

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 217

[Docket No. 240118–0017]

RIN 0648–BL97

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Empire Wind Project, Offshore New York

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule; notification of issuance of letter of authorization.

SUMMARY: In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA), as amended, notification is hereby given that NMFS promulgates regulations to govern the incidental taking of marine mammals incidental to Empire Offshore Wind, LLC (Empire Wind), a 50–50 partnership between Equinor, ASA (Equinor) and BP p.l.c., during the construction of an offshore wind energy project (the Project) in Federal and State waters off of New York, specifically within the Bureau of Ocean Energy Management (BOEM) Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS) Lease Area (OCS–A–512) (referred to as the Lease Area) and along two export cable routes to sea-to-shore transition points (collectively, the Project Area), over the course of 5 years (February 22, 2024, through February 21, 2029). These regulations, which allow for the issuance of a Letter of Authorization (LOA) for the incidental take of marine mammals during specific construction related activities within the Project Area during the effective dates of the regulations, prescribe the permissible methods of taking and other means of effecting the least practicable adverse impact on marine mammal species or stocks and their habitat, as well as requirements pertaining to the monitoring and reporting of such taking. Upon publication of this final rule and within 30 days, NMFS will issue a LOA to Empire Wind for the effective period of the final rule.

DATES: This rulemaking and issued LOA are effective from February 22, 2024, through February 21, 2029.

FOR FURTHER INFORMATION CONTACT: Jessica Taylor, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Availability

A copy of Empire Wind’s application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable>. In case of problems accessing these documents, please call the contact listed above (see **FOR FURTHER INFORMATION CONTACT**).

Purpose and Need for Regulatory Action

This final rule, as promulgated, provides a framework under the authority of the MMPA (16 U.S.C. 1361 *et seq.*) to allow for the authorization of take of marine mammals incidental to construction of the Empire Wind project within the Lease Area and along export cable corridors to landfall locations in New York. To allow this to occur, NMFS received a request from Empire Wind for 5-year regulations and a LOA that would authorize take of individuals of 17 species of marine mammals, comprising 18 stocks (two species by Level A harassment and Level B harassment and 17 species by Level B harassment only) incidental to Empire Wind’s construction activities. No mortality or serious injury was requested, nor is it anticipated or authorized in this final rulemaking. Please see the *Legal Authority for the Final Action* section below for definitions of harassment, serious injury, and incidental take.

Legal Authority for the Final Action

As noted in the Changes from the Proposed to Final Rule section, we have added regulatory definitions for terms used in this final rule. These changes are described, in detail, in the sections below and, otherwise, the description of the legal authority has not changed since the proposed rule.

The MMPA prohibits the “take” of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made, regulations are promulgated (when applicable), and public notice and an opportunity for public comment are provided.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to as “mitigation”); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth.

As noted above, no serious injury or mortality is anticipated or authorized in this final rule. Relevant definitions of MMPA statutory and regulatory terms are included below:

- *Citizen*—individual U.S. citizens or any corporation or similar entity if it is organized under the laws of the United States or any governmental unit defined in 16 U.S.C. 1362(13) (50 CFR 216.103);
- *Take*—to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal (16 U.S.C. 1362);
- *Incidental taking*—an accidental taking. This does not mean that the taking is unexpected, but rather it includes those takings that are infrequent, unavoidable or accidental (see 50 CFR 216.103);
- *Serious Injury*—any injury that will likely result in mortality (50 CFR 216.3);
- *Level A harassment*—any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild (16 U.S.C. 1362; 50 CFR 216.3); and
- *Level B harassment*—any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (16 U.S.C. 1362).

Section 101(a)(5)(A) of the MMPA and the implementing regulations at 50 CFR part 216, subpart I, provide the legal basis for proposing and, if appropriate, issuing this rule containing 5-year regulations and associated LOA. This final rule also establishes required mitigation, monitoring, and reporting requirements for Empire Wind’s construction activities.

Summary of Major Provisions Within the Final Rule

The major provisions within this final rule include:

- The authorized take of marine mammals by Level A harassment and/or Level B harassment;
 - No mortality or serious injury of any marine mammal is authorized;
 - The establishment of a seasonal moratorium on impact pile driving foundation piles during the months of the highest presence of North Atlantic right whales (*Eubalaena glacialis*) in the Project Area (January 1 to April 30 annually);
 - A requirement for both visual and passive acoustic monitoring (PAM) to occur by trained, NOAA Fisheries-approved Protected Species Observers (PSOs) and PAM (where required) operators before, during, and after select activities;
 - The establishment of clearance and shutdown zones for all in-water construction activities to prevent or reduce the risk of Level A harassment and to minimize the risk of Level B harassment;
 - A requirement to use sound attenuation device(s) during all impact pile driving installation activities to reduce noise levels;
 - A delay to the start of foundation installation if a North Atlantic right whale is observed at any distance by PSOs or acoustically detected;
 - A delay to the start of foundation installation if other marine mammals are observed entering or within their respective clearance zones;
 - A requirement to shut down pile driving (if feasible) if a North Atlantic right whale is observed or if other marine mammals are observed entering their respective shutdown zones;
 - A requirement to implement sound field verification (SFV) requirements during impact pile driving of foundation piles to measure in situ noise levels for comparison against the modeled results;
 - A requirement to implement soft starts during impact pile driving using the least hammer energy necessary for installation;
 - A requirement to implement ramp-up during the use of high-resolution geophysical (HRG) marine site characterization survey equipment;
 - A requirement for PSOs to continue to monitor for 30 minutes after any impact pile driving for foundation installation;
 - A requirement for the increased awareness of North Atlantic right whale presence through monitoring of the appropriate networks and Channel 16, as well as reporting any sightings to the sighting network;

- A requirement to implement various vessel strike avoidance measures;
- A requirement to implement measures during fisheries monitoring surveys, such as removing gear from the water if marine mammals are considered at-risk or are interacting with gear; and
- A requirement for frequently scheduled and situational reporting including, but not limited to, information regarding activities occurring, marine mammal observations and acoustic detections, and SFV monitoring results.

Under section 105(a)(1) of the MMPA, failure to comply with these requirements or any other requirements in a regulation or permit implementing the MMPA may result in civil monetary penalties. Pursuant to 50 CFR 216.106, violations may also result in suspension or withdrawal of the LOA for the Project. Knowing violations may result in criminal penalties, under section 105(b) of the MMPA.

Fixing America's Surface Transportation Act (FAST-41)

This project is covered under title 41 of the Fixing America's Surface Transportation Act, or "FAST-41." FAST-41 includes a suite of provisions designed to expedite the environmental review for covered infrastructure projects, including enhanced interagency coordination as well as milestone tracking on the public-facing Permitting Dashboard. FAST-41 also places a 2-year limitations period on any judicial claim that challenges the validity of a Federal agency decision to issue or deny an authorization for a FAST-41 covered project (42 U.S.C. 4370m-6(a)(1)(A)).

The Project is listed on the Permitting Dashboard, where milestones and schedules related to the environmental review and permitting for the Project can be found at <https://www.permits.performance.gov/permitting-project/fast-41-covered-projects/empire-wind-energy-project>.

Summary of Request

On December 7, 2021, Empire Wind submitted a request for the promulgation of regulations and issuance of an associated 5-year LOA to take marine mammals incidental to construction activities associated with implementation of the Project (offshore of New York in BOEM Lease Area OCS-A-0512. The request was for the incidental, but not intentional, taking of a small number of 17 marine mammal species (comprising 18 stocks). Neither Empire Wind nor NMFS expects any

serious injury or mortality to result from the specified activities, nor has NMFS authorized any.

In response to our questions and comments, and following extensive information exchange between Empire Wind and NMFS, Empire Wind submitted a final, revised application on August 8, 2022. NMFS deemed it adequate and complete on August 11, 2022. This final application is available on NMFS' website at <https://www.fisheries.noaa.gov/protected-resource-regulations>.

On September 9, 2022, NMFS published a notice of receipt (NOR) of Empire Wind's adequate and complete application in the **Federal Register** (87 FR 55409), requesting public comments and information on Empire Wind's request during a 30-day public comment period. During the NOR public comment period, NMFS received comment letters from an environmental non-governmental organization (Responsible Offshore Development Alliance) and a corporate entity (Allco Renewable Energy Limited). NMFS has reviewed all submitted material and has taken these into consideration during the drafting of this final rule.

In June 2022, new scientific information was released regarding marine mammal densities (Roberts *et al.*, 2023). In response, Empire submitted a final addendum to the application on January 25, 2023, which included revised marine mammal densities and take estimates based on Roberts *et al.* (2023). The addendum also identified a revision to the density calculation methodology. Both of these revisions were recommended by NMFS. Empire requests the regulations and subsequent LOA be valid for 5 years beginning in the first quarter of 2024 (February 22) through the first quarter of 2029 (February 21). Neither Empire Wind nor NMFS expects serious injury or mortality to result from the specified activities. Empire's complete application and associated addendum are available on NMFS' website at: https://www.fisheries.noaa.gov/action/incidental-take-authorization-empire-offshore-wind-llc-construction-empire-wind-project-ew1?check_logged_in=1.

On April 13, 2023, NMFS published a proposed rule in the **Federal Register** for the Project (88 FR 22696). In the proposed rule, NMFS synthesized all of the information provided by Empire Wind, all best available scientific findings and literature relevant to the proposed project, and outlined, in detail, proposed mitigation, monitoring, and reporting measures designed to effect the least practicable adverse impacts on marine mammal species and

stocks. The public comment period on the proposed rule was open for 30 days on <https://www.regulations.gov> starting on April 13, 2023, and closed after May 13, 2023. Specific details on the public comments received during this 30-day period are described in the Comments and Responses section.

NMFS previously issued three Incidental Harassment Authorizations (IHAs) to Equinor and its predecessors for related work regarding high resolution site characterization surveys (see 83 FR 19532, May 3, 2018; 84 FR 18801, May 2, 2019 (renewal); 85 FR 60424, September 25, 2020). To date, Equinor has complied with all the requirements (*e.g.*, mitigation, monitoring, and reporting) of the previous IHAs and information regarding their monitoring results may be found in the Estimated Take section. These monitoring reports can be found on NMFS' website: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-other-energy-activities-renewable>.

On August 1, 2022, NMFS announced proposed changes to the existing North Atlantic right whale vessel speed regulations (87 FR 46921, August 1, 2022) to further reduce the likelihood of mortalities and serious injuries to endangered right whales from vessel collisions, which are a leading cause of the species' decline and a primary factor in an ongoing Unusual Mortality Event (UME). Should a final vessel speed rule be issued and become effective during the effective period of this incidental take regulation (ITR)—or any other MMPA incidental take authorization (ITA)—the authorization holder will be required to comply with any and all applicable requirements contained within the final rule. Specifically, where measures in any final vessel speed rule are more protective or restrictive than those in this or any other MMPA authorization, authorization holders will be required to comply with the requirements of the rule. Alternatively, where measures in this or any other MMPA authorization are more restrictive or protective than those in any final vessel speed rule, the measures in the MMPA authorization will remain in place. The responsibility to comply with the applicable requirements of any vessel speed rule will become effective immediately upon the effective date of any final vessel speed rule and, when notice is published on the effective date, NMFS

will also notify Empire Wind if the measures in the speed rule were to supersede any of the measures in the MMPA authorization such that they were no longer required.

Description of the Specified Activity

Overview

Empire Wind plans to construct and operate two offshore wind projects within OCS-A 0512: Empire Wind 1 (western portion of Lease Area) and Empire Wind 2 (eastern portion of Lease Area). The two projects combined will produce a total of approximately 2,076 megawatts (MW) of renewable energy to New York. Empire Wind 1 (816 MW) and Empire Wind 2 (1,260 MW) will be electrically isolated and independent of each other and each will be connected to their own points of interconnection via individual submarine export cable routes.

The Project will consist of several different types of permanent offshore infrastructure, including wind turbine generators (WTGs) and associated foundations, offshore substations (OSSs), inter-array cables, submarine export cables and scour protection. Specifically, activities to construct the Project include the installation of up to 147 WTGs and two OSSs by impact pile driving (total of 149 foundations). Additional activities will include cable installation, site preparation activities (*e.g.*, dredging), HRG surveys, installation of cofferdams or casing pipes supported by goal post piles, removal of berthing piles and performing marina bulkhead work; and conducting several types of fishery and ecological monitoring surveys. Multiple vessels will transit within the Project Area and between ports and the wind farm to perform the work and transport crew, supplies, and materials. All offshore cables will connect to onshore export cables, substations, and grid connections on Long Island and Brooklyn, New York. Marine mammals exposed to elevated noise levels during impact and vibratory pile driving or site characterization surveys may be taken by Level A harassment and/or Level B harassment, depending on the specified activity. A detailed description of the construction project is provided in the proposed rule as published in the **Federal Register** (88 FR 22696, April 13, 2023).

Activities Not Considered in Empire Wind's Request for Authorization

During construction, Empire will receive equipment and materials to be staged and loaded onto installation vessels at one or more existing third-party port facilities. Empire has not yet finalized the selection of all facilities, although they will include the South Brooklyn Marine Terminal (SBMT) in Brooklyn, New York. SBMT has been selected as the location for export cable landfall and the onshore substation for Empire Wind 1. Empire also has leased portions of SBMT for Empire Wind 1 and Empire Wind 2 for laydown and staging of wind turbine blades, turbines, and nacelles; foundation transition pieces; or other facility parts during construction of the offshore wind farm.

The final port selection(s) for staging and construction will be determined based upon whether the ports are able to accommodate Empire Wind's schedule, workforce, and equipment needs. Any port improvement construction activities to facilitate laydown and staging would be conducted by a separate entity, would serve the broader offshore wind industry in addition to the Project, and are not addressed further.

Empire Wind is not planning on detonating any unexploded ordnance (UXO) or munitions and explosives of concern (MEC) during the effective period of the rule. Hence, Empire Wind did not analyze or request, and NMFS is not authorizing, take associated with this activity. Other means of removing UXO/MEC may occur (*e.g.*, lift and shift). As UXO/MEC detonation will not occur, it is not discussed further in this analysis.

Dates and Duration

Empire Wind anticipates activities resulting in harassment to marine mammals occurring throughout all 5 years of the final rule (table 1). Offshore Project activities are expected to begin in March 2024, after issuance of the 5-year LOA, and continue through March 2029. Empire Wind anticipates the following construction schedule over the five-year period. Empire Wind has noted that these are the best and conservative estimates for activity durations, but that the schedule may shift due to weather, mechanical, or other related delays. Additional information on dates and activity-specific durations can be found in the proposed rule and are not repeated here.

TABLE 1—ACTIVITY SCHEDULE TO CONSTRUCT AND OPERATE THE PROJECT

Project activity	Expected timing Empire Wind 1	Expected timing Empire Wind 2
Submarine Export Cables	Q3 2024; Q3 2025	Q3–Q4 2025.
OSS Jacket Foundation and Topside	Q2 ¹ –Q4 2025	Q2 ¹ –Q4 2025; Q2 ¹ –Q4 2026. ²
Monopile Foundation Installation	Q2 ¹ –Q4 2025	Q2 ¹ –Q4 2025; Q2 ¹ –Q4 2026.
WTG Installation	Q4 2025–Q2 2026	Q4 2026–Q3 2027.
Interarray Cables	Q2–Q4 2025	Q2–Q3 2026.
HRG Surveys	Q1 2024–Q4 2028	Q1 2024–Q4 2028.
Cable Landfall Construction	Q1–Q4 2024 ³	Q1 2024–Q4 2025. ³
Marina Activities	n/a	Q1–Q4 2024.
Barnum Channel Cable Bridge Construction	n/a	Q4 2024–Q2 2025.

Note: Project activities are anticipated to start no earlier than Q1 2024. Q1 = January through March; Q2 = April through June; Q3 = July through September; Q4 = October through December.

¹ Impact driving of foundation piles is prohibited between January 1 and April 30. During Q2 such activities could not start until May 1.

² Empire Wind 2 OSS jacket installation is planned for 2025, only Empire Wind 2 topside work is planned for 2026.

³ While cable landfall construction could occur at any time during the time period identified would only occur for approximately 30 days.

Specific Geographic Region

A detailed description of the Specific Geographic Region, defined as the Mid-Atlantic Bight, is provided in the proposed rule as published in the **Federal Register** (88 FR 22696, April 13, 2023). Since the proposed rule was published, no changes have been made

to the Specified Geographic Region. Generally, most of Empire Wind’s specified activities (*i.e.*, impact pile driving of WTGs and OSS monopile foundations; vibratory pile driving (installation and removal) of temporary cofferdams and goal posts; vibratory pile and removal of sheet piles and bulkhead

piles; placement of scour protection; trenching, laying, and burial activities associated with the installation of the export cable route and inter-array cables; HRG site characterization surveys; and WTG operation) are concentrated in the Lease Area and cable corridor.

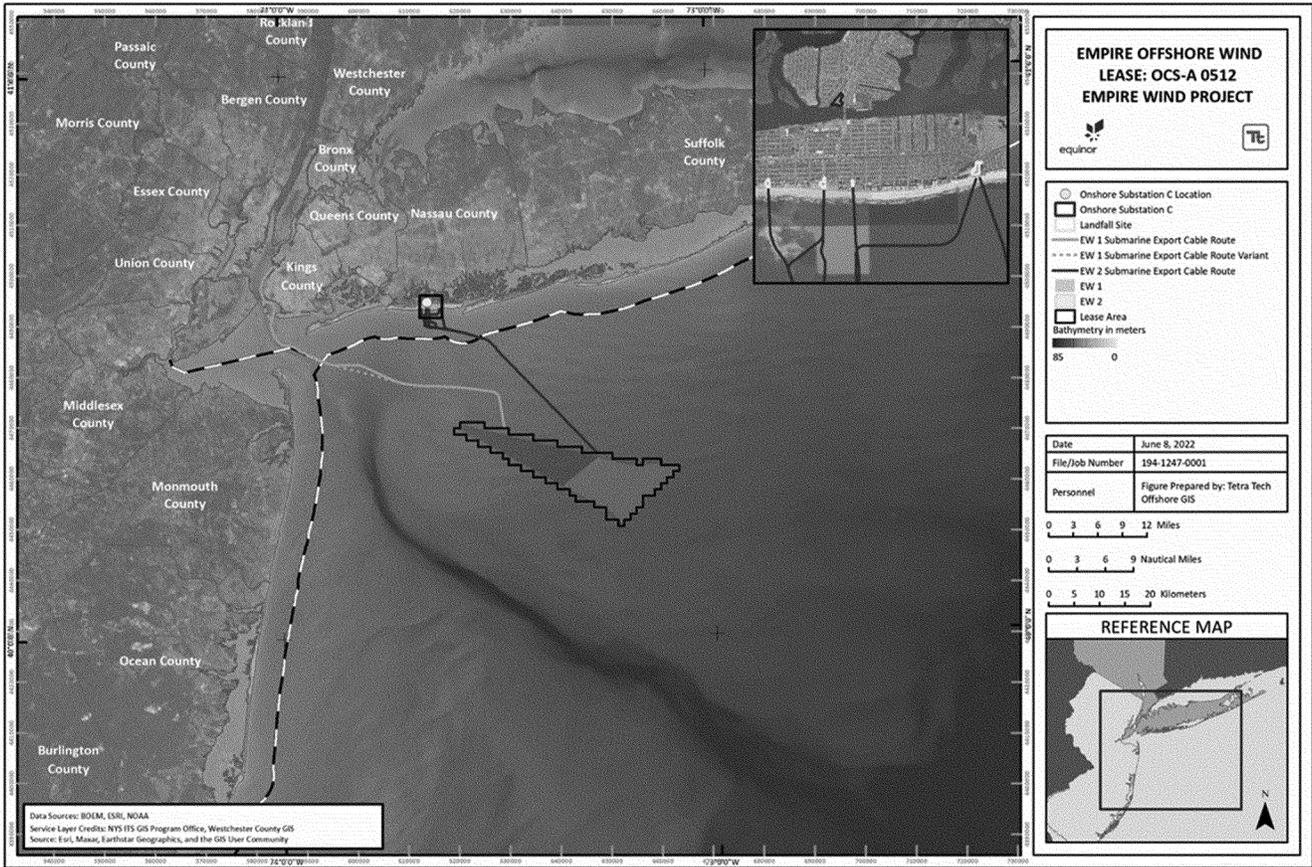


Figure 1 -- Project Area

Comments and Responses

A notice of proposed rulemaking was published in the **Federal Register** on April 13, 2023 (88 FR 22696). The proposed rulemaking described, in detail, Empire Wind's specified activities, the specific geographic region of the specified activities, the marine mammal species that may be affected by these activities, and the anticipated effects on marine mammals. In the proposed rule, we requested that interested persons submit relevant information, suggestions, and comments on Empire Wind's request for the promulgation of regulations and issuance of an associated LOA described therein, our estimated take analyses, the preliminary determinations, and the proposed regulations. The proposed rule was available for a 30-day public comment period.

NMFS received 328 comment submissions, comprising 319 individual comments from private citizens and 8 comment letters from organizations or public groups, including, but not limited to, the Marine Mammal Commission (the Commission), Clean Ocean Action, Oceana, Inc., Responsible Offshore Development Alliance, Friends of Animals, Lido Beach Civic Association, Defend Brigantine Beach, and the Natural Resources Defense Council. Some of the comments received were considered out-of-scope, including, but not limited to: comments related to impacts to the coastal ecosystem and local community; concerns for other species outside of NMFS' jurisdiction (e.g., birds); maintenance of the permanent structures; costs associated with offshore wind development; distance of the Project from shore; and other projects that are not the Project. These are not described herein or discussed further. Moreover, where comments recommended that we include measures that were already contained within the proposed rule, we have not included them here if the final rule carries over the same measure as those comments are considered adequately addressed. In addition, if a comment received was unclear and therefore did not raise a significant point, the comment is not responded to herein.

The comment letters received during the public comment period which contained substantive information were considered by NMFS in its estimated take analysis; required mitigation, monitoring, and reporting measures; final determinations; and final regulations. These comments are described and responded to below. All substantive comments and letters are

available on NMFS' website: <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>. Please review the corresponding public comment link for full details regarding the comments and letters.

