.); the marine mammal occurrence in Level A harassment or Level B harassment zones; the description of any mitigation-related action implemented, or mitigation-related actions called for but not implemented, in response to the sighting (*e.g.*, delay, shutdown, *etc*.) and time and location of the action; other human activity in the area, and; other applicable information, as required in any LOA issued under section 5 herein;

(4) If a marine mammal is acoustically detected during PAM monitoring, the following information must be recorded and reported to NMFS: location of hydrophone (latitude and longitude; in Decimal Degrees) and site name; bottom depth and depth of recording unit (in meters); recorder (model & manufacturer) and platform type (*i.e.*, bottom-mounted, electric glider, *etc*.), and instrument ID of the hydrophone and recording platform (if applicable); time zone for sound files and recorded date/times in data and metadata (in relation to Universal Coordinated Time (UTC); *i.e.*, Eastern Standard Time (EST) time zone is UTC-5); duration of recordings (start/end dates and times; in International Organization for Standardization (ISO) 8601 format, yyyy-mm-ddTHH:MM:SS.sssZ); deployment/retrieval dates and times (in ISO 8601 format); recording schedule (must be continuous); hydrophone and recorder sensitivity (in dB re. 1 microPascal (μPa)); calibration curve for each recorder; bandwidth/sampling rate (in Hz); sample bit-rate of recordings; and, detection range of equipment for relevant frequency bands (in meters);

(i) For each detection, the following information must be noted: species identification (if possible); call type and number of calls (if known); temporal aspects of vocalization (date, time, duration, *etc*.; date times in ISO 8601 format); confidence of detection (detected, or possibly detected); comparison with any concurrent visual sightings; location and/or directionality of call (if determined) relative to acoustic recorder or construction activities; location of recorder and construction activities at time of call; name and version of detection or sound analysis software used, with protocol reference; minimum and maximum frequencies

viewed/monitored/used in detection (in Hz); and name of PAM operator(s) on duty.

(5) Empire Wind must compile and submit weekly reports during foundation installation to NMFS Office of Protected Resources that document the daily start and stop of all pile driving associated with the Project; the start and stop of associated observation periods by PSOs; details on the deployment of PSOs; a record of all detections of marine mammals (acoustic and visual); any mitigation actions (or if mitigation actions could not be taken, provide reasons why); and details on the noise attenuation system(s) used and its performance. Weekly reports are due on Wednesday for the previous week (Sunday to Saturday) and must include the information required under this section. The weekly report must also identify which turbines become operational and when (a map must be provided). Once all foundation pile installation is completed, weekly reports are no longer required by Empire Wind;

(6) Empire Wind must compile and submit monthly reports to NMFS Office of Protected Resources during foundation installation that include a summary of all information in the weekly reports, including project activities carried out in the previous month, vessel transits (number, type of vessel, MMIS number, and route), number of piles installed, all detections of marine mammals, and any mitigative action taken. Monthly reports are due on the 15th of the month for the previous month. The monthly report must also identify which turbines become operational and when (a map must be provided). Full PAM detection data and metadata must also be submitted monthly on the 15th of every month for the previous month via the webform on the NMFS North Atlantic Right Whale Passive Acoustic Reporting System website at *https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-templates;*

(7) Empire Wind must submit a draft annual report to NMFS Office of Protected Resources no later than 90 days following the end of a given calendar year. Empire Wind must provide a final report within 30 days following resolution of NMFS' comments on the draft report. The draft and final reports must detail the following: the total number of marine mammals of each species/stock detected and how many were within the designated Level A harassment and Level B harassment zone(s) with comparison to authorized take of marine mammals for the associated activity type; marine mammal detections and behavioral observations before, during, and after each activity; what mitigation measures were implemented (*i.e.*, number of shutdowns or clearance zone delays, *etc*.) or, if no mitigative actions were taken, why not; operational details (*i.e.*, days and duration of impact and vibratory pile driving, days, days and amount of HRG survey effort, *etc*.); any PAM systems used; the results, effectiveness, and which noise attenuation systems were used during relevant activities (*i.e.*, foundation pile driving); summarized information related to situational reporting; and any other important information relevant to the Project, including additional information that may be identified through the adaptive management process. The

final annual report must be prepared and submitted within 30 calendar days following the receipt of any comments from NMFS on the draft report. If no comments are received from NMFS within 60 calendar days of NMFS' receipt of the draft report, the report must be considered final;