Public Comments and Responses

Modeling and Take Estimates

Comment 1: The Commission has stated that, due to uncertainty in how NMFS will be addressing their previously submitted comments for other final offshore wind rulemakings, they are not providing "an exhaustive letter regarding similar issues" for Empire Wind's action. They have stated that, in lieu of this, they incorporate by reference all previously submitted comment letters for past proposed rules (i.e., Sunrise Wind, Revolution Wind, Ocean Wind 1) and that NMFS should specifically review these previously submitted letters (i.e., Sunrise Wind (88 FR 8996, February 10, 2023), Revolution Wind (87 FR 79072, December 23, 2022), and Ocean Wind 1 (87 FR 64868, October 26, 2022) and incorporate, where applicable, relevant information in the context of the Project. They specifically noted that these general concerns could include "underestimated numbers of Level A and B harassment takes (including failing to round up to group size), incomplete SFV measurement requirements, insufficient mitigation and monitoring measures, errors and omissions in the preamble to and the proposed rule, and the general issue of quality control and quality assurance in NMFS's preparation of proposed incidental take authorizations."

Response: NMFS acknowledges the receipt of a comment letter on the proposed Project by the Commission, as well as receipt of comment letters from the Commission for the Sunrise Wind (88 FR 8996, February 10, 2023), Revolution Wind (87 FR 79072, December 23, 2022), and Ocean Wind 1 (87 FR 64868, October 26, 2022) proposed projects. We appreciate that, in the past, the Commission has provided very specific and detailed comments and suggestions on NMFS' actions, as a collaborative effort to improve both the incidental take authorizations (ITAs) themselves as well as the conservation benefits for NMFS' trust species. Because the Commission did not provide specific comments on the proposed rule for the Project, we cannot address any specific concerns. However, we can address general themes of concern raised in previous letters, and, inasmuch as another

specific comment is applicable here, we refer the Commission back to our previous responses.

Overall, the Commission's previous letters raised concerns over acoustic modeling, underestimating take estimates, mitigation and monitoring, and reporting measures. The Commission raised specific concerns over underestimating take requests by Level A harassment associated with impact pile driving (see comment 2), the size of the minimum visibility zone (see comment 15), the number of vessels required to implement mitigation measures (see comment 5), and SFV reporting measures (see comment 18) in its letter and we have addressed these in the relevant responses. With respect to mitigation, monitoring and reporting requirements, we have thoroughly addressed the Commission's previous concerns and have updated final rules, including this one, accordingly. In response to the Commission's comments, NMFS has strengthened requirements for noise attenuation systems, increased the number of PSOs required for monitoring, and added additional reporting requirements for SFV measurements. Lastly, any "omissions" and "general issues of quality control and quality assurance" from one action are less likely to be present in another action as updates are carried through across actions (although NMFS does not agree that every example previously raised by the Commission was, in fact, an error). For all of these reasons, not all of the Commission's specific concerns raised in previous letters apply to this project and we cannot address specific concerns the Commission did not identify in its letter. We have, however, made certain changes based on the Commission's previous comments referenced here. Those changes are identified in the Changes From the Proposed to Final Rule section, and are also described below in this Response to Public Comments section.

As we continue to learn from and refine our MMPA process for offshore wind actions, we look forward to continuing to work cooperatively with the Commission to identify opportunities to further minimize impacts to marine mammals, where practicable.

Comment 2: The Commission indicated that, for past proposed rules, there have been discrepancies with take requests by Level A harassment associated with impact pile driving accounting for documented average group sizes of species, and suggested ensuring that Empire Wind's take requests by Level A harassment are

consistent with documented average group sizes for the Project Area.

Response: While we do not agree with the Commission in all cases regarding their identification of “discrepancies,” in this case, we have agreed that their recommendation is appropriate.

Specifically, in response to the Commission’s comment and Endangered Species Act (ESA) consultation discussion, and based upon recent PSO sighting reports in the Project Area, NMFS has decided to increase take by Level A harassment associated with impact pile driving for fin whales in order to ensure that authorized take is consistent with documented average group size for the Project Area. Take by Level A harassment for year 2 (2025) associated with impact-pile-driving activities will be increased from two fin whales to four fin whales, assuming two groups of two whales each are taken by Level A harassment. In year 3 (2026), take by Level A harassment associated with impact-pile-driving activities will be increased from one fin whale to two fin whales, assuming one group of two whales are taken by Level A harassment. Additional take by Level A harassment is authorized during year 2 due to increased pile-driving activity during that year.

Comment 3: Commenters stated that there is no evidence or research proving that the Project would not cause the mortality or serious injury of marine mammals. The commenters mistakenly categorized Level A harassment and Level B harassment as mortality and serious injury.

Response: Regarding take by serious injury or mortality, the proposed rule stated that no serious injury and/or mortality is expected or proposed for authorization, and the same carries into the final rule for which no take by serious injury or mortality has been authorized (see 50 CFR 217.292(c)).

Regarding the suggestion that there is no evidence proving the take estimates are accurate, the take numbers, as shown in the proposed and final rule, are based on the best available marine mammal density data, published and peer reviewed scientific literature, on-the-water reports from other nearby projects or past MMPA actions, and highly complex statistical models of which real-world assumptions and inputs have been incorporated to estimate take on a project-by-project basis. In the Estimated Take section, NMFS has provided a detailed rationale for why the amount and manner of take described in this final rule is reasonable and based on the best available science. The commenters did not provide any

information to support the claim that take estimates are not representative of the take that may occur incidental to the Project. NMFS disagrees with the commenter and expects that the take numbers authorized for this action are sufficient given the activity proposed and planned by Empire Wind.

Mitigation

Comment 4: Commenters recommended that NMFS increase the size of the clearance and shutdown zones for site assessment surveys to 500 meters (m) for all large whales and 1,000 m for North Atlantic right whales and require a 1,000-m acoustic clearance zone (*i.e.*, necessitating the use of PAM for HRG surveys); and require that any unidentified large whale within 1,000 m of the vessel be considered a North Atlantic right whale.

Response: NMFS disagrees with several of the suggestions provided by the commenters. As described in the proposed rule and this final rule, the required 500-m shutdown zone for North Atlantic right whales exceeds the modeled distance to the largest 160-dB Level B harassment isopleth (50.05 m during Compressed High Intensity Radiated Pulse (CHIRP) use) by a large margin, minimizing the likelihood that they will be harassed in any manner by this activity. For other ESA-listed species (*e.g.*, fin and sei whales), NMFS Greater Atlantic Regional Fisheries Office’s (GARFO’s) 2021 Offshore Wind Site Assessment Survey Programmatic ESA consultation (<https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-take-reporting-programmatics-greater-atlantic>) determined that a 100-m shutdown zone is sufficient to minimize exposure to noise that could be disturbing. Accordingly, NMFS has adopted this shutdown zone size for all baleen whale species other than the North Atlantic right whale. Commenters do not provide scientific information for NMFS to consider to support their recommendation to expand the shutdown zone. Given that these surveys are relatively low impact and NMFS has prescribed a precautionary North Atlantic right whale shutdown zone that is larger (500 m) than the largest estimated harassment zone (50.05 m), NMFS has determined that an increase in the size of the shutdown zone during HRG surveys is not warranted.

Regarding the use of acoustic monitoring to implement the shutdown zones, NMFS does not consider acoustic monitoring an effective tool for use with HRG surveys for the reasons discussed below and therefore, has not required it

in this final rule. As described in the Mitigation section, NMFS has determined that the prescribed mitigation requirements are sufficient to effect the least practicable adverse impact on all affected species or stocks.

The commenters do not provide additional scientific information for NMFS to consider to support their recommendation to require PAM during site assessment surveys. NMFS disagrees that this measure is warranted because it is not expected to be effective for use in detecting the species of concern. It is generally accepted that, even in the absence of additional acoustic sources, using a towed passive acoustic sensor to detect baleen whales (including North Atlantic right whales) is not typically effective because the noise from the vessel, the flow noise, and the cable noise are in the same frequency band and will mask the vast majority of baleen whale calls. Vessels produce low-frequency noise, primarily through propeller cavitation, with main energy in the 5–300 hertz (Hz) frequency range. Source levels range from about 140 to 195 decibels (dB) referenced to 1 (re 1) μ Pa (micropascal) at 1 m (National Research Council (NRC), 2003; Hildebrand, 2009), depending on factors such as ship type, load, and speed, and ship hull and propeller design. Studies of vessel noise show that it appears to increase background noise levels in the 71–224 Hz range by 10–13 dB (Hatch *et al.*, 2012; McKenna *et al.*, 2012; Rolland *et al.*, 2012). PAM systems employ hydrophones towed in streamer cables approximately 500 m behind a vessel. Noise from water flow around the cables and from strumming of the cables themselves is also low frequency and typically masks signals in the same range. Experienced PAM operators (Thode *et al.*, 2017) emphasized that a PAM operation could easily report no acoustic encounters, depending on species present, simply because background noise levels rendered any acoustic detection impossible. The same report stated that a typical eight-element array towed 500 m behind a vessel could be expected to detect delphinids, sperm whales, and beaked whales at the required range, but not baleen whales, due to expected background noise levels (*e.g.*, seismic noise, vessel noise, and flow noise).

Further, there are several additional reasons why we disagree that use of PAM is warranted for HRG surveys, specifically. While NMFS agrees that PAM can be an important tool for augmenting detection capabilities in certain circumstances (*e.g.*, foundation installation), its utility in further

reducing impacts during HRG survey activities is limited. First, for this activity, the area expected to be ensounded above the Level B harassment threshold is relatively small (a maximum of 50.05 m); this reflects the fact that the source level is comparatively low and the intensity of any resulting impacts would be lower level. Further, it means that inasmuch as PAM will only detect a portion of any animals exposed within a zone, the overall probability of PAM detecting an animal in the harassment zone is low. Together, these factors support the limited value of PAM for use in reducing take for activities/sources with smaller zones. Also, PAM is only capable of detecting animals that are actively vocalizing, while many marine mammal species vocalize infrequently or during certain activities, which means that only a subset of the animals within the range of the PAM would be detected (and potentially have reduced impacts). Additionally, localization and range detection can be challenging under certain scenarios. For example, odontocetes are fast moving and often travel in large or dispersed groups which makes localization difficult.

Given that the effects to marine mammals from the types of HRG surveys authorized in this final rulemaking are expected to be limited to low level behavioral harassment even in the absence of mitigation, the limited additional benefit anticipated by adding this detection method (especially for North Atlantic right whales and other low frequency cetaceans, species for which PAM has limited efficacy during this activity), and the cost and impracticability of implementing a full-time PAM program, we have determined the current requirements for visual monitoring are sufficient to ensure the least practicable adverse impact on the affected species or stocks and their habitat during HRG surveys.

Comment 5: The Commission noted that the proposed rule does not require a second vessel to implement the various mitigation measures and that PSOs would only be required on the pile driving vessel. The Commission further noted that these measures are not consistent with other offshore wind rules.

Response: In response to the Commission's comment and the ESA consultation discussion, Empire Wind may propose an alternative monitoring technology that has been demonstrated to have a greater visual monitoring capability compared to 3 PSOs on a dedicated PSO vessel in place of a requirement to have a second dedicated PSO vessel during impact pile driving

activities to implement mitigation measures. The proposed alternative monitoring technology must be approved by NMFS. A minimum of three PSOs on duty at any given time will be required to conduct monitoring from each vessel. These requirements are included in the final rule and described in further detail in § 217.285(b)(4).

Comment 6: Commenters recommended that NMFS require clearance and shutdown zones for North Atlantic right whales specifically, including: (1) a minimum of 5,000 m for the visual clearance, acoustic clearance, and shutdown zones in all directions from the driven pile location; and (2) an acoustic shutdown zone that would extend at least 2,000 m in all directions from the driven pile location.

Commenters also recommended that NMFS require pile-driving clearance and shutdown zones for large whales (other than North Atlantic right whale) that are large enough to avoid all take by Level A harassment and minimize Level B harassment to the most practicable extent.

Response: NMFS agrees with this comment and is now requiring both clearance and shutdown zones for North Atlantic right whales that are activated at any distance of detection.

The commenters do not provide additional scientific information for NMFS to consider to support their recommendation to expand clearance and shutdown zones to effect the least practicable adverse impact on marine mammals, particularly large whales, excluding the North Atlantic right whale. The required shutdown and clearance zones (equally sized) for large whales (other than North Atlantic right whale) are based on the largest exposure range calculated for any mysticete, other than humpback whales, that represents the distance to the Level A harassment cumulative sound exposure level (SEL_{cum}) isopleth for the low frequency hearing group, rounded up to the nearest hundred for PSO clarity. Required monitoring and mitigation for these zones will minimize Level A harassment and Level B harassment to the extent practicable and avoid most Level A harassment of large whales (all species of large whales have six or fewer takes by Level A harassment across all 5 years of the rule). Further enlargement of these zones could interrupt and delay the Project such that a substantially higher number of days would be needed to complete the construction activities, which would incur additional costs, but importantly, also potentially increase the number of days that marine mammals are exposed to the

disturbance. Accordingly, NMFS has determined that enlargement of these zones is not warranted, and that the existing required clearance and shutdown zones support a suite of measures that will effect the least practicable adverse impact on other large whales.

Comment 7: Commenters noted that the final rule should clarify that if weather or other conditions limit the range of observation, then shutdown zones will be initiated. Commenters also questioned the feasibility of the shutdown mitigation requirements in real-world conditions and what would occur if the authorized take levels were exceeded. In addition, commenters state concerns on the required mitigation measures, assessing the effectiveness of the mitigation measures, and reporting the use of the mitigation measures in real-time.

Response: NMFS disagrees that additional clarification should be added to describe the initiation of shutdown zones if weather conditions limit the range of observation. With respect to weather and other conditions that could impede observations, NMFS has clearly explained and established in the proposed and final rule a minimum visibility zone that must be visually clear of marine mammals before and during pile driving. If this area cannot be visually monitored, pile driving must not be initiated or must cease. In addition to visual monitoring, Empire Wind is required to conduct PAM which is not influenced by poor visibility conditions.

In regard to a scenario where Empire Wind exceeds their authorized take levels, any further take would be unauthorized and, therefore, prohibited under the MMPA. All mitigation measures stated in this notice and in the issued LOA are considered feasible. NMFS works with each ITA applicant, including Empire Wind, to ensure that project-specific mitigation measures are possible in real-world conditions. This includes shutdown zones when there is reduced visibility. As stated in the rule condition § 217.285(b)(5), Empire Wind must ensure certain equipment is provided to PSOs, such as thermal (*i.e.*, infrared) cameras, to allow PSOs to adequately complete their duties, including in reduced-visibility conditions. NMFS does not agree that additional wording is necessary within the rule to further describe the requirement and implementation of shutdown zones. Further, pursuant to the adaptive management provisions in the rule, NMFS may modify the required mitigation or monitoring measures, if doing so creates a

reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring. NMFS disagrees that the rule's mitigation measures are insufficient.

NMFS reviews required reporting (see Monitoring and Reporting) and uses the information to evaluate the mitigation measure effectiveness. Additionally, the mitigation measures included in Empire Wind's rule are not unique, and data from prior rules support the effectiveness of these mitigation measures. NMFS finds the level of reporting currently required is sufficient for managing the issued rule and monitoring the affected stocks of marine mammals.

Comment 8: A commenter suggested that PSOs complement their survey efforts using additional technologies, such as infrared detection devices, when in low-light conditions.

Response: NMFS agrees with the commenter regarding this suggestion and a requirement to utilize a thermal (infrared) device during low-light conditions was included in the proposed rule. That requirement is included as a requirement of the final rule.

Comment 9: A commenter suggested that NMFS require: (1) at least 15 dB of sound attenuation from pile driving, with a minimum of 10 dB to be required; (2) field measurements be conducted on the first pile installed and the data must be collected from a random sample of piles through the construction period, although the commenter specifically notes that they do not support field testing of unmitigated piles; and (3) that all sound source validation reports of field measurements be evaluated by both NMFS and BOEM prior to additional piles being installed and that these reports be made publicly available. Another commenter has suggested that NMFS strengthen its requirement to maximize the level of noise reduction possible for the Project, utilizing 10 dB as the minimum only, but meeting upwards of 20 dB of noise reduction. To support their assertion, they cited datasets by Bellmann *et al.* (2020, 2022). They also recommended that NMFS require the "best commercially available combined [noise attenuation system] technology" to achieve noise reduction and attenuation.

A commenter also suggested that NMFS require Empire Wind to use HRG acoustic sources at the lowest practicable source levels needed to meet the objectives of the site characterization surveys.

Response: NMFS agrees that previous measurements indicate that the

deployment of double big bubble curtains should result in noise reductions beyond the assumed 10 dB. As described in both the proposed and final rule, NMFS has included requirements for sound attenuation methods that successfully (evidenced by required sound field verification measurements) reduce real-world noise levels produced by impact pile driving of foundation installation to, at a minimum, the levels modeled assuming 10-dB reduction, as analyzed in this rulemaking. While NMFS is requiring that Empire Wind reduce sound levels to at or below the model outputs analyzed (assuming a reduction of 10 dB), we are not requiring greater reduction as it is currently unclear (based on measurements to date) whether greater reductions are consistently practicable for these activities, even if multiple noise attenuation systems (NASs) are used.

In response to the recommendation by the commenters for NMFS to confirm that a 10-dB reduction is achieved, NMFS clarifies that, because no unattenuated piles would be driven, there is no way to confirm a 10-dB reduction; rather, *in-situ* SFV measurements will be required to confirm that sound levels are at or below those modeled assuming a 10-dB reduction.

However, when SFV measurements are conducted during construction, several factors come into play in determining how well modeled levels/isopleths correspond to those measured in the field, such as the level at the source, how well the noise travels in the environment, and the effectiveness of the deployed NAS across a broad range of frequencies. For these reasons, NMFS believes assuming only a 10-dB noise reduction is conservative. Furthermore, if SFV measurements consistently demonstrate that more than a 10-dB reduction is achievable, adjustments in monitoring and mitigation can be made by NMFS, upon request by Empire Wind. We reiterate that there is no requirement to achieve 10-dB attenuation as no unattenuated piles would be driven (in order to minimize impacts and noting as supported by one of the commenters here and on past similar actions); therefore, it is not possible to collect the data necessary to enforce this requirement. However, we are requiring the developer to meet the noise levels modeled, assuming 10-dB attenuation. NMFS is also actively engaged with other agencies and offshore wind developers on furthering quieting technologies.

It is important to note that the assumed 10-dB reduction is not a limit,

but rather a conservative estimate of the likely achievable noise reduction, which along with all other modeling assumptions, allows for estimation of marine mammal impacts and informs monitoring and mitigation. However, we have incorporated requirements to add or modify NAS in the event that noise levels exceed those modeled. NMFS is required to authorize the requested incidental take if it finds such incidental take of small numbers of marine mammals by the requestor while engaging in the specified activities within the specified geographic region will have a negligible impact on such species or stock and, where applicable, will not have an unmitigable adverse impact on the availability of such species or stock for subsistence uses.

NMFS notes that Empire Wind must conduct SFV on 3 monopiles and on all OSS foundations (24 pin piles total) and, at this time, NMFS does not support unmitigated field testing for pile installation. If SFV 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 of attenuation), Empire Wind may request a modification of the clearance and shutdown zones for foundation pile driving of monopiles. If requested and upon receipt of an interim SFV report, NMFS may adjust zones (*i.e.*, Level A harassment, Level B harassment, clearance, shutdown, and/or minimum visibility zone) to reflect SFV measurements.

In addition to the SFV requirements in the proposed rule, we added to this final rule the requirement that Empire Wind must conduct abbreviated SFV monitoring (consisting of a single acoustic recorder placed at an appropriate distance from the pile) on all foundation installations for which the complete SFV monitoring, as required in the proposed rule, is not carried out to be consistent with the Biological Opinion. NMFS is requiring that these SFV results must be included in the weekly reports. Any indications that distances to the identified Level A harassment and Level B harassment thresholds for whales 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.

As part of the updates to the final rule, in response to these comments regarding sufficient NAS, NMFS will also require maintenance checks and testing of NAS systems before each use to ensure the NAS is usable and the

system is able to achieve the modeled reduction, this information would be required to be reported to NMFS within 72 hours of an installation and before the next installation occurs.

NMFS agrees that the final SFV reports that have undergone quality assurance/quality control by the agencies and include all of the required information to support full understanding of the results will be made publicly available. NMFS will make all final reports available on our website. NMFS agrees with the recommendation that Empire Wind should utilize its HRG acoustic sources at the lowest practicable source level to meet the survey objective, and has incorporated this requirement into the final rule.

Comment 11: To minimize the risk of vessel strikes for all whales, and especially in recognition of the imperiled state of North Atlantic right whales, commenters do not believe that mitigation measures to reduce the risk of vessel strike are strong enough and have instead suggested that NMFS require a mandatory 10-knot (kn) (5.14 m/s) speed restriction for all project vessels (including PSO survey vessels) at all times, except for reasons of safety, and in all places except in limited circumstances where the best available scientific information demonstrates that whales do not occur in the area.

Alternatively, commenters suggested that project proponents could work with NMFS to develop an “Adaptive Plan” that modifies vessel speed restrictions if the monitoring methods are proven to be effective when vessels are traveling 10 kn (5.14 m/s) or less. One commenter further suggested that if the Adaptive Plan is scientifically proven to be equally or more effective than a 10-kn speed restriction, that the Adaptive Plan could be used as an alternative to the 10-kn speed restriction.

In a related comment, a commenter encouraged NMFS to proactively work to reduce the risk of vessel strike across maritime industries by conducting research to better understand large whale habitat use in the New York Bight through targeted research studies focusing on habitat use at the surface and at depth in order to inform development of vessel strike reduction measures for large whale species.

Response: NMFS acknowledges that vessel strikes pose a risk to marine wildlife, including North Atlantic right whales, but disagrees with the commenter that the mitigation measures to prevent vessel strike are insufficient. Under the MMPA, NMFS must prescribe regulations setting forth other means of effecting the least practicable

adverse impact of the requestor’s specified activities on species or stocks and its habitat. In both the proposed and final rules, we analyzed the potential for vessel strike resulting from the planned activities. We determined that the risk of vessel strike is low, based on the nature of the activities, including the number of vessels involved in those activities and the relative slower speed of most of those vessels, and the fact that high speed vessels are mostly used for activities (e.g., crew transfer during foundation installation) that occur when large whale presence is lower than during the foundation pile driving seasonal restriction. In addition, vessels associated with the construction activities will add a discountable amount of vessel traffic to the specific geographic region.

To further reduce the already low risk, NMFS has required several mitigation measures specific to vessel strike avoidance. With the implementation of these measures, NMFS has determined that the potential for vessel strike is so low as to be discountable and vessel strike is reasonably considered to be avoidable. Whales and other marine mammal species are present within the Project Area year-round. However, many large whale species (e.g., North Atlantic right whales) are less frequently found within the Project Area during the months when foundation installation, which requires the most use of higher-speed vessels, would occur (i.e., May through November; Roberts *et al.*, 2023). As described in the proposed rule and included in this final rule, NMFS is requiring Empire Wind to reduce speeds to 10 kn (5.14 m/s) or less in circumstances when North Atlantic right whales are known to be present or more likely to be in the area where vessels are transiting, which include, but are not limited to, all Slow Zones (Dynamic Management Area (DMA) or acoustic Slow Zone), when traveling between ports in New Jersey, New York, Maryland, or Virginia from November 1 to April 30, and if a North Atlantic right whale is detected visually or acoustically at any distance or reported within 10 kilometers (km). Vessels are also required to slow and maintain separation distances for all marine mammals. As described in the proposed rule, all vessels must have a dedicated, trained crew member or PSO onboard. Furthermore, vessels towing survey gear travel at very slow speeds (e.g., roughly 4–5 kn (7.4–9.3 km/hour)) and any vessels engaged in construction activities would be primarily stationary during the pile-driving event.

Additionally, aside from any requirements of this rule, Empire Wind is required to comply with all spatial and temporal approach (500 m) and speed restrictions outlined in existing regulations (50 CFR 224.105 and 222.32).

While we acknowledge that a year-round 10-kn requirement could potentially fractionally reduce the already discountable probability of a vessel strike, this theoretical reduction would not be expected to manifest in measurable real-world differences in impact. Further, additional limitations on speed or requiring a PSO on all transiting vessels have significant practicability impacts on applicants, in that, given the distance of Empire Wind’s Lease Area offshore of New York, vessel trips to and from shore would significantly increase in duration to the extent that delays to the Project and planned construction schedule would be likely to occur, which could extend the number of days necessary to complete all pile driving of foundations. Furthermore, Empire Wind has committed to the use of PAM within the vessel transit corridor to further aid in the detection of marine mammals. NMFS has determined that these and other included measures ensure the least practicable adverse impact on species or stocks and their habitat. Therefore, we are not requiring project-related vessels to travel 10 kn (5.14 m/s) or less at all times.

Regarding an “Adaptive Plan” to allow the developer to travel over 10 kn (5.14 m/s) where they would otherwise not be allowed, there are adaptive management provisions in the rule that allows for modification to mitigation measures, when warranted. Should Empire Wind request modifications to the vessel strike avoidance measures, NMFS would consider the request and act accordingly.

In addition to the vessel strike avoidance measures, NMFS has also included a requirement that all vessels be equipped with automatic identification system (AIS) to facilitate compliance checks with the speed limit requirements. Lastly, we disagree with the commenter that the final rule and LOA must include a vessel traffic plan beyond the extensive measures outlined here. At least 180 days prior to the start of vessel operations commencing, Empire Wind must submit both a Vessel Strike Avoidance Plan, including plans for conducting PAM in the transit corridors should Dominion Energy determine they wish to travel over 10 kn (18.5 km/hr) in the transit corridors, to NMFS for review and approval.

NMFS acknowledges the commenter's recommendation for NMFS to work to reduce the risk of vessel strike to large whales by conducting targeted research to better understand large whale habitat use in the New York Bight. Although the initiation of targeted research studies is beyond the scope of this authorization, NMFS uses the best available data to assess large whale distributions and risk of vessel strike, and applies mitigation measures to reduce this risk to effect the least practicable impact to all marine mammal species and stocks.

Comment 12: Commenters suggested that NMFS prohibit pile driving during periods of highest risk for North Atlantic right whales, which they define as times of the highest relative density of animals during foraging and migration, and times where mom-calf pairs, pregnant females, surface active groups (that are foraging or socializing), or aggregations of three or more whales, are not expected to be present. Citing multiple information sources, commenters further specifically recommended the seasonal restriction for pile driving be expanded to November 1 through April 30 to reflect the period of highest detections of vocal activity, sightings, and abundance estimates of North Atlantic right whales. Multiple commenters requested for the seasonal restriction of pile driving to be expanded to November 1 through May 31 to provide additional protection for North Atlantic right whales. Commenters also recommended prohibiting pile driving during seasons when protected species are known to be present or migrating in the Project Area, in addition to any dynamic restrictions due to the presence of North Atlantic right whale or other endangered species.

Response: NMFS disagrees that extending the seasonal restriction on pile driving to include May or November is appropriate or warranted. NMFS has restricted foundation installation pile driving from January through April, which represent the times of year when North Atlantic right whales are most likely to be in the Project Area. We recognize that the density of whales begins to elevate in December (based upon Roberts *et al.*, 2023); however, it is not until January when density greatly increases. Empire Wind has indicated that to complete the Project, pile driving is needed from May through November and may be required in December. In this final rule, NMFS has included an additional measure where pile driving in December must be avoided to the maximum extent practicable but may occur if necessary, provided Empire Wind receives NMFS'

prior approval. We also note that any time of year when foundation installation is occurring, a sighting or acoustic detection of a North Atlantic right whale at any distance triggers a pile driving delay or shutdown. We also reiterate that Empire Wind is required to implement a minimum visibility zone, as reflected by the results of JASCO Applied Sciences' (JASCO) underwater sound propagation modeling. With the application of these enhanced mitigation and monitoring measures, impacts to the North Atlantic right whale will be further reduced, if any are encountered when transiting through the migratory corridor.

As noted and acknowledged by NMFS in both the proposed and final rules, North Atlantic right whale distribution is changing due to climate change and other factors, and they are present year-round in the vicinity of the Project. However, as shown in Roberts *et al.* (2023), which NMFS considers the best available scientific information regarding marine mammal densities in the Atlantic Ocean, it is not until January that densities begin to significantly increase. Further, North Atlantic right whales are not likely to be engaged in feeding behaviors in the Project Area, from May to November or during any other time period, as the Project Area is primarily a migratory corridor for North Atlantic right whales. While some opportunistic foraging may occur, the waters off of New York do not include known foraging habitat for North Atlantic right whales. As described in the Description of Marine Mammals in the Geographic Area section, foraging habitat is located in colder, more northern waters including southern New England, the Gulf of Maine, and Canada. In addition, Roberts *et al.*, (2023) density data indicates much lower densities of North Atlantic right whales in the Project Area during the months of May (0.025 animals/100 km²) and November (0.016 animals/100 km²) as compared to the months of January through April (0.088, 0.116 animals/100 km²). For these reasons, and given the inclusion of December in the seasonal impact pile driving restriction without NMFS's prior approval, NMFS finds that further expansion of the seasonal impact pile driving restrictions (beyond December through April) would be impracticable and is unwarranted.

The comment was not specific and may be suggesting prohibiting pile driving when any protected species are present; however, such a restriction would not be practicable to implement as there is no time of year when some

species of marine mammals are not present.

Comment 13: A commenter suggested that when HRG surveys are allowed to resume after a shutdown event, the surveys should be required to use a ramp-up procedure to encourage any nearby marine life to leave the area.

Response: NMFS agrees with this recommendation and included in the proposed rule (88 FR 22696, April 13, 2023) and this final rule a stipulation that when technically feasible, survey equipment must be ramped up at the start or restart of survey activities. Ramp-up must begin with the power of the smallest acoustic equipment at its lowest practical power output appropriate for the survey. When technically feasible the power must then be gradually turned up and other acoustic sources added in a way such that the source level would increase gradually. NMFS notes that ramp-up is not required for short periods where acoustic sources were shut down (*i.e.*, less than 30 minutes) if PSOs have maintained constant visual observation and no detections of marine mammals occurred within the applicable shutdown zones.

Comment 14: A commenter asserted that the LOA must include requirements for all vessels associated with the Project, including vessels owned by the developer, contractors, employees, and others regardless of ownership, operator, and contract. They stated that exceptions and exemptions will create enforcement uncertainty and incentives to evade regulations through reclassification and redesignation. They recommended that NMFS simplify this by requiring all vessels to abide by the same requirements, regardless of size, ownership, function, contract or other specifics.

Response: NMFS agrees with the commenter and the proposed rule and final rule have general conditions to hold Empire Wind and its designees (including vessel operators and other personnel) accountable while performing operations under the authority of this final rule. The final rule indicates that the conditions contained therein apply to Empire Wind and its designees and requires that a copy of the LOA must be in the possession of Empire Wind, the vessel operators, the lead PSO, and any other relevant designees of Empire Wind. The final rule also states that Empire Wind must ensure that the vessel operator and other relevant vessel personnel, including the PSO team, are briefed on all responsibilities, communication procedures, marine mammal monitoring protocols, operational procedures, and

requirements prior to the start of project activities, and when relevant new personnel join the construction and survey operations.

Comment 15: The Commission noted that NMFS' proposed minimum visibility zone (1.2 km) is insufficient given that the shutdown zone for mysticetes and sperm whales during impact installation of monopiles (1.5 km) is greater than this distance. The Commission further noted that this is not consistent with other offshore wind rules.

Response: NMFS appreciates the suggestion by the Commission and agrees with the proposed expansion of the minimum visibility zone. In response to the Commission's comment and ESA consultation discussion, the minimum visibility zone for impact pile driving has been increased from 1.2 km to 1.5 km for mysticetes and sperm whales. This updated measure is included in the final rule.

Comment 16: Commenters recommended that NMFS should restrict pile driving at night and during periods of low visibility to protect all large whale species. This would include no pile driving being allowed to begin after 1.5 hours before civil sunset or during times where the visual clearance zone and shutdown zone (called the "exclusion zone" in the appendix) cannot be visually monitored, as determined by the Lead PSO.

A commenter expressed that pile driving should only be allowed to continue after dark if the activity was started during daylight hours and must continue due to human safety or installation feasibility (*i.e.*, stability) concerns, but that nighttime monitoring protocols be required. A commenter suggested that if pile driving must continue after dark, Empire Wind should be required to notify NMFS with these reasons and an explanation for exemption. Additionally, a commenter stated that a summary of the frequency of these exceptions must be made publicly available to ensure that these are indeed exceptions, rather than the norm, for the Project.

Response: NMFS recognizes the need to protect marine mammals that may be exposed to pile-driving noise, as well as the challenges of detecting marine mammals in low-light and nighttime conditions. However, we note that while it may be more difficult to detect marine mammals at night, there are benefits to completing the pile driving in a shorter total amount of time, and exposing marine mammals to fewer days of pile-driving noise. Given this, NMFS disagrees that no activities should occur during reduced visibility, as long as the

use of alternative technologies allow sufficient monitoring of the clearance and shutdown zones, including the minimum visibility zone.

However, in this case, Empire Wind has not requested, nor has NMFS included a provision for pile driving to begin outside the civil sunset/civil sunrise temporal restrictions; therefore, Empire Wind will not be able to initiate pile driving at night. In the proposed rule, we indicated that Empire Wind must initiate pile driving prior to 1.5 hours before civil sunset and not before 1 hour after civil sunrise unless they submit to NMFS, for approval, an Alternative Monitoring Plan for nighttime pile-driving activities. This requirement has been carried over to this final rule.

Regarding the reporting requirement specified by the commenter, we are already requiring weekly and monthly reports during foundation installation, which would contain information that would inform on how long and when pile driving occurred as Empire Wind is required to document the daily start and stop times of all pile-driving activities. At minimum, a final annual report with this information will be made available to the public, as recommended by the commenter.

Comment 17: A commenter stated that NMFS should require acoustic and visual monitoring to begin at least 60 minutes prior to the commencement or resumption of pile driving and should be conducted throughout the duration of the pile-driving activity. The commenter further suggested that visual observation of the clearance zone should continue until 30 minutes after completion of pile driving, and that the LOA should prohibit initiating pile driving within 1.5 hours of civil sunset or in times of low visibility when the visual clearance zone cannot be monitored.

Response: NMFS agrees with the commenter and has included in the final rule the requirement for that visual monitoring to begin at least 60 minutes prior to commencement or resumption of impact pile driving of foundation piles. Moreover, PAM must be conducted for at least 24 hours immediately prior to foundation installation impact pile driving activities. The PAM operator must review all detections from the previous 24-hour period immediately prior to pile driving activities. Foundation pile driving may only begin once the clearance zones have been clear for 30 minutes immediately prior to commencing the activity. Visual monitoring must begin at least 30 minutes prior to commencement or resumption of vibratory pile driving

associated with cable landfall construction and marina activities, which is located in coastal waters and is relatively quiet compared to foundation installation. PAM is not required for cable landfall and marina pile driving. Visual monitoring and PAM (where required) will continue for 30 minutes post completion of both impact and vibratory pile driving.

Monitoring, Reporting, and Adaptive Management

Comment 18: The Commission noted that the proposed rule did not specify the information that must be included in any interim or final SFV report, and that this is inconsistent with previous proposed rules.

Response: In response to the Commission's comment and ESA consultation discussion, NMFS has included more specific requirements for reporting SFV measurements. This includes comprehensive requirements for both interim and final SFV reports.

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 be included in the final SFV report as well. Details on the information NMFS is requiring in SFV reports can be found in § 217.285(f)(9) and (11).

Comment 19: Multiple commenters expressed concern for the accountability, fairness, and transparency regarding how cumulative impacts to the marine ecosystem would be measured. A commenter further suggested NMFS include a requirement for all phases of construction to subscribe to the highest level of transparency, including frequent reporting to Federal agencies, requirements to report all visual and acoustic detections of North Atlantic right whales and any dead, injured, or entangled marine mammals to the Fisheries Service or the Coast Guard as soon as possible and not later than the end of the PSO shift. To foster stakeholder relationships and allow public engagement and oversight of the permitting, the commenter suggested that the LOA should require all reports and data to be accessible on a publicly available website. Another commenter recommended that NMFS improve the transparency of the ITA process by moving away from a "segmented phase-by-phase and project-by-project approach" to authorizations.

Response: NMFS agrees with the need for reporting and indeed, the MMPA

calls for LOAs to incorporate reporting requirements. As included in the proposed rule, the final rule includes requirements for reporting that supports the commenter's recommendations. Empire Wind is required to submit a monitoring report to NMFS within 90 days after completion of project activities that fully documents the methods and monitoring protocols, summarizes the data recorded during monitoring. PSO datasheets or raw sightings data must also be provided with the draft and final monitoring report.

Further, the draft rule and final rule stipulate that if a North Atlantic right whale is observed at any time by any vessels, during construction work or during vessel transit, Empire Wind must immediately report sighting information to the NMFS North Atlantic Right Whale Sighting Advisory System within 2 hours of occurrence, when practicable, or no later than 24 hours after occurrence. Empire Wind may also report the sighting to the U.S. Coast Guard. Additionally, Empire Wind must report any discoveries of injured or dead marine mammals, including entangled animals, to the Office of Protected Resources, NMFS, and to the New England/Mid-Atlantic Regional Stranding Coordinator as soon as feasible. All final reports submitted to NMFS will be included on the website for availability to the public.

In regards to improving transparency by moving away from a "segmented phase-by-phase and project-by-project approach, the MMPA, and its implementing regulations allow, upon request, the incidental take of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographic region. NMFS authorizes the requested incidental take of marine mammals if it finds that the taking would be of small numbers, have no more than a "negligible impact" on the marine mammal species or stock, and not have an "unmitigable adverse impact" on the availability of the species or stock for subsistence use. NMFS emphasizes that an ITA does not authorize the activity itself but authorizes the take of marine mammals incidental to the "specified activity" for which incidental take coverage is being sought. In this case, NMFS is responding to Empire Wind's request—as required by the statute—to incidentally take marine mammals while engaged in construction activities and marine site characterization surveys. NMFS determines whether the necessary findings can be made based on Empire Wind's application. NMFS

does not have the authority to force project proponents to batch or aggregate multiple activities into a single MMPA take authorization request. Similarly, while the BOEM's Environmental Impact Statement (EIS), which NMFS adopted, evaluates the cumulative effects of the activity (*i.e.*, the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions) on the human environment in order to support multiple decisions, the findings necessary for issuance of an MMPA authorization are based on an assessment of the impacts on marine mammals and their habitat, and do not require measurement of impacts on the "marine ecosystem." In addition, the ESA consultation assesses impacts to listed species from Empire Wind's proposed action, added to the baseline of offshore wind actions that had previously been approved.

Comment 20: Commenters expressed interest in understanding the outcome if the number of actual takes exceed the number authorized during construction of an offshore wind project (*i.e.*, if the Project would be stopped mid-construction or operation), and how offshore wind developers will be held accountable for impacts to protected species instead of impacts being mistakenly assigned to fishermen. The commenter further maintained that the offshore wind industry must be accountable for incidental takes from construction and operations separately from the take authorizations for managed commercial fish stocks.

Response: NMFS carefully reviews models and take estimate methodology to authorize a number of takes, by species and manner of take, that is a likely outcome of the Project. There are several conservative assumptions built into the models to ensure the number of takes authorized is sufficient based on the description of the Project. Empire Wind would be required to submit frequent reports which would identify the number of takes applied to the Project.

In the unexpected event that Empire Wind exceeds the number of takes authorized for a given species, the MMPA and its implementing regulations state that NMFS shall withdraw or suspend the LOA issued under these regulations, after notice and opportunity for public comment, if it finds the methods of taking or the mitigation, monitoring, or reporting measures are not being substantially complied with, or the taking allowed is having, or may have, more than a negligible impact on the species or stock concerned (16 U.S.C. 1371(a)(5)(B); 50

CFR 216.206(e)). Additionally, failure to comply with the requirements of the LOA may result in civil monetary penalties and knowing violations may result in criminal penalties (16 U.S.C. 1375; 50 CFR 216.206(g)).

Moreover, as noted previously, fishing impacts, and NMFS assessment of them, generally center on entanglement in fishing gear, which is a very acute, visible, and severe impact (*i.e.*, mortality or serious injury). In contrast, the impacts incidental to the specified activities are primarily acoustic in nature and limited to Level A harassment and Level B harassment, there is no anticipated or authorized serious injury or mortality that the fishing industry could theoretically be held accountable for. Any take resulting from the specified activities would not be associated with take authorizations related to commercial fish stocks. The impacts of commercial fisheries on marine mammals and incidental take for said fishing activities are managed separately from those of non-commercial fishing activities such as offshore wind site characterization surveys, under MMPA section 118.

Comment 21: A commenter suggested that NMFS require Empire Wind to utilize direct-drive turbines instead of gearboxes.

Response: NMFS disagrees with the commenter's suggestion to require Empire Wind to utilize direct-drive turbines instead of gearboxes. Empire Wind included the use of turbines that may contain gearboxes in the description of their specified activity, and NMFS has evaluated the activity as charged and made the determinations necessary to support the issuance of incidental take regulations. Although direct-drive technology is newer, gearboxes are effective and frequently used in the offshore wind industry, and it is outside of the scope of NMFS' authority to require the use of direct-drive turbines over gearboxes.

Comment 22: A commenter asserted that the requirement of having PSOs onboard project vessels is insufficient to prevent harm to North Atlantic right whales as right whales can be difficult to spot from a boat and poor weather or low light conditions make detecting right whales challenging.

Response: NMFS recognizes that visual detection based mitigation approaches are not 100 percent effective. Animals are missed because they are underwater (*i.e.*, availability bias) or because they are available to be seen but are missed by observers (*i.e.*, perception and detection biases) (*e.g.*, Marsh and Sinclair, 1989). However, visual observation remains one of the

best available methods for marine mammal detection. For North Atlantic right whales in particular, the required Clearance Zones are any distance (impact pile driving), 1,600 m (vibratory pile driving/marine activities), and 500 m (HRG surveys) and, therefore, it is unlikely that an individual would approach the harassment zone undetected.

In addition, as described in the proposed rule, NMFS is requiring that Empire Wind employ both visual and PAM methods for monitoring, as both approaches aid and complement each other (Van Parijs *et al.*, 2021). The use of PAM will augment visual detections for foundation pile driving, especially for activities with the largest zones. NMFS is requiring the use of PAM to monitor 10 km zones around the piles and that the systems be capable of detecting marine mammals during pile driving within this zone. In this final rule, table 39 clearly specifies this 10 km PAM monitoring zone. For further detail on the requirements for the use of PAM, see comments 4 and 17.

Comment 23: A commenter recommended that the LOA should require all vessels supporting site characterization to be equipped with and using Class A AIS devices at all times while on the water. A commenter suggested this requirement should apply to all vessels, regardless of size, associated with the survey.

Response: NMFS acknowledges that vessel strikes pose a risk to marine wildlife, including North Atlantic right whales. For the final rule, NMFS has included a requirement that all vessels be equipped with AIS to facilitate compliance checks with the speed limit requirements.

Comment 24: Several commenters recommended that NMFS increase the frequency of information review for adaptive management to at least once a quarter and to have a mechanism in place to undertake review and adaptive management on an ad hoc basis if a serious issue is identified (*e.g.*, if unauthorized levels of Level A take of marine mammals are reported or if serious injury or mortality of an animal occurs).

Response: We disagree that the frequency at which information is reviewed should be defined in the Adaptive Management provision. The purpose of the Adaptive Management provision is to allow for the incorporation of new information as it becomes available, which could mean advancements and new information becomes available quickly (*i.e.*, days or weeks) that would necessitate NMFS to consider adapting the issued LOA, or

over long periods of time as robust and conclusive information becomes available (*i.e.*, months or years). NMFS will be reviewing interim reports as they are submitted, hence, the quarterly review, as suggested by the commenter, is not necessary. NMFS retains the ability to make decisions as information becomes available, and after discussions with Empire Wind about feasibility and practicability.