(8) Empire Wind must submit its draft 5-year report to NMFS Office of Protected Resources on all visual and acoustic monitoring conducted within 90 calendar days of the completion of activities occurring under the LOA. A 5-year report must be prepared and submitted within 60 calendar days following receipt of any NMFS Office of Protected Resources comments on the draft report. If no comments are received from NMFS Office of Protected Resources within 60 calendar days of NMFS Office of Protected Resources receipt of the draft report, the report shall be considered final. The draft and final 5-year report must include, but is not limited to: the total number (annually and across all five years) of marine mammals of each species/stock detected and how many were detected within the designated Level A harassment and Level B harassment zone(s) with comparison to authorized take of marine mammals for the associated activity; a summary table(s) indicating the amount of each activity type (e.g., pile installation, HRG) completed in each of the five years and total; GIS shapefile(s) of the final location of all piles, cable routes, and other permanent structures including an indication of what year installed and began operating; GIS shapefile of all North Atlantic right whale sightings, including dates and group sizes; a five-year summary and evaluation of all SFV data collected; a five-year summary and evaluation of all PAM data collected; a five-year summary and evaluation of marine mammal behavioral observations; a five-year summary and evaluation of mitigation and monitoring implementation and effectiveness; and a list of recommendations to inform environmental compliance assessments for future offshore wind actions;

(9) For those foundations requiring thorough SFV measurements, Empire Wind must provide the initial results of the SFV measurements to NMFS Office of Protected Resources in an interim report after each foundation installation event as soon as they are available and prior to any subsequent foundation installation, but no later than 48 hours after each completed foundation installation event. The report must include, at minimum: hammer energies/schedule used during pile driving, including, the total number of strikes and the maximum hammer energy; the model-estimated acoustic ranges ($R_{95\%}$) to compare with the real-world sound field measurements; peak sound pressure level (SPL_{pk}), root-mean-square sound pressure level that contains 90 percent of the acoustic energy (SPL_{rms}), and sound exposure level (SEL, in single strike for pile driving, $SEL_{ss,}$), for each hydrophone, including at least the maximum, arithmetic mean, minimum, median (L50) and L5 (95 percent exceedance) statistics for each metric; estimated marine mammal Level A harassment and Level B harassment acoustic isopleths, calculated using the maximum-over-depth L5 (95 percent exceedance level, maximum of both hydrophones) of the associated sound metric; comparison of modeled results assuming 10-dB attenuation against the measured marine mammal Level A harassment and Level B harassment acoustic isopleths;

estimated transmission loss coefficients; pile identifier name, location of the pile and each hydrophone array in latitude/longitude; depths of each hydrophone; one-third-octave band single strike SEL spectra; if filtering is applied, full filter characteristics must be reported; and hydrophone specifications including the type, model, and sensitivity. Empire Wind must also report any immediate observations which are suspected to have a significant impact on the results including but not limited to: observed noise mitigation system issues, obstructions along the measurement transect, and technical issues with hydrophones or recording devices. If any *in-situ* calibration checks for hydrophones reveal a calibration drift greater than 0.75 dB, pistonphone calibration checks are inconclusive, or calibration checks are otherwise not effectively performed, Empire Wind must indicate full details of the calibration procedure, results, and any associated issues in the 48-hour interim reports;

(10) Empire Wind must conduct abbreviated SFV for all foundation installations for which the complete SFV monitoring is not carried out (refer back to subsection 3(c)(13), whereas a single acoustic recorder must be placed at an appropriate distance from the pile, in alignment with the completed Biological Opinion. All results must be included in the weekly reports. Any indications that distances to the identified Level A harassment and Level B harassment thresholds for marine mammals were exceeded must be addressed by Empire Wind, including an explanation of factors that contributed to the exceedance and corrective actions that were taken to avoid exceedance on subsequent piles;

(11) The final results of all SFV measurements from each foundation installation must be submitted as soon as possible, but no later than 90 days following completion of each event's SFV measurements. The final reports must include all details included in the interim report as well as, at minimum, the following: the peak sound pressure level (SPL_{pk}); the root-mean-square sound pressure level that contains 90 percent of the acoustic energy (SPL_{rms}); the single strike sound exposure level (SEL_{ss}); the integration time for SPL_{rms}; the spectrum; and the 24-hour cumulative SEL extrapolated from measurements at all hydrophones. The final report must also include at least the maximum, mean, minimum, median (L_{50}) and L_5 (95 percent exceedance) statistics for each metric; the SEL and SPL power spectral density and/or one-third octave band levels (usually calculated as decidecade band levels) at the receiver locations should be reported; the sound levels reported must be in median, arithmetic mean, and L5 (95 percent exceedance) (i.e., average in linear space), and in dB; range of transmission loss coefficients; the local environmental conditions, such as wind speed, transmission loss data collected on-site (or the sound velocity profile); baseline pre- and post-activity ambient sound levels (broadband and/or within frequencies of concern); a description of depth and sediment type, as documented in the Construction and Operation Plan (COP), at the recording and foundation installation locations; the extents of the measured Level A harassment and Level B harassment zone(s); hammer energies required for pile installation and the number of strikes per pile; the hydrophone equipment and methods (*i.e.*, recording device, bandwidth/sampling rate; distance from the pile where recordings were made; the

depth of recording device(s)); a description of the SFV measurement hardware and software, including software version used, calibration data, bandwidth capability and sensitivity of hydrophone(s), any filters used in hardware or software, any limitations with the equipment, and other relevant information; the spatial configuration of the noise attenuation device(s) relative to the pile; a description of the noise abatement system and operational parameters (*e.g.*, bubble flow rate, distance deployed from the pile, *etc*.), and any action taken to adjust the noise abatement system. A discussion which includes any observations which are suspected to have a significant impact on the results including but not limited to: observed noise mitigation system issues, obstructions along the measurement transect, and technical issues with hydrophones or recording devices, must also be included in the final SFV report;

(12) If at any time during the project Empire Wind becomes aware of any issue or issues which may (to any reasonable subject-matter expert, including the persons performing the measurements and analysis) call into question the validity of any measured Level A harassment or Level B harassment isopleths to a significant degree, which were previously transmitted or communicated to NMFS Office of Protected Resources, Empire Wind must inform NMFS Office of Protected Resources within 1 business day of becoming aware of this issue or before the next pile is driven, whichever comes first;

(13) If a North Atlantic right whale is acoustically detected at any time by a project-related PAM system, Empire Wind must ensure the detection is reported as soon as possible to NMFS, but no longer than 24 hours after the detection via the *24-hour North Atlantic right whale Detection Template* (*https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-templates*). Calling the hotline is not necessary when reporting PAM detections via the template;

(14) Full detection data, metadata, and location of recorders (or GPS tracks, if applicable) from all real-time hydrophones used for monitoring during construction must be submitted within 90 calendar days following completion of activities requiring PAM for mitigation via the International Organization for Standardization (ISO) standard metadata forms available on the NMFS Passive Acoustic Reporting System website *(https://www.fisheries.noaa.gov/resource/document/passive-acoustic-reporting-system-templates*). Submit the completed data templates to *nmfs.nec.pacmdata@noaa.gov*. The full acoustic recordings from real-time systems must also be sent to the National Centers for Environmental Information (NCEI) for archiving within 90 days following completion of activities requiring PAM for mitigation. Submission details can be found at: *https://www.ncei.noaa.gov/products/passive-acoustic-data;*

(15) Empire Wind must submit situational reports if the following circumstances occur, including all instances wherein an exemption is taken must be reported to NMFS Office of Protected Resources within 24 hours, in specific circumstances, including but not limited to the following:

(i) If a North Atlantic right whale is observed at any time by PSOs or project personnel, Empire Wind must ensure the sighting is immediately (if not feasible, as soon as possible and no longer than 24 hours after the sighting) reported to NMFS, the U.S. Coast Guard, and the Right Whale Sightings Advisory System (RWSAS). If in the Northeast Region (Maine to Virginia/North Carolina border) call (866-755-6622). If in the Southeast Region (North Carolina to Florida) call (877-WHALE-HELP or 877-942-5343). If circumstances arise where calling NMFS is not possible, reports must be made to the U.S. Coast Guard via channel 16 or through the WhaleAlert app (*http://www.whalealert.org/*). The sighting report must include the time, date, and location of the sighting, number of whales, animal description/certainty of sighting (provide photos/video if taken), Lease Area/project name, PSO/personnel name, PSO provider company (if applicable), and reporter's contact information;

(ii) If a North Atlantic right whale is observed at any time by PSOs or project personnel, Empire Wind must submit a summary report to NMFS Greater Atlantic Regional Fisheries (GARFO; *nmfs.gar.incidental-take@noaa.gov*), NMFS Office of Protected Resources, and NMFS Northeast Fisheries Science Center (NEFSC; *ne.rw.survey@noaa.gov*) within 24 hours with the above information and the vessel/platform from which the sighting was made, activity the vessel/platform was engaged in at time of sighting, project construction and/or survey activity at the time of the sighting (*e.g.*, pile driving, cable installation, HRG survey), distance from vessel/platform to sighting at time of detection, and any mitigation actions taken in response to the sighting;