We do not agree with the suggestion by the commenter for ad hoc changes in the event that additional take by Level A harassment or take via serious injury/mortality of a marine mammal occurs. NMFS has included two relevant provisions in its final ITA, one prohibiting take by mortality of serious injury (“Take by mortality or serious injury of any marine mammal species is not authorized”) and another prohibiting the taking of marine mammals in any manner other than what is specified in the LOA (“It is unlawful for any person to . . . take any marine mammal specified in the LOA in any manner other than as specified in the LOA.”) We refer the commenter to the Prohibitions portion of the final regulations text (see § 217.293). If the Project takes any marine mammal in a manner that has not been specified in the final rule and LOA (*i.e.*, unauthorized take by Level A harassment), or project vessels strike a marine mammal, Empire Wind would be in violation of its LOA and NMFS would undertake appropriate actions, as determined to be necessary.

Effects Assessment

Comment 25: Multiple commenters stated that NMFS must make an assessment of which activities, technologies, and strategies are truly necessary to achieve site characterization to inform development of the offshore wind projects and which strategies are not critical. In addition, commenters asserted that NMFS should prescribe the appropriate survey techniques and mitigate any potential stressors to effect the least practicable impact on all affected species and stocks. Commenters further encouraged NMFS to require that the LOA holder minimize the impacts of underwater noise to the fullest extent feasible, including through the use of best available technology and methods to minimize sound levels from geophysical surveys such as through the use of technically and commercially feasible and effective noise reduction and attenuation measures. One commenter emphasized that there should be a focus on reducing impacts to species with extreme sensitivity to noise (*e.g.*, harbor

porpoises) and species experiencing UMEs (*e.g.*, harbor seals).

Response: The MMPA requires that an LOA include measures that will effect the least practicable adverse impact on the affected species and stocks, and, in practice, NMFS agrees that the LOA should include conditions for the activities that will first avoid adverse effects on marine mammal species in and around the Project Area, where practicable, and minimize the effects that cannot be avoided. NMFS has determined that the ITR and LOA meet this requirement to effect the least practicable adverse impact. As part of the analysis for all ITRs, NMFS evaluates the effects expected as a result of the specified activity, makes the necessary findings, and prescribes mitigation requirements sufficient to achieve the least practicable adverse impact on the affected species and stocks of marine mammals.

Comment 26: A commenter asserted that NMFS must fully consider the discrete effects of each activity and the cumulative effects of the suite of approved, proposed, and potential activities on marine mammals (particularly North Atlantic right whales) and ensure that the cumulative effects are not excessive before issuing an incidental take authorization (ITA). Other commenters encouraged NMFS to consider the total takes of all species alongside takes that NMFS has authorized for other wind-related activities, and noted that the cumulative impacts of offshore wind activities on marine mammals are not yet known. Commenters objected to NMFS’s conclusion that the application’s take limit of 29 North Atlantic right whales for construction activities in the coastal waters between off New York will have a “negligible impact” on the species and fulfills the requirement for “small numbers” of takes, especially in light of the North Atlantic right whale’s critically endangered status, the ongoing UME that this species is experiencing and, consequently, the asserted existential threat posed to the species by obstacles to even one individual’s survival—and they emphasized this comment in combination with the need to consider the take from multiple projects.

Response: NMFS is required to authorize the requested incidental take if it finds the total incidental take of small numbers of marine mammals by U.S. citizens “while engaging in that (specified) activity” within a specified geographic region during the 5-year period (or less) will have a negligible impact on such species or stock and, where applicable, will not have an

unmitigable adverse impact on the availability of such species or stock for subsistence uses (16 U.S.C.

1371(a)(5)(A)). Negligible impact is defined as “an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effect on annual rates of recruitment or survival” (50 CFR 216.103). Neither the MMPA nor its implementing regulations require consideration of unrelated activities and their impacts on marine mammal populations in the negligible impact determination. Consistent with the preamble of NMFS’ implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are factored into the baseline, which is used in the negligible impact analysis. Here, NMFS has factored into its negligible impact analysis the impacts of other past and ongoing anthropogenic activities via their impacts on the baseline (*e.g.*, as reflected in the density/distribution and status of the species, population size and growth rate, and other relevant stressors).

The preamble of NMFS’ implementing regulations also addresses cumulative effects from future, unrelated activities. Such effects are not considered in making the negligible impact determination under MMPA section 101(a)(5). NMFS considers: (1) cumulative effects that are reasonably foreseeable when preparing a National Environmental Policy Act (NEPA) analysis; and (2) reasonably foreseeable cumulative effects under section 7 of the ESA for ESA-listed species, as appropriate. Accordingly, NMFS has adopted and reviewed BOEM’s EIS and as part of its inter-agency coordination. This EIS addresses cumulative impacts related to the Project and substantially similar activities in similar locations. Cumulative impacts regarding the promulgation of the regulations and issuance of an LOA for construction activities planned by Empire Wind, have been adequately addressed in the adopted EIS that supports NMFS’ determination that this action has been appropriately analyzed under NEPA. Separately, the cumulative effects of the Project on ESA-listed species, including the North Atlantic right whale, were analyzed under section 7 of the ESA when NMFS engaged in formal inter-agency consultation with the NOAA GARFO. The Biological Opinion for the Project determined that NMFS’ promulgation of the rulemaking and issuance of an LOA for construction activities associated with leasing,

individually and cumulatively, are likely to adversely affect, but not jeopardize, listed marine mammals.

NMFS disagrees that the authorized take of 29 North Atlantic right whales by Level B harassment incidental to the Project will have a non-negligible impact on the species and notes that the commenter did not provide additional scientific information supporting this claim for NMFS to consider. Take by injury, serious injury, or mortality is not authorized. NMFS emphasizes that the authorized incidental take is limited to Level B harassment (*i.e.*, behavioral disturbance). As described in the proposed rule and this final rule (see Negligible Impact Analysis and Determination section), NMFS has determined that the Level B harassment of North Atlantic right whales will not result in impacts to the population through effects on annual rates or recruitment or survival. The Project Area occurs offshore of New York, which does not include habitat where North Atlantic right whales are known to concentrate in foraging or reproductive behaviors. The Project Area is a known migratory corridor. Hence, it is likely that most of the authorized takes represent an exposure to a different individual, which means that the behavioral impacts to North Atlantic right whales are limited to behavioral disturbance occurring on 1 or 2 days within a year—an amount that would not be expected to impact reproduction or survival. Across all years, while it is possible an animal migrating through could have been exposed during a previous year, the low amount of take authorized during the 5-year period (n=29 takes of North Atlantic right whales by Level B harassment) of the rule makes this scenario unlikely. Any disturbance to North Atlantic right whales due to Empire Wind’s activities is expected to result in temporary avoidance of the immediate area of construction but not abandonment of its migratory path. Slight displacement (but not abandonment) of a migratory pathway is unlikely to result in energetic consequences that could affect reproduction or survival of any individuals. Other impacts such as masking, Temporary Threshold Shift (TTS), and temporary communication and foraging disruption may occur (again noting that North Atlantic right whales concentrate foraging far north of the Project Area (*e.g.*, southern New England, Gulf of Maine, and Canada). However, these impacts would also be temporary and unlikely to lead to survival or reproduction impacts of any

individual, especially when the extensive suite of mitigation, including numerous measures targeted specifically towards minimizing impacts to North Atlantic right whales, are considered.

NMFS also disagrees with the commenter’s arguments on the topic of small numbers. In the Empire Wind proposed rule, NMFS describes that when the predicted number of individuals to be taken is less than one-third of the species or stock abundance, the take is considered to be of small numbers. The small number of takes being authorized is incidental to the specified activities. NMFS has provided a reasoned approach to small numbers, as described in the “Taking Marine Mammals Incidental to Geophysical Surveys Related to Oil and Gas Activities in the Gulf of Mexico” final rule (86 FR 5322 at 5438, April 19, 2021). Utilizing that approach, NMFS has made the necessary small numbers finding for all affected species and stocks in this case (see Small Numbers section for more detail).

Comment 27: A commenter stated that some of the specified activities will increase the number of vessels in the ocean in the Project Area, which will lead to an increased threat of harm by vessel strikes to marine mammals, specifically North Atlantic right whales.

Response: NMFS acknowledges that vessel strikes can result in injury or mortality of marine mammals. We analyzed the potential for vessel strike resulting from Empire Wind’s activities (including the anticipated number of vessels in the area) and determined that based on the nature of the activity and the required mitigation measures specific to vessel strike avoidance included in this rulemaking, the potential for vessel strike is so low as to be discountable. The required mitigation measures, all of which were included in the proposed rulemaking and are now required in the final regulations, include: a requirement that all vessel operators comply with 10 kn (18.5 km/hour) or less speed restrictions in any Seasonal Management Area (SMA), DMA, or Slow Zone while underway, and check daily for information regarding the establishment of mandatory or voluntary vessel strike avoidance areas (SMAs, DMAs, Slow Zones) and information regarding North Atlantic right whale sighting locations; a requirement that all vessels, regardless of size, operating from November 1 through April 30 operate at speeds of 10 kn (18.5 km/hour) or less; a requirement that all vessel operators reduce vessel speed to 10 kn (18.5 km/hour) or less when any large whale, any mother/calf pairs, pods, or large assemblages of non-

delphinid cetaceans are observed near the vessel; a requirement that all project vessels maintain a separation distance of 500 m or greater from North Atlantic right whales; a requirement that, if underway, vessels must steer a course away from any sighted North Atlantic right whale at 10 kn (18.5 km/hr) or less until the 500-m minimum separation distance has been established; a requirement that, if a North Atlantic right whale is sighted in a vessel's path, or within 500 m of an underway vessel, the underway vessel must reduce speed and shift the engine to neutral; and, a requirement that all vessels underway must maintain a minimum separation distance of 100 m or 50 m from all other marine mammals (species-dependent and excluding North Atlantic right whales), with an understanding that at times this may not be possible (e.g., for animals that approach the vessel). Based on these, we have determined that the vessel strike avoidance measures in the rulemaking are sufficient to ensure the least practicable adverse impact on species or stocks and their habitat.

Comment 28: A commenter expressed concern about the use of multiple vessels concurrently performing the HRG survey work may increase take potential, and that only one ship at a time should be permitted to actively emit sound for survey data collection within 200 nautical miles (nmi) of other ships working in other lease areas.

Response: The commenter does not provide information supporting their statement that multiple HRG survey vessels would increase the potential for take. The amount of take requested by Empire Wind and authorized by NMFS considers the total amount of HRG effort that would occur. Further, the commenter does not provide information supporting their comment that an Empire Wind HRG vessel should operate more than 200 miles from other HRG vessels for other projects. NMFS is not requiring this recommendation because it is not practicable.

Comment 29: Commenters stated that NMFS must utilize the best available science in their analysis. A commenter stated that NMFS must use the most recent and best available science in evaluating impacts to North Atlantic right whales, including updated population estimates, recent habitat usage patterns for the Project Area, and a revised discussion of the acute and cumulative stress on whales in the region. A commenter identified that the North Atlantic right whale population abundance is less than that cited in the proposed rule and that the current mitigation plan would not give assurance that endangered and critically

endangered species would be protected. In addition, a commenter noted concerns regarding the number of species that could be impacted by the activities, as well as a lack of baseline data being available for species in the area. The commenter stated that NMFS did not adequately address the potential for cumulative impacts to bottlenose dolphins from Level B harassment over several years of project activities and that there is not sufficient baseline information about how harbor seals use the water of the Lease Area to conclude that the activities covered by rule will have a negligible impact on harbor seals.

Response: The MMPA and its implementing regulations require that ITRs be established based on the best available information, which does not always mean the most recent information. NMFS considered all relevant information regarding North Atlantic right whale, including the information cited by the commenters. In the context of stock abundance, NMFS generally considers the information in the most recent U.S. Atlantic and Gulf of Mexico Stock Assessment Report (SAR; Hayes *et al.*, 2023) to be the best available information for a particular marine mammal stock because of the MMPA's rigorous stock assessment report (SAR) procedural requirements, which includes peer review by a statutorily established Scientific Review Group. Since issuance of the proposed rule, NMFS has finalized the 2022 SAR indicating the North Atlantic right whale population abundance is estimated at 338 individuals (confidence interval: 325–350; 88 FR 4162, January 24, 2023). NMFS has used this most recent best available information in the analysis of this final rule. This new estimate, which is based on the analysis from Pace *et al.* (2017) and subsequent refinements found in Pace (2021), is included by reference in the draft and final 2022 SARs (<https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports>) and provides the most recent and best available estimate, including improvements to NMFS' right whale abundance model. More recently, in October 2023, NMFS released a technical report identifying that the North Atlantic right whale population size based on sighting history through 2022 was 356 whales, with a 95 percent credible interval ranging from 346 to 363 (Linden, 2023). NMFS conservatively relies on the lower SAR abundance estimate in this final rule. The finalization of the draft to final 2022 SAR did not change the estimated

take of North Atlantic right whales or authorized take numbers, nor affect our ability to make the required findings under the MMPA for Empire Wind's construction activities.

NMFS relied upon the best scientific evidence available, including, but not limited to, the draft 2022 SAR, scientific literature, and Duke University's density model (Roberts *et al.*, 2023), in analyzing the impacts of Empire Wind's specified activities on marine mammals. The MMPA requires us to evaluate the effects of the specified activities in consideration of the best scientific evidence available and, if the necessary findings are made, to issue the requested take authorization. The MMPA does not allow us to delay decision making to wait for additional information may become available in the future. While commenters suggest generally that NMFS consider the best scientific evidence available, none of the commenters provided additional scientific information for NMFS to consider. Furthermore, NMFS notes that it has previously addressed discussions on cumulative impact analyses in previous comments and references the commenter back to these specific responses in this final rule.

Regarding the commenter's concern about the lack of baseline information for harbor seals, NMFS applied data from the Atlantic Marine Assessment Program for Protected Species (AMAPPS; <https://www.fisheries.noaa.gov/new-england-mid-atlantic/population-assessments/atlantic-marine-assessment-program-protected>) annual reports available from 2010 to 2020 (<https://www.fisheries.noaa.gov/resource/publication-database/atlantic-marine-assessment-program-protected-species>) that represents that best available data for harbor seal distribution across the Atlantic Ocean. NMFS has considered this AMAPPS data in our analysis as well as datasets from the Oceanographic Biodiversity Information System (OBIS, 2023; Smith, 2014) to assess impacts to harbor seals.

Regarding cumulative impacts to bottlenose dolphins across years of project activities, the estimated take by Level B harassment of each stock is not likely representative of the number of individuals that would be taken each year. Repeated takes of the same individuals are likely due to the ranging patterns of each stock. The Project Area also covers a small portion of each stock's range and comparable habitat would be available to dolphins across years. For further discussion of cumulative effects of marine mammals, please see our response in comment 26.

In addition, NMFS has further considered take of the bottlenose dolphin stocks affected by this action, and has adjusted its attribution of such take regarding the Northern Migratory Coastal stock of bottlenose dolphins in the negligible impact and small numbers analyses included in this rule.

Comment 30: Commenters stated that there is a lack of basic research about the impacts of offshore wind energy development on large whales, especially in terms of *in situ* data and interactions between whales and turbines. They asserted that scientific baselines are necessary for assessing potential impacts to whales and that NMFS has failed to include critical scientific assessments and consultations.

Response: The MMPA requires NMFS to evaluate the effects of the specified activities in consideration of the best scientific evidence available and to issue the requested ITR if it makes the necessary findings. The MMPA does not allow NMFS to delay issuance of the requested authorization on the presumption that new information will become available in the future. If new information becomes available in the future, NMFS may modify the mitigation and monitoring measures in an LOA issued under these regulations through the adaptive management provisions. Furthermore, NMFS is required to withdraw or suspend an LOA if, after notice and public comment, and unless an emergency exists, it determines the authorized incidental take may be having more than a negligible impact on a species or stock.

NMFS has duly considered the best scientific evidence available in its effects analysis. The “Potential Effects of Underwater Sound on Marine Mammals” section of the proposed rule included a broad overview of the potential impacts on marine mammals from anthropogenic noise and provided summaries of several studies regarding the impacts of noise from several different types of sources (*e.g.*, airguns, Navy sonar, vessels) on large whales, including North Atlantic right whales. Offshore wind farm construction generates noise that is similar, or, in the case of vessel noise, identical, to noise sources included in these studies (*e.g.*, impact pile driving and airguns both produce impulsive, broadband sounds where the majority of energy is concentrated in low frequency ranges), and the breadth of the data from these studies helps us predict the impacts from wind activities. In addition, as described in the proposed rule, it is general scientific consensus that behavioral responses to sound are

highly variable and context-specific and are impacted by multiple factors including, but not limited to, behavioral state, proximity to the source, and the nature and novelty of the sound. Overall, the ecological assessments from offshore wind farm development in Europe and peer-reviewed literature on the impacts of noise on marine mammals both in the United States and worldwide provides the information necessary to conduct an adequate analysis of the impacts of offshore wind construction and operation on marine mammals in the Atlantic OCS. NMFS acknowledges that studies in Europe typically focus on smaller porpoise and pinniped species, as those are more prevalent in the North Sea and other areas where offshore wind farms have been constructed, and notes that the commenter did not provide additional scientific information for NMFS to consider.

Comment 31: Commenters expressed concern regarding ocean noise and the interference it has on communication between whales. Commenters were specifically concerned with the low-frequency noise from large vessels involved in the construction activities overlapping North Atlantic right whale communication.

Response: As discussed in the Negligible Impact Analysis and Determination section (specifically the *Auditory Masking or Communication Impairment* section) of both the proposed and final rule, the level of masking that could occur from Empire Wind’s activities will have a negligible impact on marine mammals, including North Atlantic right whales. Inherent in the concept of masking is the fact that the potential for the effect is only present during the times that the animal and the sound source are in close enough proximity for the effect to occur. In addition, this time period would need to coincide with a time that the animal was utilizing sounds at the masked frequency). As our analysis (both quantitative and qualitative components) indicates, because of the relative movement of whales and vessels, as well as the stationary nature of a majority of the activities, we do not expect these exposures with the potential for masking to be of a long duration within a given day. Further, because of the relatively low density of North Atlantic right whales during months when most of Empire Wind’s activities would be occurring (*i.e.*, May through November in most cases), and the relatively large area over which the vessels will travel and where the activities will occur, we do not expect any individual North Atlantic right

whales to be exposed to potentially masking levels from these surveys for more than a few days in a year. Furthermore, as many of the activities are occurring in clusters and specific areas rather than sporadically dispersed in the Project Area (*i.e.*, foundation installation all occurs in the same general area, nearshore cable installation activities occur in relatively similar and nearby areas), animals are likely to temporarily avoid these locations during periods where activities are occurring but are expected to return once activities have ceased.

As noted above, any masking effects of Empire Wind’s activities are expected to be limited in duration, if present. For HRG surveys, given the likelihood of significantly reduced received levels beyond short distances from the transiting survey vessel, the short duration of potential exposure, the lower likelihood of extensive additional contributors to background noise offshore and within these short exposure periods, and the fact that the frequency of HRG signals are primarily above those used in social communication or for detection of other important clues, we believe that the incremental addition of the survey vessel is unlikely to result in more than minor and short-term masking effects. For pile driving, and especially foundation installation, masking effects are more likely given the larger zones and longer durations, and animals that approach the source could experience temporary masking of some lower frequency cues. However, any such effects would be localized to the areas around these stationary activities, which means that whales transiting through the area could adjust their transit away from the construction location and return once the activity has completed. As described in the “Potential Effects of the Activities on Marine Mammals” section of the proposed rule, NMFS acknowledges the noise contributions of vessels to the soundscape and the potential for larger vessels such as commercial shipping vessels, especially, to mask mysticete communication. For the activity as a whole, including the operation of supporting vessels for Empire Wind’s activities, any masking that might potentially occur would likely be incurred by the same animals predicted to be exposed above the behavioral harassment threshold, and thereby accounted for in the analysis. NMFS notes that the commenter did not provide additional scientific information for NMFS to consider to support its concern.

Other

Comment 32: A commenter noted that this proposed rule is for two separate offshore wind energy projects: Empire Wind 1 and 2 and the associated export cable areas. The commenter further recommends that ITR and LOA requests for each energy project be submitted and reviewed separately. Another commenter encouraged NMFS to issue LOAs on an annual basis, rather than a single 5-year LOA, to allow for the continuous incorporation of the best available scientific and commercial information, modify mitigation and monitoring measures as necessary and in a timely manner, and to account for the quickly evolving situation for the North Atlantic right whale.

Response: NMFS disagrees with these comments. The MMPA allows for the authorization of incidental take within a specified geographical region, provided all the necessary findings are made. The applicant identifies the activities for which it is requesting authorization, and NMFS analyzes the request, including consideration of any germane factors that affect the analysis and may vary from one part of the Project Area to another, such as physical, biological, or chemical features. For example, the difference in the density of marine mammals between Empire Wind 1 and 2 is fully factored into the analysis. Further, it is generally considered more beneficial to evaluate the impacts of multiple activities together, where possible, as it allows for a more comprehensive assessment of the impacts and a more holistic approach to the mitigation and monitoring of those impacts. Here, Empire Wind would be responsible for conducting all construction and site characterization activities for Empire Wind 1 and 2. Some of these activities for each project would take place within the same year. For example, site characterization surveys are planned to occur during each of the 5 years across the Project Areas. In addition, impact pile driving of monopile foundations is expected to occur in Empire Wind 1 and Empire Wind 2 across years 2 and 3 of the Project. Further, the final rule includes requirements for annual reports, in addition to weekly and monthly requirements, to support annual evaluation of the activities and monitoring results, and the final rule includes an Adaptive Management provision (see § 217.297(c)) that allows NMFS to make modifications to the mitigation, monitoring, and reporting measures found in the LOA if new information supports the modifications and doing so creates a reasonable

likelihood of more effectively accomplishing the goals of the measures. As requested, and supported by the findings herein, NMFS will issue a single 5-year LOA to Empire Wind for activities for both Empire Wind 1 and 2.

Comment 33: Multiple commenters urged NMFS to deny the proposed project and/or postpone any offshore wind activities until NMFS determines effects of all offshore wind (OSW) activities on marine mammals in the region and determines that the recent whale deaths are not related to OSW activities, especially in light of recent UMEs. Similarly, some commenters provided general concerns regarding recent whale stranding events on the Atlantic Coast, including speculation that the strandings may be related to wind energy development-related activities. However, the commenters did not provide any specific information supporting these concerns.