(iii) If a large whale other than a North Atlantic right whale is observed at any time by PSOs or project personnel, Empire Wind must report the sighting to the WhaleAlert app (*http://www.whalealert.org/*) as soon as possible but no later than 48 hours;

(iv) In the event that personnel involved in the Project discover a stranded, entangled, injured, or dead marine mammal, Empire Wind must immediately report the observation to NMFS. If in the Greater Atlantic Region (Maine to Virginia) call the NMFS Greater Atlantic Stranding Hotline (866-755-6622); if in the Southeast Region (North Carolina to Florida), call the NMFS Southeast Stranding Hotline (877-942-5343). Separately, Empire Wind must report the incident to NMFS Office of Protected Resources (*PR.ITP.MonitoringReports@noaa.gov)*; if in the Greater Atlantic region (Maine to Virginia), to NMFS Greater Atlantic Regional Fisheries Office (GARFO; *nmfs.gar.incidental-take@noaa.gov*, *nmfs.gar.stranding@noaa.gov*); if in the Southeast region (North Carolina to Florida), to NMFS Southeast Regional Office (SERO; *secmammalreports@noaa.gov*); and to the U.S. Coast Guard, as soon as feasible but within 24-hours. The report (via phone or email) must include contact (name, phone number, *etc.*), the time, date, and location of the first

discovery (and updated location information if known and applicable); species identification (if known) or description of the animal(s) involved; condition of the animal(s) (including carcass condition if the animal is dead); observed behaviors of the animal(s), if alive; if available, photographs or video footage of the animal(s); and general circumstances under which the animal was discovered; and

(v) In the event of a vessel strike of a marine mammal by any vessel associated with the Project or if project activities cause a non-auditory injury or death of a marine mammal, Empire Wind must immediately report the incident to NMFS. If in the Greater Atlantic Region (Maine to Virginia) call the NMFS Greater Atlantic Stranding Hotline (866-755-6622) and if in the Southeast Region (North Carolina to Florida) call the NMFS Southeast Stranding Hotline (877-942-5343). Separately, Empire Wind must immediately report the incident to NMFS Office of Protected Resources (*PR.ITP.MonitoringReports@noaa.gov)* and, if in the Greater Atlantic region (Maine to Virginia), NMFS GARFO (*nmfs.gar.incidental-take@noaa.gov, nmfs.gar.stranding@noaa.gov*) or, if in the Southeast region (North Carolina to Florida), NMFS SERO (*secmammalreports@noaa.gov*). The report must include the time, date, and location of the incident; species identification (if known) or description of the animal(s) involved; vessel size and motor configuration (inboard, outboard, jet propulsion); vessel's speed leading up to and during the incident; vessel's course/heading and what operations were being conducted (if applicable); status of all sound sources in use; description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike; environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike; estimated size and length of animal that was struck; description of the behavior of the marine mammal immediately preceding and following the strike; if available, description of the presence and behavior of any other marine mammals immediately preceding the strike; estimated fate of the animal (*e.g.*, dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and to the extent practicable, photographs or video footage of the animal(s). Empire Wind must immediately cease all on-water activities until the NMFS Office of Protected Resources is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the LOA. NMFS Office of Protected Resources may impose additional measures to minimize the likelihood of further prohibited take and ensure MMPA compliance. Empire Wind may not resume their activities until notified by NMFS Office of Protected Resources; and

(16) Empire Wind must report any lost gear associated with the fishery surveys to the NOAA Greater Atlantic Regional Fisheries Office Protected Resources Division

(*nmfs.gar.incidentaltake@noaa.gov*) as soon as possible or within 24 hours of the documented time of missing or lost gear. This report must include information on any markings on the gear and any efforts undertaken or planned to recover the gear.

5. Modifications to Letter of Authorization:

(a) This LOA may be modified, upon request by Empire Wind, provided that:

(1) NMFS Office of Protected Resources determines that the specified activities, mitigation, monitoring, and reporting measures, as well as the anticipated impacts, required by the previous LOA under this subpart were implemented successfully. This excludes changes made pursuant to the adaptive management provision found in Section 5(c).

(b) Any LOA modification request by Empire Wind that includes changes to the activity or the mitigation, monitoring, or reporting measures (excluding changes made pursuant to the adaptive management provision found in Section 5(c)), may be approved, provided that:

(1) NMFS Office of Protected Resources determines that the changes to the activity or the mitigation, monitoring, or reporting do not change the findings made for the regulations in this subpart and do not result in an increase in the maximum annual or five-year total estimated number of takes for any species; and

(2) NMFS Office of Protected Resources may, if appropriate, publish a notice of proposed LOA in the *Federal Register*, including the associated analysis of the change, and solicit public comment before issuing the LOA.

(c) *Adaptive Management*: After consulting with Empire Wind regarding the practicability of the modifications, NMFS Office of Protected Resources may modify (including delete, modify, or add to) the existing mitigation, monitoring, or reporting measures, if doing so creates a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring. These could include:

(1) Possible sources of data that could contribute to the decision to modify the mitigation, monitoring, or reporting measures in an LOA include, but are not limited to:

(i) Results from Empire Wind's monitoring(s);

(ii) Results from other marine mammals and/or sound research or studies; and/or

(iii) Any information that reveals marine mammals may have been taken in a manner, extent, or number not authorized by the regulations in this subpart or subsequent LOA.

(2) If the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS Office of Protected Resources shall publish a notice of proposed LOA in the Federal Register and solicit public comment.

(3) If the NMFS Office of Protected Resources determines that an emergency exists that poses a significant risk to the well-being of species or stocks of marine mammals, this LOA may be modified without prior notice or opportunity for public comment. Notice would be published in the *Federal Register* within 30 days of the action.

Should you have questions regarding this LOA or the required conditions found herein, please contact NMFS Office of Protected Resources staff, Jaclyn Daly (*jaclyn.daly@noaa.gov*) and Jessica Taylor (*jessica.taylor@noaa.gov*).

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2/20/2024

Kimberly Damon-Randall,
Director, Office of Protected Resources,
National Marine Fisheries Service.