Response: NMFS authorizes take of marine mammals incidental to construction activities and marine site characterization surveys, provided the necessary findings are made, but does not authorize the activities themselves. Therefore, while NMFS has the authority to modify, suspend, or revoke an LOA if the LOA holder fails to abide by the conditions prescribed therein (e.g., failure to comply with monitoring or reporting requirements), or if NMFS determines that (1) the authorized taking is having or is likely to have more than a negligible impact on the species or stocks of affected marine mammals, or (2) the prescribed measures are likely not or are not effecting the least practicable adverse impact on the affected species or stocks and their habitat, it is not within NMFS' jurisdiction to impose a moratorium on offshore wind development or to require activities to cease.

NMFS reiterates that there is no evidence that noise resulting from offshore wind development-related construction activities or site characterization surveys could potentially cause marine mammal stranding, and there is no evidence linking recent large whale mortalities and currently ongoing site characterization surveys. The commenters offer no such evidence. NMFS will continue to gather data to help us determine the cause of death for these stranded whales. We note the Marine Mammal Commission's recent statement: "There continues to be no evidence to link these large whale strandings to offshore wind energy development, including no evidence to link them to sound emitted during wind development-related site

characterization surveys, known as HRG surveys. Although HRG surveys have been occurring off New England and the mid-Atlantic coast, HRG devices have never been implicated or causatively-associated with baleen whale strandings" (Marine Mammal Commission Newsletter, Spring 2023).

There is an ongoing UME for humpback whales along the Atlantic coast from Maine to Florida, which includes animals stranded since 2016. Partial or full necropsy examinations were conducted on approximately half of the whales. Necropsies were not conducted on other carcasses because they were too decomposed, not brought to land, or stranded on protected lands (e.g., national and state parks) with limited or no access. Of the roughly 90 whales examined, about 40 percent had evidence of human interaction (i.e., vessel strike or entanglement). Vessel strikes and entanglement in fishing gear are the greatest human threats to large whales. The remaining 50 necropsied whales either had an undetermined cause of death due to a limited examination or decomposition of the carcass, or had other causes of death (e.g., parasite-caused organ damage and starvation).

As discussed herein, impact and vibratory pile driving may result in minor Permanent Threshold Shift (PTS) or TTS, as well as behavioral disturbance. HRG sources may behaviorally disturb marine mammals (e.g., avoidance of the immediate area). These HRG surveys are very different from seismic airguns used in oil and gas surveys or tactical military sonar. They produce much smaller impact zones because, in general, they have lower source levels and produce output at higher frequencies. The area within which HRG sources might behaviorally disturb a marine mammal is orders of magnitude smaller than the impact areas for seismic airguns or military sonar. Any marine mammal exposure would be at significantly lower levels and shorter duration, which is associated with less severe impacts to marine mammals.

Comment 34: A commenter expressed concern regarding the potential for increased uncertainty in estimates of marine mammal abundance resulting from wind turbine presence during low aerial surveys and potential effects of NMFS' ability to continue using current low-flying survey methods to fulfill its mission of precisely and accurately assessing protected species.

Response: NMFS and BOEM have collaborated to establish the "Federal Survey Mitigation Strategy for the Northeast U.S. Region" (Hare *et al.*,

2022). This interagency effort is intended to guide the development and implementation of a program to mitigate impacts of wind energy development on fisheries surveys. For more information on this effort, please see <https://repository.library.noaa.gov/view/noaa/47925>.

Comment 35: Referencing the low Potential Biological Removal (PBR) for North Atlantic right whales, a commenter stated that all industrial full-scale construction for offshore wind energy should be paused until the Federal agencies determine how best to eliminate or avoid all impacts, Level A harassment, and Level B harassment on the North Atlantic right whale.

Response: NMFS is required to authorize the requested incidental take if it finds the total incidental take of small numbers of marine mammals by U.S. citizens while engaging in a specified activity within a specified geographic region during a 5-year period (or less) will have a negligible impact on such species or stock and, where applicable, will not have an unmitigable adverse impact on the availability of such species or stock for subsistence uses (16 U.S.C. 1371(a)(5)(A)). While the ITA must be based on the best scientific information available, the MMPA does not allow NMFS to delay issuance of the requested authorization on the presumption that new information will become available in the future. NMFS has made the required findings based on the best scientific information available and has included mitigation measures to effect the least practicable adverse impacts on North Atlantic right whales. Many of these mitigation measures are found in the Draft Strategy (Strategy) for construction activities. While NMFS continues to work together with BOEM towards the goals identified in the Strategy, finalizing the Strategy (or similar efforts) or completing specific goals identified in the strategy are not a prerequisite for the issuance of an ITA.

While NMFS agrees that the North Atlantic right whale population abundance is alarmingly low (with entanglement in fishing gear and vessel strikes being the leading causes of North Atlantic right whale mortality), NMFS disagrees that the type of harassment authorized in this rulemaking will have a non-negligible impact (*i.e.*, adversely affect the species through effects on annual rates of recruitment or survival). NMFS emphasizes that no mortality, serious injury, or Level A harassment is anticipated or authorized for North Atlantic right whales from Empire Wind's specified activities. Further, the impacts of Level B harassment (*i.e.*, behavioral disturbance) are expected to

have a negligible impact on the North Atlantic right whale population. The magnitude of behavioral harassment authorized is very low and the severity of any behavioral responses is expected to be primarily limited to temporary displacement and avoidance of the area when some activities that have the potential to result in harassment are occurring (see Negligible Impact Analysis and Determination section for our full analysis). No impacts to the reproductive success or survival of any individual North Atlantic right whales are expected to result from these disturbances and, as such, no impacts to the population are expected to result. In its comment, the commenter conflates PBR level and Level B harassment and suggests that Level B harassment can have population level impacts. The PBR level is defined as the maximum number of animals, not including natural mortalities, that may be removed from a stock while allowing that stock to reach or maintain its optimum sustainable population (16 U.S.C. 1362(20)). Thus, PBR is only germane in the discussion of "removals" of individual North Atlantic right whales from the population and, therefore, PBR is not applicable in this discussion since no impact to reproduction or survival of any individuals is anticipated or authorized. Further, the commenter did not suggest mitigation measures to eliminate and avoid all impacts to North Atlantic right whales for NMFS to evaluate or consider.

Changes From the Proposed to Final Rule

Since the publication of the proposed rule in the **Federal Register** (88 FR 22696, April 13, 2023), NMFS has made changes, where appropriate, that are reflected in the regulatory text and preamble text of this final rule. These changes are briefly identified below, with more information included in the indicated sections of this final rule:

Changes in Information Provided in the Preamble

As described in the response to public comments section, NMFS received 328 comments regarding this rulemaking, specifically including numerous comments that requested greater protections for marine mammals through the mitigation and monitoring measures or clarification on implementation of those measures. NMFS continues to receive information generated by current offshore wind development, which helps further inform our incorporation of these public comments into the rule. We have made certain changes described below in

response to public comment or as needed for clarity. In addition, the information found in the preamble of the proposed rule was based on the best available information at the time of publication. Since publication of the proposed rule, new information has become available including NMFS' final 2022 SARs (Hayes *et al.*, 2023), which has been used to update the final rule as appropriate.

The following changes were made to the Purpose and Need for Regulatory Action section of the preamble to this final rule:

We have added regulatory definitions under Legal Authority for the Final Action for the sake of clarity.

The following changes are reflected in the Description of Marine Mammals in the Geographic Area section of the preamble to this final rule:

Given the release of NMFS' final 2022 SARs (Hayes *et al.*, 2023), we have updated the total mortality/serious injury (M/SI) amount for North Atlantic right whales from 8.1 to 31.2. This increase is due to the inclusion of undetected annual M/SI in the total annual serious injury/mortality. In addition, NMFS recently released a technical report identifying that the North Atlantic right whale population size based on sighting history through 2022 was 356 whales, with a 95-percent credible interval ranging from 346 to 363. This information has also been included in the stock abundance column in table 2, "Marine mammal species that may occur in the Project Area and be taken, by harassment."

Given the availability of new information, we have made updates to the UME summaries for multiple species.

The following changes are reflected in the Estimated Take section of the preamble to this final rule:

In consideration of comments received from the Commission, we have increased the amount of take authorized for fin whales during impact pile driving, by Level A harassment, from one to four (based on two group sizes from the AMAPPS dataset) in year 2 and from one to two (based on one group size from AMAPPS) in year 3. Prior to adding this requirement, NMFS considered this proposed increase in take and considered this measure practicable. This decision was additionally supported by an increased number of sightings of fin whales in the Project Area during June, July, and August 2023 (Empire Wind, 2023).

We have also updated our methodology for estimating take authorized for harbor seals, grays seals, long-finned pilot whales, and short-

finned pilot whales, by Level B harassment, and subsequently, updated take by Level B harassment authorized for seal species. Pilot whale and seal guild densities were scaled by local abundances based upon occurrence data (OBIS, 2023; Smith, 2014) to identify the proportion of the guild densities that should be attributed to each species. Species-specific densities were used to calculate exposure estimates for each pilot whale and seal species. Based upon this updated methodology, pilot whale exposure estimates and take estimates have not changed. Updated seal exposure estimates and take estimates are described in tables 22 and 23.

After considering a comment from Clean Ocean Action concerning the take by Level B harassment of bottlenose dolphins and a comment from the Commission regarding attribution of take between the offshore and coastal stocks of bottlenose dolphins on the Ocean Wind 1 project, which was incorporated by reference here in the Commission's comment letter, NMFS has updated the description of take by Level B harassment for the northern migratory coastal stock of bottlenose dolphins, incidental to HRG surveys. While take numbers have not changed, we have taken a finer look at calculating the percentage of take attributed to the two affected bottlenose dolphin stocks. We have included a detailed description of estimating take by Level B harassment, incidental to HRG surveys, for the northern migratory coastal bottlenose dolphin stock in the Negligible Impact and Small Numbers sections of this rule.

The following changes are reflected in the Mitigation section of the preamble to this final rule:

NMFS has re-organized and simplified this section to avoid repeating entirely the requirements provided in the regulatory text.

In response to multiple commenters' concerns regarding noise attenuation, we have added a general requirement that noise levels must not exceed those modeled assuming 10 dB of attenuation and all project vessels must utilize AIS.

In consideration of a recommendation from the Commission and a requirement to increase the minimum visibility zone in the Biological Opinion (BiOp), NMFS has increased the minimum visibility zone for mysticetes for impact pile driving from 1.2 km to 1.5 km to be consistent with the shutdown zone for mysticetes. In the BiOp, the minimum visibility zone was also increased to 1.5 km.

Based on a recommendation by a commenter and a requirement to

increase the visual shutdown zone for North Atlantic right whales in the BiOp, NMFS has increased the visual shutdown zone for North Atlantic right whales for impact pile driving from 1.5 km to any distance. NMFS has also increased the PAM clearance and shutdown zones for North Atlantic right whales to any distance. Prior to increasing the shutdown and clearance zones, NMFS considered these measures internally, and found these measures to be practicable.

Based on multiple commenters' concerns regarding noise attenuation, and as informed by preliminary sound measurements from South Fork Wind, NMFS has added a requirement that two functional noise attenuation devices that reduce noise levels to the modeled harassment isopleths, assuming a 10-dB attenuation, must be used during foundation pile driving. A single bubble curtain alone will not be allowed for use in mitigation.

We clarify that the mitigation measure restricting Project vessels from traveling over 10 kn (5.14 m/s) in the transit corridor, unless Empire Wind conducts real-time acoustic monitoring to detect large whales (including North Atlantic right whales), applies only when other speed restrictions are not in place.

Based on multiple commenters' concerns regarding impacts to North Atlantic right whales from pile driving, we added the requirement that Empire Wind must delay or shutdown if a North Atlantic right whale is acoustically detected at any distance within the 10 km PAM monitoring zone.

Because Empire Wind identified that the soft-start procedure in the proposed rule was concerning regarding engineering feasibility and practicability, we have removed the specific soft-start procedure identified in the proposed rule (but not the requirement to conduct a soft-start) and will provide a practicable soft-start procedure in the LOA.

The following changes are reflected in the Monitoring and Reporting section of the preamble to this final rule:

We have updated the process for obtaining NMFS approval for PSO and PAM Operators to be similar to requirements typically included for seismic (e.g., airgun) surveys and have clarified education, training, and experience necessary to obtain NMFS approval.

In consideration of a recommendation by the Commission and based upon NMFS' internal consideration that this would be a practicable measure, we have added a requirement that the Lead PSO must have a minimum of 90 days of at-sea experience and must have

obtained this experience within the last 18 months.

We have added a requirement to have at least three active PSOs on duty on the pile driving vessel rather than two PSOs, as was originally described in the proposed rule. Addition of this requirement is based on commenters' concerns regarding sufficient marine mammal monitoring and NMFS' evaluation that three PSOs (each covering 120 degrees) will improve the reliability of detection from the pile driving platform.

In response to multiple comments seeking augmented noise reduction technologies, including comments from Oceana, the Natural Resources Defense Council, and the Commission, we have added a requirement stating that Empire Wind must use at least two functional noise attenuation devices that reduce noise levels to the modeled harassment isopleths, assuming 10-dB attenuation, and clarify that a single bubble curtain must not be used. Second, we added requirements that SFV must be conducted on every pile until measured noise levels are at or below the modeled noise levels, assuming 10 dB, for at least three consecutive monopiles and abbreviated SFV monitoring must be conducted on all additional foundation installations to align with the requirements in the BiOp. Third, we have added a requirement that Empire Wind must deploy at least eight hydrophones at four locations (one bottom and one mid-water column at each location) along an azimuth that is likely to see lowest propagation loss and two hydrophones (one bottom and one mid-water) at 750 m, 90 degrees from the primary azimuth during installation of all piles where SFV monitoring is required.

NMFS has changed the submission date from 90 to 180 days prior to the start of pile driving commencement for the Pile Driving Marine Mammal Monitoring Plan and the PAM Plan (noting the Vessel Strike Avoidance and Vibratory Pile Driving Plans retain the 90-day requirement as these activities are very nearshore) to align with the requirements of the BiOp.

In response to a comment from the Natural Resources Defense Council, we have removed the requirements for reviewing data on an annual and biennial basis for adaptive management and instead will make adaptive management decisions as frequently as new information warrants it.

Changes in the Regulatory Text

As described above regarding changes made to the preamble, we have made the following corresponding and

additional changes to the regulatory text in response to public comment, especially those numerous public comments requesting greater mitigation and monitoring measures, or for clarity, as informed by comment and continuing information generated by current offshore wind projects.

For clarity and consistency, we revised three paragraphs in § 217.280, “Specified activity and specified geographical region,” of the regulatory text to fully describe the specified activity, specified geographical region, and requirements imposed on the LOA Holder (Empire Wind).

Due to a change in the Empire Wind final rule and LOA issuance schedule, we updated the effective dates for these regulations in § 217.281.

For clarity, we revised one paragraph in § 217.282, “Permissible methods of taking,” to fully describe the specified geographical area.

In response to several commenters’ concerns regarding strengthening mitigation and monitoring measures, NMFS has added a requirement for confirmation of all required training to be documented on a training course log sheet and reported to NMFS before initiating project activities. 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.

NMFS has also added a requirement that the marine mammal monitoring team must monitor available sources of information on North Atlantic right whale presence in or near the Project Area no less than every 4 hours.

In § 217.284(a)(4), NMFS has clarified that any visual observation of marine mammals, as opposed to ESA-listed marine mammals, must be communicated to PSOs and vessel captains.

NMFS has added additional clarification on the authority of PSOs and PAM operators in § 217.284(a)(7) to ensure compliance and proper implementation of the regulations.

NMFS has specified that any visual or acoustic detection of a North Atlantic right whale must trigger a delay in commencement of pile driving and HRG surveys.

In consideration of multiple commenters’ concerns regarding vessel transparency, including those concerns expressed by Oceana, NMFS has added a requirement that all project vessels must utilize AIS.

NMFS has included a requirement for Empire Wind to consent to onsite observations and inspections by Federal personnel during project activities.

NMFS has added a prohibition to interfering with PSO or PAM operator responsibilities.

NMFS has clarified that all underway vessels requiring a dedicated visual observer would be transiting within the specified geographic area.

NMFS has added a requirement for any large whale sighting to be communicated to all project-associated vessels, and for a large whale sighting log sheet to be retained for the vessel captain’s review each day.

NMFS has clarified the requirement in § 217.284(b)(8) in the proposed rule to specify that this measure applies to vessels traveling in the specified geographic region.

In consideration of several commenters’ concerns regarding strengthening mitigation measures to avoid vessel strike, NMFS has removed the requirement in § 217.284(b)(16) in the proposed rule for any underway vessel to avoid speed over 10 kn (18.5 km/hr) or abrupt changes in course direction until an animal is on a path away from the separation distance. The current requirement in § 217.284(b) requires vessels to reduce speed and shift engine to neutral if an animal is within the separation distance.

NMFS has updated the requirement in § 217.284(b)(17) in the proposed rule that a North Atlantic right whale detection triggers a speed restriction for all vessels (previously only crew transfer vessels) within 10 km for a 24-hour period (previously 12-hour period).

NMFS has updated the requirement for submission of a North Atlantic vessel strike avoidance plan from 90 to 180 days prior to commencement of vessel use.

For clarity, NMFS has updated the term “foundation impact pile driving” to “foundation pile driving.”

Because Empire Wind identified that the soft-start procedure in the proposed rule was concerning regarding engineering feasibility and practicability, we have removed the specific soft-start procedure identified in the proposed rule (but not the requirement to conduct a soft-start) and will provide a practicable soft-start procedure in the LOA.

NMFS has clarified boundaries for observations of North Atlantic right whales that trigger a delay in the commencement of pile driving.

In response to multiple comments seeking augmented noise reduction technologies, including those from Oceana, the Natural Resources Defense Council, and the Commission, NMFS has added a requirement that two functional noise attenuation devices

that reduce noise levels to the modeled harassment isopleths, assuming 10-dB attenuation must be used during impact pile driving, and a single bubble curtain may not be used.

NMFS has clarified requirements for PAM systems, including a requirement for the PAM system to be able to detect a vocalization of North Atlantic right whales up to 10 km away.

NMFS has increased the minimum requirement for PSOs on the pile driving platform. As described above, addition of this requirement is based on commenters’ concerns regarding sufficient marine mammal monitoring and NMFS’ evaluation that 3 PSOs (each covering 120 degrees) will improve the reliability of marine mammal detection from the pile driving platform.

NMFS has added a requirement for Empire Wind to conduct abbreviated SFV measurements on all piles for which thorough SFV monitoring is not being conducted to align with requirements of the BiOp and public requests for noise abatement. In consideration of a comment from the MMC, NMFS has also added more specific requirements for SFV measurements and reporting, including the submission of interim reports and description of information required for reports, conducting additional in-situ measurements, and equipment calibration.

In consideration of Oceana’s comment regarding frequent reporting to federal agencies, NMFS has added a requirement for Empire Wind to submit 48-hour interim reports after each foundation is measured using thorough SFV. Abbreviated SFV reports are due weekly.

NMFS has clarified requirements applying to HRG surveys operating sub-bottom profilers (SBPs) in § 217.284(e) to ensure compliance and proper implementation of the regulations.

In consideration of multiple commenters’ concerns regarding HRG survey acoustic impacts and effective mitigation measures, NMFS has added a requirement for acoustic source ramp-ups to be scheduled in order to minimize the time spent with the source activated.

For fishery monitoring surveys, NMFS has added multiple requirements designed to further augment mitigation and minimization of impacts to marine mammals in alignment with public comment, including quick emptying of gear after retrieval, labeling all gear, and marine mammal avoidance requirements.

The following changes are reflected in § 217.285, “Requirements for monitoring and reporting,” and the

associated Monitoring and Reporting section of the preamble to this final rule:

NMFS has added a requirement for all PSOs and PAM operators to have successfully completed a relevant training course within the last 5 years and to submit the certificate of course completion in order to further clarify PSO requirements to ensure compliance.

NMFS has further clarified PAM operator qualifications as well as PSO and PAM training requirements in § 217.285 to ensure compliance and proper implementation of regulations. This additional clarification includes detailed requirements for prior experience, being independent observers, ability for PAM operators to review and classify acoustic detections in real-time, PSO marine mammal identification and behavior training to focus on species specific to the North Western Atlantic Ocean, and PSO and PAM training to have been completed within the past 5 years and have included a certificate of course completion. NMFS has specified that Empire Wind must submit the names of NMFS previously approved PSOs and PAM operators at least 30 days prior to commencement of the specified activities and 15 days prior to when new PSOs/PAM operators are required after activities have commenced.

NMFS has specified the following additional details in § 217.285(b) to clarify PSO and PAM operator requirements in order to ensure compliance and proper implementation of regulations: PAM operators may be located remotely or on-shore, and must assist PSOs in ensuring full coverage of the clearance and shutdown zones; PSOs must monitor for marine mammals prior to, during, and following impact pile driving, vibratory pile driving, and HRG surveys that use sub-bottom profilers and monitoring must be done while free from distractions; all on-duty PSOs and PAM operator(s) are to remain in real-time contact with the on-duty construction personnel responsible for implementing mitigations; and 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.

NMFS has clarified the following requirements for monitoring during fishery surveys to ensure compliance and proper implementation of regulations: All captains and crew conducting fishery surveys must be trained in marine mammal detection and identification and marine mammal monitoring must be conducted within 1

nmi from the planned survey location by the trained captain and/or a member of the scientific crew for 15 minutes prior to deploying gear, throughout gear deployment and use, and for 15 minutes after haul back. In addition, NMFS has specified that any dates in reports for NMFS must be in the MM/DD/YYYY format, and location information must be provided in Decimal Degrees and with the coordinate system information.

NMFS has added additional requirements for inclusion in SFV reports in consideration of the MMC's concerns for the information included in any SFV report to be specified.

NMFS has clarified that final annual reports 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.

In consideration of the Commission's concerns for underestimating takes by Level A harassment and Level B harassment, NMFS has added a requirement that 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, Empire Wind must inform NMFS Office of Protected Resources within one business day of becoming aware of this issue or before the next pile is driven, whichever comes first.

NMFS has added specific regional contact information for reporting North Atlantic right whale sightings and stranded, entangled, injured, or dead marine mammals.

NMFS had added a requirement to report observations of any large whale (other than North Atlantic right whales) to the WhaleAlert app.