Date

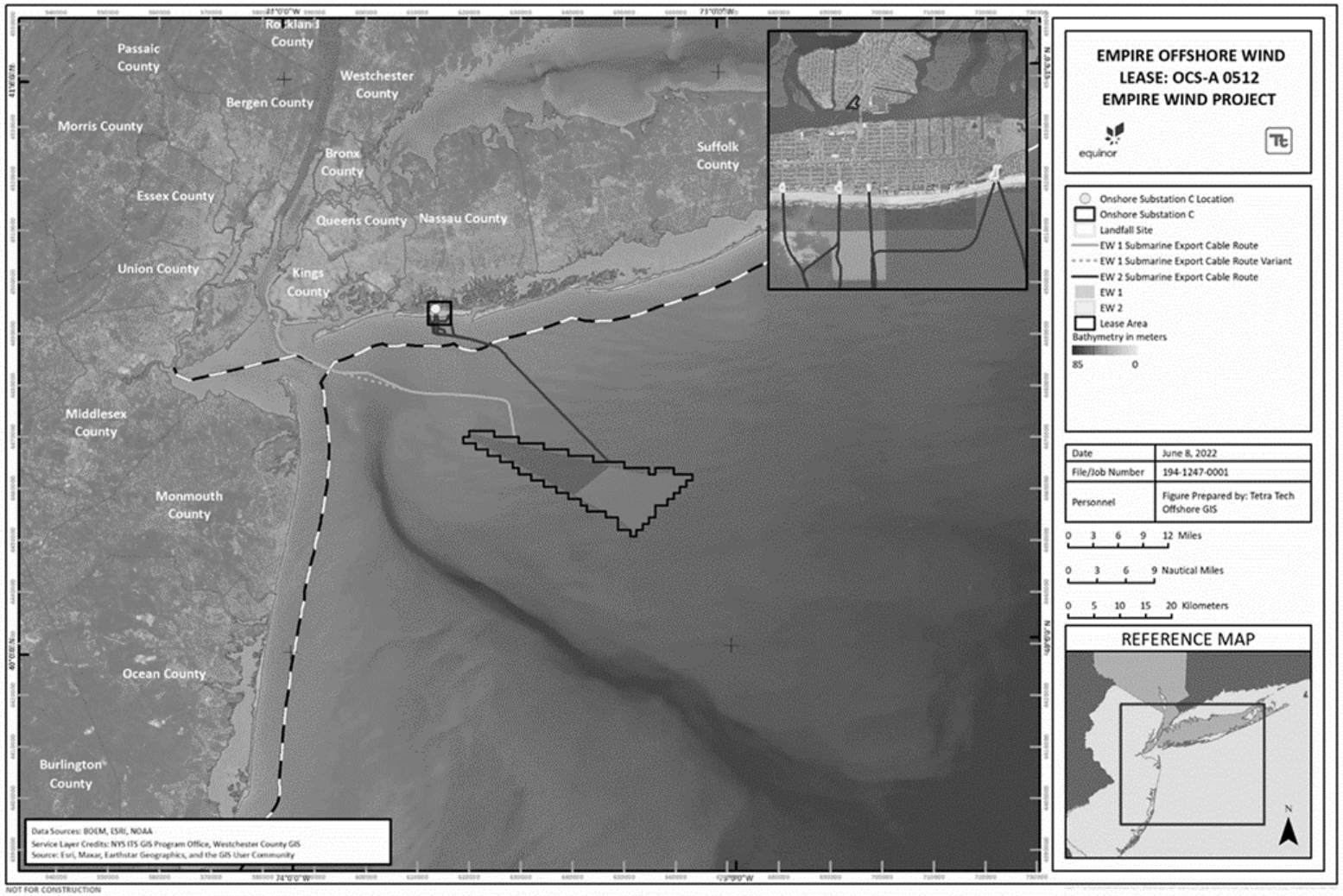

Figure 1 — Project Location

Table 1 – Maximum Annual and 5-year Total Take Authorized For the Empire Wind Project Incidental to All Specified Activities

Common Name	Scientific Name	Stock	Maximum Annual Take		5-year Total Take	
			Level A Harassment	Level B Harassment	Level A Harassment	Level B Harassment
Order Artiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Balaenidae						
North Atlantic right whale*	*Eubalaena glacialis*	Western Atlantic	0	13	0	29
Family Balaenopteridae (rorquals)						
Fin whale*	*Balaenoptera physalus*	Western North Atlantic	4	136	6	201
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine	0	63	0	97
Minke whale	*Balaenoptera acutorostrata*	Canadian Eastern Coastal	4	83	6	167
Sei whale*	*Balaenoptera borealis*	Nova Scotia	0	4	0	9
Family Physeteridae						
Sperm whale*	*Physeter macrocephalus*	North Atlantic	0	3	0	6
Family Delphinidae						
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic	0	90	0	315

Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic	0	747	0	1,840
Bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic - Offshore	0	1,800 (pile driving only)	0	2,565 (pile driving only)
		Northern Migratory Coastal	0	1,185 (pile driving only)	0	1,455 (pile driving only)
		Northern Migratory Coastal and Western North Atlantic - Offshore	0	2,865 (HRG survey)	0	8,730
Common dolphin	*Delphinus delphis*	Western North Atlantic	0	9,870	0	24,030
Pilot whale *spp*. (comprising long-finned and short-finned pilot whale)	*Globicephala melas* and *Globicephala macrorhynchus*	Western North Atlantic	0	417	0	1,009
Risso's dolphin	*Grampus griseus*	Western North Atlantic	0	200	0	700
Family Phocoenidae (porpoises)						
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy	0	243	0	565
Order Carnivora – Superfamily Pinnipedia						
Family Phocidae (earless seals)						
Gray seal	*Halichoerus grypus*	Western North Atlantic	0	501	0	1,496
Harbor seal	*Phoca vitulina*	Western North Atlantic	0	662	0	1,752

Harp seal	*Pagophilus grownlandicus*	Western North Atlantic	0	4	0	20

** Endangered Species Act-listed species*

Table 2 - Minimum Visibility, Clearance, and Shutdown Zones During Impact Pile Driving for Monopiles and Pin Piles

Monitoring Zones	North Atlantic Right Whales	Other Mysticetes/Sperm Whales (m)	Pilot Whales and Delphinids (m)	Harbor Porpoises (m)	Seals (m)
Minimum Visibility Zone[1]	1,500				
Visual Clearance Zone[2]	Any visual distance from foundation PSOs	2,000	200	400	200
PAM Clearance Zone[2]	Any distance within 10km PAM Monitoring Zone	2,000	200	400	200
Visual Shutdown Zone[3]	Any visual distance from foundation PSOs	1,500 (2,000)	200	400	200
PAM Shutdown Zone[3]	Any distance	1,500 (2,000)	200	400	200

PAM Monitoring Zone	10,000 m^4

1 - The minimum visibility zone corresponds to the largest modeled $ER_{95percent}$ distances to the Level A harassment isopleth of all marine mammals when up to two typical piles per day are installed (summer or winter) or one difficult-to-drive pile is installed in summer (when Empire intends to complete all pile driving), rounded up to the closest 0.5 km.