NMFS has added a requirement that Empire Wind must report any lost gear associated with the fishery surveys to the NMFS GARFO Protected Resources Division (nmfs.gar.incidental-take@noaa.gov) as soon as possible or within 24 hours of the documented time of missing or lost gear.

Description of Marine Mammals in the Geographic Area

As noted in the Changes from the Proposed to Final Rule section, updates have been made to the abundance estimate for North Atlantic right whales and to the UME summaries of multiple species. These changes are described in

detail in the sections below and, otherwise, the marine mammal information has not changed since the proposed rule.

Thirty-eight marine mammal species under NMFS' jurisdiction have geographic ranges within the western North Atlantic OCS (Hayes *et al.*, 2023). Sections 3 and 4 of Empire Wind's ITA application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species (Empire Wind, 2022). Additional information regarding population trends and threats may be found in NMFS's SARs (<https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments>) and more general information about these species (e.g., physical and behavioral descriptions) may be found on NMFS's website (<https://www.fisheries.noaa.gov/find-species>).

Table 2 lists all species and stocks for which take is expected and authorized for this action, and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA, and provides the PBR, where known. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (16 U.S.C. 1362(20)), as described in NMFS's SARs. While no mortality is anticipated or authorized, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's U.S. Atlantic and Gulf of Mexico SARs. All values presented in table 2 are the most recent available at the time of publication and are available in NMFS' 2022 draft SARs available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports>.

TABLE 2—MARINE MAMMAL SPECIES THAT MAY OCCUR IN THE PROJECT AREA AND BE TAKEN BY HARASSMENT

Common name ¹	Scientific name	Stock	ESA/ MMPA status; strategic (Y/N) ²	Stock abundance (CV, N _{min} , most recent abundance survey) ³	PBR	Annual M/SI ⁴
Order Artiodactyla—Cetacea—Superfamily Mysticeti (baleen whales)						
Family Balaenidae: North Atlantic right whale ...	<i>Eubalaena glacialis</i>	Western Atlantic	E, D, Y	338 (0; 332; 2020), 356 (346–363, 2022) ⁵ .	0.7	⁶ 31.2
Family Balaenopteridae (rorquals):						
Fin whale	<i>Balaenoptera physalus</i>	Western North Atlantic	E, D, Y	6,802 (0.24; 5,573; 2016)	11	1.8
Sei whale	<i>Balaenoptera borealis</i>	Nova Scotia	E, D, Y	6,292 (1.02; 3,098; 2016)	6.2	0.8
Minke whale	<i>Balaenoptera acutorostrata</i>	Canadian Eastern Coastal	-, -, N	21,968 (0.31; 17,002; 2016).	170	10.6
Humpback whale	<i>Megaptera novaeangliae</i>	Gulf of Maine	-, -, N	1,396 (0; 1,380; 2016) ...	22	12.15
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Physteridae: Sperm whale	<i>Physeter macrocephalus</i>	North Atlantic	E, D, Y	4,349 (0.28; 3,451; 2016)	3.9	0
Family Delphinidae:						
Atlantic white-sided dolphin	<i>Lagenorhynchus acutus</i>	Western North Atlantic	-, -, N	93,233 (0.71; 54,433; 2016).	544	27
Atlantic spotted dolphin	<i>Stenella frontalis</i>	Western North Atlantic	-, -, N	39,921 (0.27; 32,032; 2016).	320	0
Bottlenose dolphin	<i>Tursiops truncatus</i>	Western North Atlantic Off- shore.	-, -, N	62,851 (0.23; 51,914; 2016).	519	28
Long-finned pilot whales ...	<i>Globicephala melas</i>	Northern Migratory Coastal	-, -, Y	6,639 (0.41; 4,759; 2016)	48	12.2–21.5
Short-finned pilot whales ...	<i>Globicephala macrorhynchus</i> ...	Western North Atlantic	-, -, N	39,215 (0.3; 30,627; 2016).	306	29
Risso's dolphin	<i>Grampus griseus</i>	Western North Atlantic	-, -, N	28,924 (0.24; 23,637; 2016).	236	136
Common dolphin	<i>Delphinus delphis</i>	Western North Atlantic	-, -, N	35,215 (0.19; 30,051; 2016).	301	34
Family Phocoenidae (por- poises):						
Harbor porpoise	<i>Phocoena phocoena</i>	Gulf of Maine/Bay of Fundy	-, -, N	172,897 (0.21; 145,216; 2016).	1,452	390
					851	16
Order Carnivora—Superfamily Pinnipedia						
Family Phocidae (earless seals):						
Gray seal ⁷	<i>Halichoerus grypus</i>	Western North Atlantic	-, -, N	27,300 (0.22; 22,785; 2016).	1,458	4,453
Harbor seal	<i>Phoca vitulina</i>	Western North Atlantic	-, -, N	61,336 (0.08; 57,637; 2018).	1,729	339
Harp seal ⁸	<i>Pagophilus grownlandicus</i>	Western North Atlantic	-, -, N	7,600,000 (UNK, 7,100,000).	426,000	178,573

¹ Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (<https://www.marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies>; Committee on Taxonomy, 2022).

² ESA status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

³ NMFS marine mammal SARs online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments> (Hayes et al., 2023). CV is the coefficient of variation; N_{min} is the minimum estimate of stock abundance. In some cases, CV is not applicable.

⁴ These values, found in NMFS' SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (e.g., commercial fisheries, ship strike).

⁵ The current SAR includes an estimated population (N_{best} 338) based on sighting history through November 2020 (Hayes et al., 2023). In October 2023, NMFS released a technical report identifying that the North Atlantic right whale population size based on sighting history through 2022 was 356 whales, with a 95-percent credible interval ranging from 346 to 363 (Linden, 2023).

⁶ Total annual average observed North Atlantic right whale mortality during the period 2016–2020 was 8.1 animals and annual average observed fishery mortality was 5.7 animals. Numbers presented in this table (31.2 total mortality and 22 fishery mortality) are 2015–2019 estimated annual means, accounting for undetected mortality and serious injury.

⁷ NMFS' stock abundance estimate (and associated PBR value) applies to the U.S. population only. Total stock abundance (including animals in Canada) is approximately 451,431. The annual M/SI value given is for the total stock.

⁸ Harp seals are rare in the region; however, stranding data suggest this species may be present during activities that may take marine mammals.

All 38 species that could potentially occur in the Project Area are included in table 12 of the Empire Wind ITA application and are discussed therein (Empire Wind, 2022). While the majority of these species have been documented or sighted off the New York coast in the past, for the species and

stocks not listed in table 2, NMFS considers it unlikely that their occurrence would overlap the activity in a manner that would result in harassment, either because of their spatial occurrence (i.e., more northern or southern ranges) and/or with the geomorphological characteristics of the

underwater environment (i.e., water depth in the development area). A detailed description of the species likely to be affected by Empire Wind's project, including brief introductions to the species and relevant stocks, information regarding population trends and threats, and information regarding

local occurrence, were provided in the proposed rule (88 FR 22696, April 13, 2023). Since that time, we are not aware of any changes in the status of the species and stocks listed in table 2; therefore, detailed descriptions are not provided here. Please refer to the proposed rule for these descriptions (88 FR 22696, April 13, 2023). Please also refer to NMFS’ website (<https://www.fisheries.noaa.gov/find-species>) for generalized species accounts.

Since the publication of the proposed rule, the following updates have occurred to the below species in regards to general information or their active UMEs.

North Atlantic Right Whale

In August 2023, NMFS released its final 2022 SARs, which updated the population estimate (N_{best}) of North Atlantic right whales from 368 to 338 individuals and the annual M/SI value from 8.1 to 31.2 due to the addition of estimated undetected mortality and serious injury, as described above, which had not been previously included in the SAR. The population estimate is slightly lower than the “North Atlantic Right Whale Consortium’s 2022 Report Card”, which identifies the population estimate as 340 individuals (Pettis *et al.*, 2023). In October 2023, NMFS released a technical report identifying that the North Atlantic right whale population size based on sighting history through 2022 was 356 whales, with a 95-percent credible interval ranging from 346 to 363 (Linden, 2023). The Northeast Fisheries Science Center (NEFSC) completed both technical and policy reviews of this report. Elevated North Atlantic right whale mortalities have occurred since June 7, 2017, along the United States and Canadian coast, with the leading category for the cause of death for this UME determined to be “human interaction,” specifically from entanglements or vessel strikes. As of November 30, 2023, there have been 36 confirmed mortalities (dead stranded or floaters), 0 pending mortalities, and 34 seriously injured free-swimming whales for a total of 70 whales. As of October 14, 2022, the UME also considers

animals (n=51) with sublethal injury or illness (*i.e.*, “morbidity”) bringing the total number of whales in the UME to 121. More information about the North Atlantic right whale UME is available online at: <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2023-north-atlantic-right-whale-unusual-mortality-event>.

Humpback Whale

Since January 2016, elevated humpback whale mortalities have occurred along the Atlantic coast from Maine to Florida. This event was declared a UME in April 2017. As of November 30, 2023 (*i.e.*, updated since the proposed rule), partial or full necropsy examinations have been conducted on approximately half of the 212 known cases. Of the approximately 90 whales examined, about 40 percent had evidence of human interaction, either by vessel strike or entanglement (refer to <https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2023-humpback-whale-unusual-mortality-event-along-atlantic-coast>). While a portion of the whales have shown evidence of pre-mortem vessel strike, this finding is not consistent across all whales examined and more research is needed. NOAA is consulting with researchers that are conducting studies on the humpback whale populations, and these efforts may provide information on changes in whale distribution and habitat use that could provide additional insight into how these vessel interactions occurred. More information is available at: <https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2023-humpback-whale-unusual-mortality-event-along-atlantic-coast>.

Minke Whale

Since January 2017, elevated minke whale mortalities detected along the Atlantic coast from Maine through South Carolina resulted in the declaration of a UME. As of November 30, 2023 (*i.e.*, updated since the proposed rule), a total of 160 minke whales have stranded during the UME. Full or partial necropsy examinations

were conducted on more than 60 percent of the whales. Preliminary findings have shown evidence of human interactions or infectious disease in several of the whales, but these findings are not consistent across all of the whales examined and more research is needed. This UME has been declared non-active and is pending closure. More information is available at: <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2022-minke-whale-unusual-mortality-event-along-atlantic-coast>.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65-dB threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in table 3.

TABLE 3—MARINE MAMMAL HEARING GROUPS [NMFS, 2018]

Hearing group	Generalized hearing range *
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kilohertz (kHz).
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz.
High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger & L. australis).	275 Hz to 160 kHz.

TABLE 3—MARINE MAMMAL HEARING GROUPS—Continued
[NMFS, 2018]

Hearing group	Generalized hearing range *
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz.

* Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65-dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al.*, 2007) and PW pinniped (approximation).

The pinniped functional hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.*, 2006; Kastelein *et al.*, 2009; Reichmuth and Holt, 2013).

NMFS notes that in 2019a, Southall *et al.* recommended new names for hearing groups that are widely recognized. However, this new hearing group classification does not change the weighting functions or acoustic thresholds (*i.e.*, the weighting functions and thresholds in Southall *et al.* (2019a) are identical to NMFS 2018 Revised Technical Guidance). When NMFS updates our Technical Guidance, we will be adopting the updated Southall *et al.* (2019a) hearing group classification.

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

The effects of underwater noise from the Project activities have the potential to result in the harassment of marine mammals in the vicinity of the Project Area. The proposed rule (88 FR 22696, April 13, 2023) included a discussion of the effects of anthropogenic noise on marine mammals and the potential effects of underwater noise from the Project activities on marine mammals and their habitat. That information and analysis is adopted by reference into this final rule determination and is not repeated here. Please refer to the proposed rule (88 FR 22696, April 13, 2023).

Since the publication of the proposed rule, new scientific information has become available that provides additional insight into the sound fields produced by turbine operation (HDR, Inc., 2023; Holme *et al.*, 2023). Recently, Holme *et al.* (2023) stated that Tougaard *et al.* (2020) and Stöber and Thomsen (2021) extrapolated levels for larger turbines and should be interpreted with caution since both studies relied on data from smaller turbines (0.45 to 6.15 MW) collected over a variety of environmental conditions. They demonstrated that the model presented in Tougaard *et al.* (2020) tends to

overestimate levels (up to approximately 8 dB) measured to those in the field, especially with measurements closer to the turbine for larger turbines. Holme *et al.* (2023) measured operational noise from larger turbines (6.3 and 8.3 MW) associated with three wind farms in Europe and found no relationship between turbine activity (*i.e.*, power production, which is proportional to the blade's revolutions per minute) and noise level. However, it was noted that this missing relationship may have been masked by the area's relatively high ambient noise sound levels. Sound levels (*i.e.*, root-mean-square (RMS)) of a 6.3 MW direct-drive turbine were measured to be 117.3 dB at a distance of 70 meters. However, measurements from 8.3 MW turbines were inconclusive as turbine noise was deemed to have been largely masked by ambient noise.

In addition, operational turbine measurements from the Coastal Virginia Offshore Wind pilot pile project indicated that noise levels from two, 7.8 m monopiles WTGs were higher when compared to Block Island wind farm, likely due to vibrations associated with the monopiles structure (HDR, Inc., 2023). We note that this updated information does not change our assessment for impacts of turbine operational sound on marine mammals. As described in the proposed rule, NMFS will require Empire Wind to measure operational noise levels, however, is not authorizing take incidental to operational noise from WTGs.

Estimated Take

This section provides an estimate of the number of incidental takes authorized through this rulemaking, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Minor changes to the estimated and authorized take for several species have been made since publication of the proposed rule based on recommendations received during the public comment period and the best available science. These changes are described in the Changes from the

Proposed to Final Rule section above and in the sections below. Otherwise, the methodology for, and amount of, estimated take has not changed since the proposed rule.

Authorized takes would primarily be by Level B harassment, as use of the acoustic sources (*i.e.*, impact and vibratory pile driving and site characterization surveys) have the potential to result in disruption of marine mammal behavioral patterns due to exposure to elevated noise levels. Impacts such as masking and TTS can contribute to behavioral disturbances. There is also some potential for auditory injury constituting Level A harassment to occur in select marine mammal species incidental to the specified activities (*i.e.*, impact pile driving). For this action, this potential is limited to mysticetes due to their hearing sensitivities and the nature of the activities. As described below, the larger distances to the PTS thresholds, when considering marine mammal weighting functions, demonstrate this potential. For mid-frequency hearing sensitivities, when thresholds and weighting and the associated PTS zone sizes are considered, the potential for PTS from the noise produced by the Project is negligible. The required mitigation and monitoring measures are expected to minimize the severity of the taking to the extent practicable.

As described previously, no serious injury or mortality is anticipated or authorized for this project. Below, we describe how the take was estimated.

Generally speaking, NMFS estimates take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and (4) and the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively

inform take estimates is also sometimes available (e.g., previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the authorized take estimates.

Marine Mammal Acoustic Thresholds

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment). Thresholds have also been developed identifying the received level of in-air sound above which exposed pinnipeds would likely be behaviorally harassed. A summary of all NMFS' thresholds can be found at (<https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance>).

Level B harassment— Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source or exposure context (e.g., frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (e.g., other noises in the area) and the state of the receiving animals (e.g., hearing,

motivation, experience, demography, life stage, depth), and can be difficult to predict (e.g., Southall *et al.*, 2007, 2021; Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared pressure received levels (RMS SPL) of 120 dB (re 1 μ Pa) for continuous (e.g., vibratory pile driving, drilling) and above RMS SPL 160 dB re 1 μ Pa for non-explosive impulsive (e.g., seismic airguns) or intermittent (e.g., scientific sonar) sources (table 4). Generally speaking, Level B harassment take estimates based on these behavioral harassment thresholds are expected to include any likely takes by TTS as, in most cases, the likelihood of TTS occurs at distances from the source less than those at which behavioral harassment is likely. TTS of a sufficient degree can manifest as behavioral harassment, as reduced hearing sensitivity and the potential reduced opportunities to detect important signals (e.g., conspecific communication, predators,

prey) may result in changes in behavior patterns that would not otherwise occur.

Empire Wind's construction activities include the use of continuous (e.g., vibratory pile driving) and intermittent (e.g., impact pile driving and HRG acoustic sources) sources; therefore, the 120 and 160 dB re 1 μ Pa (RMS) thresholds are applicable.

Level A harassment— NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0; Technical Guidance, 2018) identifies dual criteria to assess auditory injury constituting Level A harassment to five different marine mammal groups based on hearing sensitivity as a result of exposure to noise from two different types of sources (i.e., impulsive or non-impulsive sources). As dual metrics, NMFS considers onset of PTS constituting Level A harassment to have occurred when either one of the two metrics is exceeded (i.e., metric resulting in the largest isopleth). The Project includes the use of impulsive and non-impulsive sources.

These thresholds are provided in table 4 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2018 Technical Guidance, which may be accessed at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance>.

TABLE 4—ONSET OF PTS
[NMFS, 2018]

Hearing group	PTS onset thresholds* (received level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	<i>Cell 1:</i> $L_{p,0-pk,flat}$: 219 dB; $L_{E,p, LF,24h}$: 183 dB	<i>Cell 2:</i> $L_{E,p, LF,24h}$: 199 dB.
Mid-Frequency (MF) Cetaceans	<i>Cell 3:</i> $L_{p,0-pk,flat}$: 230 dB; $L_{E,p, MF,24h}$: 185 dB	<i>Cell 4:</i> $L_{E,p, MF,24h}$: 198 dB.
High-Frequency (HF) Cetaceans	<i>Cell 5:</i> $L_{p,0-pk,flat}$: 202 dB; $L_{E,p, HF,24h}$: 155 dB	<i>Cell 6:</i> $L_{E,p, HF,24h}$: 173 dB.
Phocid Pinnipeds (PW) (Underwater)	<i>Cell 7:</i> $L_{p,0-pk,flat}$: 218 dB; $L_{E,p, PW,24h}$: 185 dB	<i>Cell 8:</i> $L_{E,p, PW,24h}$: 201 dB.
Otariid Pinnipeds (OW) (Underwater)	<i>Cell 9:</i> $L_{p,0-pk,flat}$: 232 dB; $L_{E,p, OW,24h}$: 203 dB	<i>Cell 10:</i> $L_{E,p, OW,24h}$: 219 dB.

* Dual metric thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds are recommended for consideration.

Note: Peak sound pressure level ($L_{p,0-pk}$) has a reference value of 1 μ Pa, and weighted cumulative sound exposure level ($L_{E,p}$) has a reference value of 1 μ Pa²s. In this table, thresholds are abbreviated to be more reflective of International Organization for Standardization standards (ISO, 2017). The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals (i.e., 7 Hz to 160 kHz). The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these thresholds will be exceeded.

Below, we discuss the acoustic modeling, marine mammal density information, and take estimation for each of Empire Wind's construction activities. NMFS has carefully considered all information and analysis presented by the applicant as well as all other applicable information and, based on the best available science, concurs that the applicant's estimates of the types and amounts of take for each species and stock are complete and accurate.

Marine Mammal Densities

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations.

Habitat-based density models produced by the Duke University Marine Geospatial Ecology Laboratory and the Marine-life Data and Analysis Team, based on the best available marine mammal data from 1992 to 2022 obtained in a collaboration between Duke University, the Northeast Regional Planning Body, the University of North Carolina Wilmington, the Virginia Aquarium and Marine Science Center, and NOAA (Roberts *et al.*, 2016a, 2016b, 2017, 2018, 2020, 2021a, 2021b, 2023), represent the best available science regarding marine mammal densities in the Project Area. More recently, these data have been updated with new modeling results and include density estimates for pinnipeds (Roberts *et al.*, 2016b, 2017, 2018, 2023). Density data are subdivided into five separate raster data layers for each species, including: Abundance (density); 95 percent Confidence Interval of Abundance; 5 percent Confidence Interval of Abundance; Standard Error of Abundance; and Coefficient of Variation of Abundance.

Empire Wind's initial densities and take estimates were included in the ITA application that was considered Adequate & Complete on August 11, 2022, in line with NMFS' standard ITA guidance (<https://www.fisheries.noaa.gov/national/marine-mammal-protection/apply-incident-take-authorization>). However, on June 20, 2022, the Duke Marine Geospatial Ecology Laboratory released a new, and more comprehensive, set of marine mammal density models for the area along the East Coast of the United States (Roberts *et al.*, 2023). The differences between the new density data and the older data necessitated the use of updated marine mammal densities and, subsequently, revised marine mammal take estimates. This information was provided to NMFS as an addendum to the application on

January 25, 2023, after continued discussion between Empire Wind and NMFS, and NMFS has considered it in this analysis. The application addendum was made public on NMFS' website (https://www.fisheries.noaa.gov/action/incidental-take-authorization-empire-offshore-wind-llc-construction-empire-wind-project-ew1?check_logged_in=1).

For foundation installation, the width of the perimeter around the activity area used to select density data from the Duke models was based on the largest 10-dB attenuated exposure range (the Level B harassment range) applicable to that activity and then rounded up to the nearest 0.5-km increment (10 km), which reflects the spatial resolution of the Roberts *et al.* (2023) density models. Empire Wind determined the mean density for each month by calculating the unweighted mean of all 5 x 5 km grid cells partially or fully within the analysis polygon (Roberts *et al.*, 2023). The monthly densities for an entire year were calculated to coincide with possible planned activities.

Empire Wind assumed that a maximum of 24 monopiles could be installed per month, with a maximum of 96 WTG monopiles and two OSS foundations installed in year 2 (2025) and the remaining 51 WTG monopile foundations installed in year 3 (2026). In year 2 (2025), Empire Wind assumed that 24 monopiles would be installed in the four highest-density months for each species during the May to December period and the two OSSs would be installed in the highest and second-highest-density months. Empire Wind also assumed that all 17 difficult-to-drive piles would be installed in the first year of pile driving but the distribution would be spread relatively evenly among the four highest months (*i.e.*, four piles per month except the highest-density month which assumed 5 difficult-to-drive piles for a total of 17 piles). In the second year of pile driving, 24 monopiles would be installed in the two highest-density months and the remaining 3 monopiles would be installed in the third-highest-density month. Thus, each species was presumed to be exposed to the maximum amount of pile driving based on their monthly densities (table 6). This was determined to be the most conservative approach to generate potential installation schedules for animal exposure calculation.