2 - The North Atlantic right whale visual clearance zone is any distance as observed by foundation installation PSOs. The large whale (other than North Atlantic right whale) clearance zone corresponds to the largest modeled exposure range ($ER_{95percent}$) distances to Level A harassment thresholds (SEL and peak) under all scenarios for all whales, rounded up to the nearest 0.5 km. The PAM clearance zone for non-NARWs is in effect if the PAM system can detect these species prior to pile driving; however, it is not required that the PAM system acoustically detect these species if it is not practicable.

3 - The North Atlantic right whale shutdown zone is any distance as observed by foundation installation PSOs. The large whale (other than North Atlantic right whale) shutdown zone of 2,000 m applies during days of installing two difficult-to-drive piles by impact pile driving. For all other scenarios, the 1,500 m shutdown zone is in effect. These zones correspond to the largest Level A harassment distance ($ER_{95percent}$) for all large whales under these scenarios (except fin whales in winter (December) under the 1 difficult-to-drive pile per day scenario). The PAM shutdown zone for non-NARWs is in effect if the PAM system can detect these species during pile driving; however, it is not required that the PAM system acoustically detect these species if it is not practicable.

4- The PAM system must be designed to detect North Atlantic right whales within 10km of the pile being driven. As technology allows, the PAM system should also detect other marine mammals; however, this is not required if not practicable

Table 3– Monopile Level A SEL Exposure Ranges

Species	Pile Type											
	9.6-m Monopile				11-m Monopile in Normal (T1) Soil Conditions				11-m Monopile in Soft (R3) and Softer (U3) Soil Conditions			
	Typical (Difficult to Drive) (km)				Typical (km)				Soft R3 (Softer U3) (km)			
	Summer		Winter		Summer		Winter		Summer		Winter	
	One pile/day	Two piles/day	One pile/day	Two piles/day	One pile/day	Two piles/day	One pile/day	Two piles/day	One pile/day	Two piles/day	One pile/day	Two piles/day
Low-frequency Cetaceans												
Fin Whale	0.86 (1.35)	0.94 (1.84)	0.88 (1.80)	1.01 (1.95)	0.87	0.83	0.87	0.82	0.87 (0.90)	0.43 (0.58)	0.87 (0.89)	0.48 (0.82)

Minke Whale	0.22 (0.89)	0.54 (0.90)	0.26 (0.89)	0.48 (1.05)	0.17	0.35	0.27	0.35	0.16 (0.02)	0.26 (0.16)	0.19 (0.20)	0.28 (0.23)
Humpback Whale	0.24 (0.74)	0.33 (0.69)	0.24 (0.74)	0.36 (0.83)	0.25	0.16	0.25	0.16	0.14 (<0.01)	0.15 (0.11)	0.14 (<0.01)	0.19 (0.11)
North Atlantic Right Whale	0.33 (1.09)	0.47 (1.13)	0.43 (1.13)	0.47 (1.19)	0.2	0.44	0.2	0.44	0.20 (0.37)	0.37 (0.28)	0.20 (0.49)	0.37 (0.32)
Sei Whale	0.43 (1.04)	0.54 (1.21)	0.43 (1.24)	0.58 (1.29)	0.44	0.27	0.44	0.41	0.31 (0.13)	0.27 (0.23)	0.46 (0.13)	0.27 (0.28)
Mid-frequency cetaceans	0 (0)											
High-frequency cetaceans	0 (0)											
Phocids	0 (<0.10)											

Table 4– Pin Pile (2.5 m) Level A SEL Exposure Ranges

Species	OSS 1 Foundation (km)				OSS 2 Foundation (km)			
	Summer		Winter		Summer		Winter	
	Two piles/day	Three piles/day	Two piles/day	Three piles/day	Two piles/day	Three piles/day	Two piles/day	Three piles/day
Low-frequency cetaceans								
Fin Whale	0	0	0	0.18	0	0	0	0
Minke Whale	0	0	0	0	0	0	0	0
Humpback Whale	0	0	0	0	0	0	0	0
North Atlantic Right Whale	0	0	0	0	0	0	0	0
Sei Whale	<0.01	<0.01	0	<0.01	0	0	0	0

Mid-frequency cetaceans	0
High-frequency cetaceans	0
Phocids	0

Table 5– Level B Acoustic Ranges for Monopiles and Pin Piles

Pile Type	Level B Harassment (SPL RMS) (km)	
	Typical (Difficult to Drive)	
	Summer	Winter
9.6-m monopile	3.51 (5.05)	3.77 (5.49)
11-m monopile	3.64	3.92
2.5-m pin pile	1.19	1.17

Table 6 – Distances To Thresholds and Mitigation Zones for Sheet Pile Vibratory Driving for Cofferdams

Distances to Thresholds for Empire Wind 1 Cofferdam Installation		
Marine Mammal Species Groups	Level A Harassment (SEL_{cum}) (m)	Level B Harassment (SPL RMS) (m)
Low-frequency cetaceans	122	
Mid-frequency cetaceans	0	

High-frequency cetaceans	44	1,985
Phocid pinnipeds	62	
Distances to Thresholds for Empire Wind 2 Cofferdam Installation		
Marine Mammal Species Groups	Level A Harassment (SEL_{cum}) (m)	Level B Harassment (SPL RMS) (m)
Low-frequency cetaceans	13	1,535
Mid-frequency cetaceans	0	
High-frequency cetaceans	12	
Phocid pinnipeds	11	
Mitigation Zones for Empire Wind 1 and 2		
Marine Mammals	Clearance Zone (m)	Shutdown Zone (m)
North Atlantic right whale, all other mysticetes	1,600	1,600
Delphinids and pilot whales	50	50

Harbor porpoises	100	100
Phocid pinniped (seals)	100	100

Note: SEL_{cum} = cumulative sound exposure level; SPL RMS = sound pressure level root-mean-square.

Table 7 – Distances To Thresholds and Mitigation Zones During Impact/Pneumatic Hammering for Casing Pipes for Goal Posts

Installation and Removal of Temporary Goal Posts						
Distances to Thresholds (m)						
Marine Mammal Species Groups	Level A Harassment (SEL_{cum})			Level B Harassment (SPL RMS)[1]		
	Pile	42” casing pipe	12” steel goal post	Pile	42” casing pipe	12” steel goal post
Low-frequency cetaceans	183	904.5	632.1	160	300	400
Mid-frequency cetaceans	185	32.2	22.5			
High-frequency cetaceans	155	1,077.4	752.9			
Phocid pinnipeds	185	484	338.3			
Mitigation Zones (m)						

Marine Mammal Species Groups	Clearance Zone	Shutdown Zone
North Atlantic right whale, all other mysticetes	1,600	1,600
Delphinids and pilot whales	50	50
Harbor porpoises	100	100
Seals	100	100

Note: SEL_{cum} = cumulative sound exposure level; SPL RMS = sound pressure level root-mean-square.
1- The Level B harassment distances have been rounded up from modeled zones for PSO clarity.

Table 8 – Distances To The Level A Harassment and Level B Harassment Thresholds During Vibratory Driving at Onshore Substation C Location Marina and Mitigation Zones

Distances to Thresholds (m)				
Marine Mammal Species Groups	Level A Harassment (SEL_{cum})		Level B Harassment (SPL RMS)	
	Marine Sheet Pile Installation	Marine Berthing Pile Removal	Marine Sheet Pile Installation	Marine Berthing Pile Removal
Low-frequency cetaceans	43.2	43.5	1,000	1,600
Mid-frequency cetaceans	3.8	3.9		
High-frequency cetaceans	63.8	64.3		

Phocid pinnipeds	26.2	26.5		
Mitigation Zones (m)				
Marine Mammal Species Groups	Clearance Zone		Shutdown Zone	
North Atlantic right whale, all other mysticetes	1,600		1,600	
Delphinids and pilot whales	50		50	
Harbor porpoises	100		100	
Seals	100		100	

Table 9 – Distances To The Level B Harassment Threshold and Mitigation Zones During HRG Surveys

Marine Mammals	High-resolution Geophysical (HRG) Site Characterization and Assessment Surveys		
	Level B Harassment Zone (SPL RMS) (m)	Clearance Zone (m)	Shutdown Zone (m)
	Sub-bottom Profilers		
	CHIRPs		
North Atlantic right whale - visual detection	50.05	500	500

Other ESA-listed marine mammals (fin, sei, sperm whales)		500	100
All other marine mammals species [a]		100	100

Note: SPL RMS = sound pressure level root-mean-square; Compressed High Intensity Radiated Pulse = CHIRP.
a – Exceptions are noted for delphinids from genera Delphinus, Lagenorhynchus, Stenella, Tursiops, and both seal species.

Table 10 – Vessel Separation Distances

Vessel Separation Distances (m)	
North Atlantic right whale	500
Sperm whales and other non-North Atlantic right whale baleen whales	100
Delphinids and pinnipeds	50