For cofferdam and goal post density estimates, Empire Wind used the modeled acoustic range distance to the Level B harassment threshold to calculate the ensonified area around the source of the cofferdam or goal post

installation activity (see the *Temporary Cofferdam and/or Goal Post Installation and Removal (Vibratory Pile Driving) Take Estimates* section below). Empire Wind averaged the maximum monthly densities by season as reported by Roberts *et al.* (2023): Spring (March through May), summer (June through August), fall (September through November), and winter (December through February). To be conservative, the maximum average seasonal density for each species was then carried forward in the take calculations.

To estimate densities for the HRG surveys occurring both within the Lease Area and within the export cable routes, Empire Wind mapped density data from Roberts *et al.* (2023) within the boundary of the Project Area using geographic information systems. Empire Wind averaged maximum monthly densities (as reported by Roberts *et al.*, 2023) by season over the survey duration (for winter (December through February), spring (March through May), summer (June through August), and fall (September through November)) within the HRG survey area. The maximum average seasonal density, for each species, was then carried forward in the take calculations (table 6).

NMFS notes several exceptions to the determination of the relevant densities for some marine mammal species to the method described above. These are described here in greater detail. For several marine mammal species, Roberts *et al.* (2023) does not differentiate by stock. This is true for the bottlenose dolphins, for which take has been authorized for two stocks (coastal migratory and offshore stock) for Empire Wind. This is also true for long-finned and short-finned pilot whales (pilot whale spp.) and harbor and gray seals (seals), where a pooled density is the only value available from the data that is not partitioned by stock.

To account for this, the coastal migratory and offshore stocks of bottlenose dolphins were adjusted based on the 20-m isobath cutoff, such that take predicted to occur in any area less than 20 m in depth was apportioned to the coastal stock only and take predicted to occur in waters of greater than 20 m of depth was apportioned to the offshore stock. Given the noise from cofferdam installation would not extend beyond the 20-m isobath, where the coastal stock of bottlenose dolphins predominates, it is expected that only the coastal stock is likely to be taken by this activity. As the density models do not account for group size and the resulting calculated exposures were very small, the predicted take for cofferdam installation and removal

activities was increased to account for the exposure of one average-sized group per day each of bottlenose and common dolphins.

In order to calculate exposures for gray seals, harbor seals, short-finned pilot whales, and long-finned pilot whales, the guild densities were scaled by relative local abundances of each species in each guild, using the best available estimates of local abundance, to get species-specific density estimates for the Project Area for impact pile driving activities. In estimating local abundances, all distribution data for gray seals, harbor seals, and both species of pilot whales were downloaded from the OBIS data repository (<https://www.obis.org>). After reviewing the available datasets, Empire Wind determined that data available in OBIS from the Mystic Aquarium of marine mammal strandings along the north shore of the Long Island Sound represent the best available data of relative abundances of gray seals, harbor seals, and both pilot whale species in the Project Area due to their proximity to the Project Area and a lack of sightings data for these species in offshore waters near the Lease Area. For the seals, Empire Wind used the Smith (2014) dataset to scale seal densities.

The Mystic Aquarium reported 107 observations of gray seals and 209 observations of harbor seals. Empire Wind used the proportions of 0.34 (which is equal to 107 gray seal observations divided by 316 total gray and harbor seal observations) and 0.66 (which is equal to 209 harbor seal observations divided by 316 total gray and harbor seal observations) to scale seal guild densities. The limited number of observations of gray and harbor seals near the Project Area (*i.e.*, two gray seal sightings, three harbor seal sightings) in the larger OBIS database supports this method (OBIS, 2023), and NMFS agrees with this approach. For pilot whales, the animal movement modeling showed no exposures above any threshold, so scaling was not necessary.

For some species and activities, observational data from PSOs aboard HRG and geotechnical survey vessels indicate that the density-based exposure estimates may be insufficient to account for the number of individuals of a species that may be encountered during the planned activities. A review of Empire Wind’s PSO sightings data ranging from 2018 to 2023 for the Project Area indicated that exposure estimates based on the exposure modeling methodology for some species

were likely underestimates for humpback whales, fin whales, and pilot whales. These findings are described in greater detail below.

For other less-common species, the predicted densities from Roberts *et al.* (2023) are very low, and the resulting density-based exposure estimate is less than a single animal or a typical group size for the species. In such cases, the mean group size or PSO data was considered. Mean group sizes for each species were calculated from recent aerial and/or vessel-based surveys, as shown in table 5. Group size data were also used to estimate take from marina activities given there is no density data available for the area given its inshore location. Additional detail regarding the density and occurrence as well as the assumptions and methodology used to estimate take for specific activities is included in the activity-specific subsections below.

Tables 5 and 6, below demonstrate all of the densities used in the exposure and take analyses. Table 7 shows the average marine mammal group sizes used to adjust take estimate calculations.

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Table 5 -- Mean Monthly Marine Mammal Density Estimates within a 10-km Buffer Around OCS-A 0512 Lease Area

Species	Monthly densities (animals/100 km ²) ¹												Annual Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fin whale	0.172	0.139	0.113	0.137	0.174	0.171	0.157	0.1	0.055	0.04	0.038	0.13	0.119
Humpback whale	0.091	0.061	0.076	0.119	0.133	0.113	0.03	0.022	0.054	0.101	0.13	0.113	0.087
Minke whale	0.071	0.06	0.072	0.936	1.485	0.803	0.198	0.107	0.066	0.111	0.026	0.059	0.333

North Atlantic right whale	0.1	0.116	0.115	0.088	0.025	0.006	0.003	0.003	0.004	0.008	0.016	0.05	0.045
Sei whale	0.029	0.016	0.033	0.071	0.055	0.011	0.002	0.002	0.005	0.013	0.037	0.049	0.027
Sperm whale	0.007	0.002	0.002	0.004	0.005	0.011	0.011	0.015	0.003	0	0.008	0.005	0.006
Atlantic white-sided dolphin	0.642	0.399	0.356	0.846	1.373	1.237	0.117	0.049	0.279	0.892	0.863	0.99	0.67
Atlantic spotted dolphin	0.001	0	0.001	0.003	0.01	0.019	0.033	0.072	0.177	0.26	0.133	0.013	0.06
Common dolphin	5.664	1.852	1.246	2.457	3.474	2.835	1.566	1.917	1.623	3.495	7.244	9.177	3.546
Bottlenose dolphin	0.851	0.247	0.205	0.629	2.005	3.232	3.534	2.953	2.552	2.898	2.772	2.52	2.033
Risso's dolphin	0.042	0.005	0.003	0.021	0.034	0.014	0.014	0.007	0.008	0.01	0.056	0.186	0.033
Long-finned pilot whale	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Short-finned pilot whale	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
Harbor porpoise	5.469	5.73	5.916	7.066	2.421	0.347	0.435	0.215	0.13	0.144	0.342	3.757	2.664
Gray seals	4.762	4.505	3.689	4.337	5.968	1.093	0.071	0.049	0.104	0.684	1.625	4.407	2.608

TABLE 6—THE HIGHEST AVERAGE SEASONAL MARINE MAMMAL DENSITIES (ANIMALS PER 100 km²) USED FOR ANALYSIS OF EMPIRE WIND’S HRG SURVEY EFFORT FOR THE PROJECT AREA FROM JANUARY THROUGH DECEMBER

Marine mammal species	Project area highest average seasonal density (No./100 km ²)
Fin whale ^a	0.097
Humpback whale	0.099
Minke whale	0.526
North Atlantic right whale ^a	0.073
Sei whale ^a	0.030
Sperm whale ^a	0.006
Atlantic spotted dolphin	0.058
Atlantic white-sided dolphin	0.469
Bottlenose dolphin ^b	6.299
Common dolphin	2.837
Pilot whale spp	0.019 (Annual)
Risso’s dolphin	0.035
Harbor porpoise	3.177
Gray seal	13.673
Harbor seal	13.673
Harp seal	n/a.

^a Species is listed as endangered under the ESA.

^b Bottlenose dolphin density values from Duke University (Roberts *et al.*, 2023) reported as “bottlenose dolphin” and not identified to stock. HRG survey activities were not differentiated by region relative to the 20-m isobath and therefore bottlenose dolphin takes were not identified to stock.

TABLE 7—AVERAGE MARINE MAMMAL SPECIES GROUP SIZES USED IN TAKE ESTIMATE CALCULATIONS

Marine mammal species	Average group size	Information source
Fin whale	1.25	Palka <i>et al.</i> , 2021.
North Atlantic right whale	1–2 ¹	Roberts <i>et al.</i> , 2023.
Atlantic spotted dolphin	45	Kenney & Vigness-Raposa, 2010.
Atlantic white-sided dolphin	52	Jefferson <i>et al.</i> , 2015.
Bottlenose dolphin	15	Jefferson <i>et al.</i> , 2015.
Common dolphin	30	Reeves <i>et al.</i> , 2002.
Risso’s dolphin	100	Jefferson <i>et al.</i> , 2015.
Sperm whale	3	Barkaszi <i>et al.</i> , 2012.

¹ For North Atlantic right whales, an average group size of one was used for months with mean monthly densities less than 0.01 (June–October). An average group size of two was used for months with mean monthly densities greater than 0.01 to reflect the potential for a mother calf pair (May, November, and December). Densities are based upon Roberts *et al.* (2023). Exposure estimates for impact pile driving were rounded accordingly for these months.

Modeling and Take Estimation

Below, we describe the three methods that were used to estimate take in consideration of the acoustic thresholds and marine mammal densities described above and the three different activities: WTG and OSS foundation installation, temporary cofferdam and goal post installation/removal, and HRG surveys. The take estimates for the three different activities, as well as the combined total, are presented.

WTG and OSS Foundation Installation

As described above, Empire Wind plans to install up to 147 WTGs and 2 OSSs in the Lease Area. Empire Wind modeled three WTG monopile scenarios that could occur during construction, and each was considered in the acoustic modeling conducted to estimate the potential number of marine mammal exposures above relevant harassment thresholds:

(1) 9.6-m monopiles in which typical monopile WTG foundation locations are those where the standard hammer energy would be sufficient to complete installation of the foundation to the target penetration depth;

(2) 9.6-m monopiles in which difficult-to-drive WTG foundation locations would require higher hammer energies and/or additional hammer strikes to complete foundation installation to the target penetration depth; and

(3) 11-m monopiles in which typical monopile WTG foundation locations are those where the standard hammer energy would be sufficient to complete installation of the foundation to the target penetration depth.

Empire Wind assumed various hammer schedules based upon the different WTG monopile scenarios. The various hammer schedules included the hammer energies and number of strikes predicted at various penetration depths during the pile driving process and

different soil conditions. Difficult-to-drive scenarios would only utilize 9.6-m piles as the larger 11-m piles could not be driven to target penetration depth in the soil conditions associated with difficult-to-drive turbine positions. Empire Wind estimates that a maximum of 17 total foundations may be difficult-to-drive (including as many as 7 difficult-to-drive foundations for Empire Wind 1 and as many as 10 difficult-to-drive foundations for Empire Wind 2). The actual number of difficult-to-drive piles will be informed by additional analysis of geotechnical data and other studies that will occur prior to construction but would not be greater than 17 foundations.

The amount of sound generated during pile driving varies with the energy required to drive piles to a desired depth and depends on the sediment resistance encountered. Sediment types with greater resistance require hammers that deliver higher energy strikes and/or an increased

number of strikes relative to installations in softer sediment. Maximum sound levels usually occur during the last stage of impact pile driving where the greatest resistance is encountered (Betke, 2008). Empire Wind developed hammer energy schedules for typical and difficult-to-drive 9.6-m piles and for three different seabed penetration depths for the 11-m diameter piles to represent the various soil conditions that may be encountered

in the Lease Area (*i.e.*, normal soil conditions (identified as “T1”), harder soil conditions (identified as “R3”), and outlier softer soil conditions (identified as “U3”). One OSS foundation scenario was modeled; however, this scenario was modeled at two locations (representing locations in Empire Wind 1 and Empire Wind 2) resulting in two hammer schedules. Empire Wind anticipates the different locations will require different hammer schedules

depending on site-specific soil conditions.

Key modeling assumptions for the WTG monopiles and OSS foundation pin piles are listed in table 8 (additional modeling details and input parameters can be found in Küsel *et al.*, 2022). Hammer energy schedules for WTG monopiles (9.6 m and 11 m) and OSS foundation pin piles are provided in tables 9, 10, and 11 respectively.

TABLE 8—KEY PILING ASSUMPTIONS USED IN THE SOURCE MODELING

Foundation type	Modeled maximum impact hammer energy (kJ)	Pile length (m)	Pile wall thickness (mm)	Seabed penetration (m)	Number of piles per day
9.6-m Monopile	⁴ 2,300/5,500	78.5	73–101	38	1–2
11-m Monopile R3 ¹	2,000	75.3	8.5	35	1–2
11-m Monopile T1 ²	2,500	84.1	8.5	40	1–2
11-m Monopile U3 ³	1,300	97.5	85	55	1–2
OSS Jacket (2.5-m pin pile)	3,200	57–66	50	47–56	2–3

¹ R3 = harder soil conditions.
² T1 = normal soil conditions.
³ U3 = softer soil conditions.
⁴ Typical 2,300; difficult-to-drive 5,500.

TABLE 9—HAMMER ENERGY SCHEDULES FOR MONOPILES UNDER THE TWO 9.6-M PILE DRIVING SCENARIOS
 [9.6-m Diameter pile; IHC S–5500 hammer]

“Typical” pile driving scenario (9.6-m diameter pile)			“Difficult-to-drive” pile driving scenario (9.6-m diameter pile)		
Energy level (kJ)	Strike count	Pile penetration depth (m)	Energy level (kJ)	Strike count	Pile penetration depth (m)
Initial sink depth	0	2	Initial sink depth	0	2
450	1,607	12	450	1,607	12
800	731	5	800	731	5
1,400	690	4	1,400	690	4
1,700	1,050	6	1,700	1,050	6
2,300	1,419	9	2,300	1,087	4
5,500	0	0	5,500	2,000	5
Total	5,497	38	Total	7,615	38
Strike rate (strikes/min)	30		Strike rate (strikes/min)	30	

TABLE 10—HAMMER ENERGY SCHEDULE AND NUMBER OF STRIKES PER MONOPILES UNDER THREE PILE DRIVING SCENARIOS
 [11-m Diameter pile; IHC S–5500 hammer]

Energy level (kJ)	R3-harder soil conditions (11-m monopile)		T1-normal soil conditions (11-m monopile)		U3-softer soil conditions (11-m monopile)	
	Strike count	Pile penetration depth (m)	Strike count	Pile penetration depth (m)	Strike count	Pile penetration depth (m)
Initial Sink Depth .....	.....	1	.....	3	.....	5
450 .....	.....	.....	.....	.....	622	6
500	1,168	14	1,339	14	.....	.....
750	433	3	857	6	2,781	20
1,000 .....	.....	.....	632	4	1,913	12
1,100	265	2	.....	.....	.....	.....
1,300 .....	.....	.....	.....	.....	2,019	12
1,500 .....	.....	.....	1,109	7	.....	.....
2,000	2159	15	326	2	.....	.....

TABLE 10—HAMMER ENERGY SCHEDULE AND NUMBER OF STRIKES PER MONOPILES UNDER THREE PILE DRIVING SCENARIOS—Continued

[11-m Diameter pile; IHC S–5500 hammer]

Energy level (kJ)	R3-harder soil conditions (11-m monopile)		T1-normal soil conditions (11-m monopile)		U3-softer soil conditions (11-m monopile)	
	Strike count	Pile penetration depth (m)	Strike count	Pile penetration depth (m)	Strike count	Pile penetration depth (m)
2,500 .....	.....	.....	656	4	.....	.....
Totals	4,025	35	4,919	40	7,335	55

TABLE 11—HAMMER ENERGY SCHEDULES FOR PIN PILES SUPPORTING THE JACKET FOUNDATIONS LOCATED AT OSS 1 AND OSS 2, WITH AN IHC S–4000 HAMMER

OSS 1 Location			OSS 2 Location		
Energy level (kJ)	Strike count	Pile penetration depth (m)	Energy level (kJ)	Strike count	Pile penetration depth (m)
Initial sink depth	0	8	Initial sink depth	0	5
500	1,799	30	500	1,206	22
750	1,469	12	750	1,153	9
2,000	577	4	1,100	790	7
3,200	495	2	3,200	562	4
Total	4,340	56	3,711	47	
			Total		
Strike rate (strikes/min)	30		Strike rate (strikes/min)	30	

Both monopiles and pin piles were assumed to be vertically aligned and driven to a maximum penetration depth of 38 m (125 ft) for typical and difficult-to-drive 9.6-m monopiles, 55 m (180 ft) for typical 11-m monopiles, and 56 m (184 ft) for pin piles. While pile penetration depths may vary slightly, these values were chosen as reasonable penetration depths during modeling. All acoustic modeling was performed assuming that concurrent pile driving of either monopiles or pin piles would not occur. While multiple piles may be driven within any single 24-hour period, these installation activities would not occur simultaneously. Below we describe the assumptions inherent to the modeling approach and those by which Empire Wind would not exceed:

Modeling assumptions for the Project are as follows:

- Maximum of two, 9.6-m or 11-m monopiles installed per day (3.5 hours per monopile with a 1-hour pre-clearance period; 9 hours total with 7 hours of active pile driving time), although only one monopile may be installed on some days;
- No concurrent monopile and/or pin pile driving and no overlap in pile-driving activities between Empire Wind 1 and Empire Wind 2 would occur;

- Monopiles would be 73–101 millimeters (mm) thick and would be composed of steel;
- Impact Pile Driving for monopiles: IHC S–5500 kilojoules (kJ) rated energy;
- Impact hammers would have a maximum energy capacity of 5,500 kJ;
- Up to three, 2.5-m pin piles installed per day (5 hours per pin pile), although only two pin piles may be installed on some days;
- Pin piles would be 50 mm thick; and
- Impact Pile driving: IHC S–4000 kJ rated energy.

Sound fields produced during impact pile driving were modeled by first characterizing the sound signal produced during pile driving using the industry standard GRL Wave Equation Analysis Program (GRLWEAP) (*i.e.*, the wave equation analysis of pile driving) model and JASCO Pile Driving Source Model (PDSM). We provide a summary of the modeling effort below but the full JASCO modeling report can be found in section 6 and appendix A of Empire Wind’s ITA application (https://www.fisheries.noaa.gov/action/incidental-take-authorization-empire-offshore-wind-llc-construction-empire-wind-project-ew1?check_logged_in=1).

To estimate sound propagation, JASCO used the Marine Operations Noise Model (MONM) and Full Range

Wave Dependent Acoustic Model (FWRAM; Küsel *et al.*, 2022, appendix E.4) to combine the outputs of the source model with spatial and temporal environmental factors (*e.g.*, location, oceanographic conditions, and seabed type) to get time-domain representations of the sound signals in the environment and estimate sound field levels. The lower frequency bands were modeled using MONM and FWRAM, which are based on the parabolic equation (PE) method of acoustic propagation modeling. For higher frequencies, additional losses resulting from absorption were added to the propagation loss model. See appendix G in Empire Wind’s application for a more detailed description of JASCO’s propagation models. FWRAM is based on the wide-angle PE algorithm (Collins, 1993). Because the foundation pile is represented as a linear array and FWRAM employs the array starter method to accurately model sound propagation from a spatially distributed source (MacGillivray and Chapman, 2012), using FWRAM ensures accurate characterization of vertical directivity effects in the near-field zone (1 km). Due to seasonal changes in the water column, sound propagation is likely to differ at different times of the year. The speed of sound in seawater depends on the temperature (degrees Celsius),

salinity (parts per thousand), and depth (m) and can be described using sound speed profiles. Oftentimes, a homogeneous or mixed layer of constant velocity is present in the first few meters. It corresponds to the mixing of surface water through surface agitation. There can also be other features, such as a surface channel, which corresponds to sound velocity increasing from the surface down. This channel is often due to a shallow isothermal layer appearing in winter conditions, but can also be caused by water that is very cold at the surface. In a negative sound gradient, the sound speed decreases with depth, which results in sound refracting downwards which may result in increased bottom losses with distance from the source. In a positive sound gradient, as is predominantly present in the winter season, sound speed increases with depth and the sound is, therefore, refracted upwards, which can aid in long distance sound propagation. To capture this variability, acoustic modeling was conducted using an average sound speed profile for a “summer” period including the months of May through November, and a “winter” period including December through April. FWRAM computes pressure waveforms via Fourier synthesis of the modeled acoustic transfer function in closely spaced frequency bands. Examples of decade spectral levels for each foundation pile type, hammer energy, and modeled location, using average summer sound speed profile are provided in Küsel *et al.* (2022).

Sounds produced by installation of the 9.6- and 11-m monopiles were modeled at nine representative locations as shown in figure 2 in Küsel *et al.* (2022). Sound fields from pin piles were modeled at the two planned jacket foundation locations: OSS 1 and 2. Modeling locations are shown in figure 8 in Küsel *et al.* (2022). The modeling locations were selected as they represent the range of soil conditions and water depths in the Lease Area.

Empire Wind estimated both acoustic ranges and exposure ranges. Acoustic ranges represent the distance to a harassment threshold based on sound propagation through the environment (*i.e.*, independent of any receiver) while exposure range represents the distance at which an animal can accumulate enough energy to exceed a Level A harassment threshold in consideration of how it moves through the environment (*i.e.*, using movement modeling). In both cases, the sound level estimates are calculated from three-dimensional sound fields and then, at each horizontal sampling range,

the maximum received level that occurs within the water column is used as the received level at that range. These maximum-over-depth (R_{max}) values are then compared to predetermined threshold levels to determine acoustic and exposure ranges to Level A harassment and Level B harassment zone isopleths. However, the ranges to a threshold typically differ among radii from a source, and also might not be continuous along a radii because sound levels may drop below threshold at some ranges and then exceed threshold at farther ranges. To minimize the influence of these inconsistencies, 5 percent of the farthest such footprints were excluded from the model data. The resulting range, $R_{95\%}$, was chosen to identify the area over which marine mammals may be exposed above a given threshold, because, regardless of the shape of the maximum-over-depth footprint, the predicted range encompasses at least 95 percent of the horizontal area that would be exposed to sound at or above the specified threshold. The difference between R_{max} and $R_{95\%}$ depends on the source directivity and the heterogeneity of the acoustic environment. $R_{95\%}$ excludes ends of protruding areas or small isolated acoustic foci not representative of the nominal ensounded zone. For purposes of calculating Level A harassment take, Empire Wind applied $R_{95\%}$ exposure ranges, not acoustic ranges, to estimate take and determine mitigation distances for the reasons described below.

In order to best evaluate the SEL_{cum} harassment thresholds for PTS, it is necessary to consider animal movement, as the results are based on how sound moves through the environment between the source and the receiver. Applying animal movement and behavior within the modeled noise fields provides the exposure range, which allows for a more realistic indication of the distances at which PTS acoustic thresholds are reached that considers the accumulation of sound over different durations (note that in all cases the distance to the peak threshold is less than the SEL-based threshold).

As described in section 2.6 of JASCO’s acoustic modeling report for Empire Wind (Küsel *et al.*, 2022), for modeled animals that have received enough acoustic energy to exceed a given Level A harassment threshold, the exposure range for each animal is defined as the closest point of approach (CPA) to the source made by that animal while it moved throughout the modeled sound field, accumulating received acoustic energy. The resulting exposure range for each species is the 95th

percentile of the CPA distances for all animals that exceeded threshold levels for that species ($ER_{95\%}$). The $ER_{95\%}$ ranges are species-specific rather than categorized only by any functional hearing group, which allows for the incorporation of more species-specific biological parameters (*e.g.*, dive durations, swim speeds, *etc.*) for assessing the impact ranges into the model. Furthermore, because these $ER_{95\%}$ ranges are species-specific, they can be used to develop mitigation monitoring or shutdown zones.

Tables 12 through 19 provide exposure ranges for the 9.6-m monopile (typical and difficult-to-drive), 11-m monopile, and OSS foundation pin piles, respectively, assuming 10 dB of attenuation for summer and winter. For tables 12 through 17, a single monopile and two monopiles per day are provided (the two per day ranges are shown in the parenthesis). For tables 18 and 19, two pin piles and three pin piles per day are provided. NMFS notes that monopile foundations constructed for Empire Wind are applicable to all WTGs and may be applicable to OSS structures, depending on the finalized buildout. Please see appendix A of the Empire Wind ITA application, and appendix M of the Empire Wind Construction and Operations Plan (COP) for further details on the acoustic modeling methodology.

Displayed in tables 12 through 20 below, Empire Wind would also employ a noise abatement system during all impact pile driving of monopiles and pin piles. Noise abatement systems (*e.g.*, bubble curtains) are sometimes used to decrease the sound levels radiated from a source. Additional information on sound attenuation devices is discussed in the *Noise Abatement Systems* section under the Mitigation section. In modeling the sound fields for Empire Wind’s planned activities, hypothetical broadband attenuation levels of 0 dB, 6 dB, 10 dB, 15 dB, and 20 dB were modeled to gauge the effects on the ranges to thresholds given these levels of attenuation. The results for 10 dB of sound attenuation are shown below and the other attenuation levels (0 dB, 6 dB, 15 dB, and 20 dB) can be found in the ITA application.

As shown in the tables below, exposure ranges associated with the 9.6-m diameter typical monopile scenario were predominantly greater than for the 11-m diameter monopile scenarios. While larger diameter monopiles can be associated with greater resulting sound fields than smaller diameter piles, in this case, the 11-m diameter monopile scenarios resulted in smaller modeled acoustic ranges than the 9.6-m diameter

monopile scenarios likely because the 11-m monopile would only be installed in softer sediments which would require less hammer energy and/or number of hammer strikes for installation than the 9.6-m diameter pile in harder sediments. Hence, the 9.6-m diameter monopile scenario was carried forward to the exposure analysis to be conservative, for all “typical” monopiles.

TABLE 12—EXPOSURE RANGES (ER_{95%}) TO LEVEL A HARASSMENT PTS (SEL_{cum}) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING OF 9.6-M DIAMETER “TYPICAL” AND “DIFFICULT-TO-DRIVE” MONOPILE FOUNDATIONS (SUMMER), ASSUMING 10-dB ATTENUATION^b

Species	“Typical” (in km)				“Difficult-to-drive” (in km)			
	One pile per day		Two piles per day		One pile per day		Two piles per day	
	Level A harassment (SEL; dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)
LF:								
Fin Whale	0.86	3.18	0.94	3.09	1.35	4.74	1.84	4.51
Minke Whale ^a	0.22	3.13	0.54	3.02	0.89	4.46	0.90	4.45
Humpback Whale ^a	0.24	3.15	0.33	3.01	0.74	4.47	0.69	4.53
North Atlantic Right Whale ^a	0.33	2.89	0.47	2.87	1.09	4.33	1.13	4.30
Sei Whale ^a	0.43	3.09	0.54	3.07	1.04	4.47	1.21	4.52
MF:								
Atlantic White-sided Dolphin	0	2.98	0	2.94	0	4.24	0	4.30
Atlantic Spotted dolphin	0	0	0	0	0	0	0	0
Common Dolphin	0	3.07	0	2.92	0	4.48	0	4.42
Bottlenose Dolphin	0	2.46	0	2.41	0	3.77	0	3.83
Risso’s Dolphin	0	3.07	0	2.93	0	4.73	0	4.41
Long-Finned Pilot Whale	0	0	0	0	0	0	0	0
Short-Finned Pilot Whale	0	0	0	0	0	0	0	0
Sperm Whale	0	3.25	0	2.96	0	4.59	0	4.47
HF:								
Harbor Porpoise	0	3.07	0	3.05	0	4.52	0	4.37
PW:								
Gray Seal	0	3.33	<0.01	3.26	<0.01	4.91	<0.01	4.87
Harbor Seal	0	3.02	0	2.97	0	4.68	0	4.38

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^aSpecies was considered as “migrating” in the analysis.

^bThe values here were found in tables I–19, I–20, I–23, and I–24 in Küsel *et al.*, 2022 (appendix I).

TABLE 13—EXPOSURE RANGES (ER_{95%}) TO LEVEL A HARASSMENT PTS (SEL_{cum}) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING OF 9.6-M DIAMETER “TYPICAL” AND “DIFFICULT-TO-DRIVE” MONOPILE FOUNDATIONS (WINTER), ASSUMING 10-dB ATTENUATION^c

Species	“Typical” (in km)				“Difficult-to-drive” (in km)			
	One pile per day		Two piles per day		One pile per day		Two piles per day	
	Level A harassment (SEL; dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A v harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)
LF:								
Fin Whale	0.88	3.40	1.01	3.46	1.80	5.24	1.95	4.87
Minke Whale ^a	0.26	3.31	0.48	3.29	0.89	4.88	1.05	4.66
Humpback Whale ^a	0.24	3.38	0.36	3.31	0.74	5.10	0.83	5.07
North Atlantic Right Whale ^a	0.43	3.04	0.47	3.11	1.13	4.73	1.19	4.62
Sei Whale ^a	0.43	3.28	0.58	3.43	1.24	4.95	1.29	4.85
MF:								
Atlantic White-sided Dolphin	0	3.30	0	3.19	0	4.73	0	4.72
Atlantic Spotted dolphin	0	0	0	0	0	0	0	0
Common Dolphin	0	3.28	0	3.08	0	4.89	0	4.73
Bottlenose Dolphin	0	2.73	0	2.77	0	4.23	0	4.12
Risso’s Dolphin	0	3.39	0	3.32	0	5.14	0	4.92
Long-Finned Pilot Whale	0	0	0	0	0	0	0	0
Short-Finned Pilot Whale	0	0	0	0	0	0	0	0
Sperm Whale	0	3.40	0	3.19	0	4.96	0	4.92
HF:								
Harbor Porpoise	0	3.15	0	3.22	0	5.04	0	4.75
PW:								
Gray Seal	0	3.54	<0.01	3.50	<0.01	^b 5.35	<0.01	5.19
Harbor Seal	0	3.28	0	3.29	0	4.93	0	4.71

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^aSpecies was considered as “migrating” in the analysis.

^bThese values represent the maximum Level B.

^cThe values here were found in tables I–21, I–22, I–25, and I–26 in Küsel *et al.*, 2022 (appendix I).

TABLE 14—EXPOSURE RANGES (ER_{95%}) TO LEVEL A HARASSMENT (PTS (SEL_{cum})) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING 11-M DIAMETER MONOPILE FOUNDATIONS (SUMMER) IN NORMAL (T1) SOIL CONDITIONS, ASSUMING 10-dB ATTENUATION^b

Species	Normal (T1) Soil Conditions (in km)			
	One pile per day		Two piles per day	
	Level A harassment (dB re 1 μPa ² ·s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² ·s)	Level B harassment (dB re 1 μPa)
LF:				
Fin Whale	0.87	3.32	0.83	3.16
Humpback Whale ^a	0.25	3.01	0.16	3.1
Minke Whale ^a	0.17	3.1	0.35	2.98
North Atlantic Right Whale ^a	0.20	3.09	0.44	2.93
Sei Whale ^a	0.44	3.19	0.27	3.26
MF:				
Atlantic White-sided Dolphin	0	2.97	0	2.98
Atlantic Spotted dolphin	0	0	0	0
Common Dolphin	0	3.08	0	2.94
Bottlenose Dolphin	0	2.6	0	2.62
Risso's Dolphin	0	3.21	0	3.11
Long-finned Pilot Whale	0	0	0	0
Short-Finned Pilot Whale	0	0	0	0
Sperm Whale	0	3.4	0	3.19
HF:				
Harbor Porpoise	0	3.06	0	3.04
PW:				
Gray Seal	0	3.39	0	3.4
Harbor Seal	0	3.25	0	3.09

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^aSpecies was considered as “migrating” in the analysis.

^bThe values here were found in tables I–31 and I–32 in Küsel *et al.*, 2022 (appendix I).

TABLE 15—EXPOSURE RANGES (ER_{95%}) TO LEVEL A HARASSMENT (PTS (SEL_{cum})) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING OF 11-m DIAMETER MONOPILE FOUNDATIONS (WINTER) IN NORMAL (T1) SOIL CONDITIONS, ASSUMING 10-dB ATTENUATION^b

Species	Normal (T1) soil conditions (in km)			
	One pile per day		Two piles per day	
	Level A harassment (dB re 1 μPa ² ·s)	Level B harassment behavior (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² ·s)	Level B harassment (dB re 1 μPa)
LF:				
Fin Whale	0.87	3.56	0.82	3.53
Humpback Whale ^a	0.25	3.24	0.16	3.4
Minke Whale ^a	0.27	3.29	0.35	3.31
North Atlantic Right Whale ^a	0.2	3.17	0.44	3.28
Sei Whale ^a	0.44	3.33	0.41	3.53
MF:				
Atlantic White-sided Dolphin	0	3.28	0	3.31
Atlantic Spotted dolphin	0	0	0	0
Common Dolphin	0	3.26	0	3.16
Bottlenose Dolphin	0	2.73	0	2.93
Risso's Dolphin	0	3.48	0	3.44
Long-finned Pilot Whale	0	0	0	0
Short-Finned Pilot Whale	0	0	0	0
Sperm Whale	0	3.48	0	3.35
HF:				
Harbor Porpoise	0	3.41	0	3.35
PW:				
Gray Seal	0	3.66	0	3.66
Harbor Seal	0	3.36	0	3.36

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^aSpecies was considered as “migrating” in the analysis.

^bThe values here were found in tables I–33 and I–34 in Küsel *et al.*, 2022 (appendix I).

TABLE 16—EXPOSURE RANGES (ER_{95%}) TO PTS (SEL_{cum}) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING OF 11-m WTG MONOPILE FOUNDATIONS (SUMMER) IN SOFT (R3) AND SOFTER (U3) SOIL CONDITIONS, ASSUMING 10-dB ATTENUATION^b

Species	Soft (R3) soil conditions (in km)				Softer (U3) soil conditions (in km)			
	One pile per day		Two piles per day		One pile per day		Two piles per day	
	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)
LF:								
Fin Whale	0.87	3.02	0.43	2.89	0.9	2.65	0.58	2.48
Humpback Whale ^a	0.14	2.68	0.15	2.79	<0.01	2.26	0.11	2.31
Minke Whale ^a	0.16	2.78	0.26	2.82	0.02	2.32	0.16	2.27
North Atlantic Right Whale ^a	0.2	2.72	0.37	2.67	0.37	2.21	0.28	2.2
Sei Whale ^a	0.31	2.96	0.27	2.91	0.13	2.33	0.23	2.47
MF:								
Atlantic White-sided Dolphin	0	2.75	0	2.73	0	2.24	0	2.23
Atlantic Spotted dolphin	0	0	0	0	0	0	0	0
Common Dolphin	0	2.86	0	2.76	0	2.38	0	2.41
Bottlenose Dolphin	0	2.29	0	2.32	0	1.92	0	1.95
Risso's Dolphin	0	2.86	0	2.79	0	2.41	0	2.4
Long-finned Pilot Whale	0	0	0	0	0	0	0	0
Short-Finned Pilot Whale	0	0	0	0	0	0	0	0
Sperm Whale	0	2.77	0	2.86	0	2.36	0	2.26
HF:								
Harbor Porpoise	0	2.76	0	2.73	0	2.19	0	2.28
PW:								
Gray Seal	0	2.87	0	3.01	0	2.60	<0.01	2.58
Harbor Seal	0	2.91	0	2.75	0	2.50	0	2.36

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^a Species was considered as "migrating" in the analysis.

^b The values for U3 were found in tables I-27 and I-28 in Küsel *et al.*, 2022 (appendix I). The values for R3 were found in tables I-35 and I-36 in Küsel *et al.*, 2022 (appendix I).

TABLE 17—EXPOSURE RANGES (ER_{95%}) TO PTS (SEL_{cum}) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING OF 11-m WTG MONOPILE FOUNDATIONS (WINTER) IN SOFT (R3) AND SOFTER (U3) SOIL CONDITIONS, ASSUMING 10-dB ATTENUATION^b

Species	Soft (R3) soil conditions (in km)				Softer (U3) soil conditions (in km)			
	One pile per day		Two piles per day		One pile per day		Two piles per day	
	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)
LF:								
Fin Whale	0.87	3.17	0.48	3.14	0.89	2.71	0.82	2.54
Humpback Whale ^a	0.14	3.04	0.19	2.96	<0.01	2.46	0.11	2.54
Minke Whale ^a	0.19	3.12	0.28	3.02	0.2	2.5	0.23	2.59
North Atlantic Right Whale ^a	0.2	2.93	0.37	2.89	0.49	2.37	0.32	2.38
Sei Whale ^a	0.46	3.09	0.27	3.11	0.13	2.6	0.28	2.56
MF:								
Atlantic White-sided Dolphin	0	2.9	0	2.98	0	2.43	0	2.4
Atlantic Spotted dolphin	0	0	0	0	0	0	0	0
Common Dolphin	0	3.08	0	3.08	0	2.5	0	2.53
Bottlenose Dolphin	0	2.63	0	2.41	0	2.07	0	2.11
Risso's Dolphin	0	3.04	0	3.08	0	2.63	0	2.53
Long-finned Pilot Whale	0	0	0	0	0	0	0	0
Short-Finned Pilot Whale	0	0	0	0	0	0	0	0
Sperm Whale	0	3.1	0	3.04	0	2.6	0	2.38
HF:								
Harbor Porpoise	0	3.07	0	3.09	0	2.53	0	2.51
PW:								
Gray Seal	0	3.25	0	3.25	0	2.7	<0.01	2.67
Harbor Seal	0	3.09	0	3.03	0	2.58	0	2.54

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^a Species was considered as "migrating" in the analysis.

^b The values for U3 were found in tables I-29 and I-30 in Küsel *et al.*, 2022 (appendix I). The values for R3 were found in tables I-37 and I-38 in Küsel *et al.*, 2022 (appendix I).

TABLE 18—EXPOSURE RANGES (ER_{95%}) TO LEVEL A HARASSMENT (PTS (SEL_{cum})) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING OF 2.5-m DIAMETER OSS FOUNDATIONS (SUMMER), ASSUMING 10-dB ATTENUATION^b

Species	OSS 1 Foundation (km)				OSS 2 Foundation (km)			
	Two pin piles per day		Three pin piles per day		Two pin piles per day		Three pin piles per day	
	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)
LF:								
Fin Whale	0	1.04	0	1.1	0	1.1	0	0.99
Humpback Whale ^a	0	1.02	0	1.02	0	0.94	0	0.93
Minke Whale ^a	0	1	0	0.99	0	1.01	0	1.01
North Atlantic Right Whale ^a	0	0.85	0	0.89	0	1.06	0	1.01
Sei Whale ^a	<0.01	1.08	<0.01	1.04	0	0.94	0	0.91
MF:								
Atlantic White-sided Dolphin	0	0.98	0	0.98	0	0.82	0	0.84
Atlantic Spotted dolphin	0	0	0	0	0	0	0	0
Common Dolphin	0	1.03	0	1.03	0	0.96	0	0.96
Bottlenose Dolphin	0	0.82	0	0.81	0	0.72	0	0.74
Risso's Dolphin	0	1.08	0	1.05	0	0.87	0	0.86
Long-finned Pilot Whale	0	0	0	0	0	0	0	0
Short-Finned Pilot Whale	0	0	0	0	0	0	0	0
Sperm Whale	0	0.88	0	0.95	0	1.03	0	1.02
HF:								
Harbor Porpoise	0	0.95	0	1.02	0	0.94	0	0.92
PW:								
Gray Seal	0	1.15	0	1.14	0	0.78	0	0.77
Harbor Seal	0	1.12	0	0.99	0	1.05	0	1.04

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^aSpecies was considered as "migrating" in the analysis.

^bThe values here were found in tables I-39, I-40, I-43, and I-44 in Küsel *et al.*, 2022 (appendix I).

TABLE 19—EXPOSURE RANGES (ER_{95%}) TO LEVEL A HARASSMENT (PTS (SEL_{cum})) AND LEVEL B HARASSMENT THRESHOLDS FROM IMPACT PILE DRIVING OF 2.5-m DIAMETER OSS FOUNDATIONS (WINTER), ASSUMING 10-dB ATTENUATION^b

Species	OSS 1 Jacket Foundation (km)				OSS 2 Jacket Foundation (km)			
	Two pin piles per day		Three pin piles per day		Two pin piles per day		Three pin piles per day	
	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)	Level A harassment (dB re 1 μPa ² -s)	Level B harassment (dB re 1 μPa)
LF:								
Fin Whale	0	1.08	0.18	1.04	0	1.1	0	0.99
Humpback Whale ^a	0	1.02	0	1.02	0	0.94	0	0.92
Minke Whale ^a	0	1.01	0	1.01	0	1.06	0	1.03
North Atlantic Right Whale ^a	0	0.79	0	0.88	0	1.06	0	1.04
Sei Whale ^a	0	1.08	<0.01	1.05	0	0.94	0	0.90
MF:								
Atlantic White-sided Dolphin	0	0.93	0	0.96	0	0.86	0	0.86
Atlantic Spotted dolphin	0	0	0	0	0	0	0	0
Common Dolphin	0	0.96	0	0.86	0	0.96	0	0.96
Bottlenose Dolphin	0	0.85	0	0.84	0	0.80	0	0.74
Risso's Dolphin	0	0.92	0	0.89	0	0.87	0	0.86
Long-finned Pilot Whale	0	0	0	0	0	0	0	0
Short-Finned Pilot Whale	0	0	0	0	0	0	0	0
Sperm Whale	0	0.91	0	0.89	0	1.03	0	1.02
HF:								
Harbor Porpoise	0	0.95	0	0.95	0	0.94	0	0.92
PW:								
Gray Seal	0	1.08	0	1.1	0	0.78	0	0.77
Harbor Seal	0	1.08	0	0.95	0	1.04	0	1.04

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^aSpecies was considered as "migrating" in the analysis.

^bThe values here were found in tables I-41, I-42, I-45, and I-46 in Küsel *et al.*, 2022 (appendix I).

JASCO's Animal Simulation Model Including Noise Exposure (JASMINE) animal movement model was used to predict the number of marine mammals exposed to impact pile driving sound above NMFS' injury and behavioral harassment thresholds. Sound exposure

models like JASMINE use simulated animals (also known as "animats") to forecast behaviors of animals in new situations and locations based on previously documented behaviors of those animals. The predicted 3D sound fields (*i.e.*, the output of the acoustic

modeling process described earlier) are sampled by animats using movement rules derived from animal observations. The output of the simulation is the exposure history for each animat within the simulation.

The precise location of animats and their pathways are not known prior to a project; therefore, a repeated random sampling technique (*i.e.*, Monte Carlo) is used to estimate exposure probability with many animats and randomized starting positions. The probability of an animat starting out in or transitioning into a given behavioral state can be defined in terms of the animat’s current behavioral state, depth, and the time of day. In addition, each travel parameter and behavioral state has a termination function that governs how long the parameter value or overall behavioral state persists in the simulation.

The output of the simulation is the exposure history for each animat within the simulation, and the combined history of all animats gives a probability density function of exposure during the Project. Scaling the probability density function by the real-world density of animals results in the mean number of animats expected to be exposed to a given threshold over the duration of the Project. Due to the probabilistic nature of the process, fractions of animats may be predicted to exceed threshold. If, for example, 0.1 animats are predicted to exceed threshold in the model, that is interpreted as a 10-percent chance that one animat will exceed a relevant threshold during the Project, or equivalently, if the simulation were re-run 10 times, 1 of the 10 simulations would result in an animat exceeding the threshold. Similarly, a mean number prediction of 33.11 animats can be interpreted as re-running the simulation where the number of animats exceeding the threshold may differ in each simulation but the mean number of animats over all of the simulations is 33.11. A portion of an individual marine mammal cannot be taken during a project, so it is common practice to round mean number animat exposure values to integers using standard rounding methods. However, for low-probability events it is more precise to provide the actual values.

Sound fields were input into the JASMINE model, as described above, and animats were programmed based on the best available information to “behave” in ways that reflect the

behaviors of the 17 marine mammal species (18 stocks) expected to occur in the Project Area during the proposed activity. The various parameters for forecasting realistic marine mammal behaviors (*e.g.*, diving, foraging, surface times, *etc.*) are determined based on the available literature (*e.g.*, tagging studies). When literature on these behaviors was not available for a particular species, it was extrapolated from a similar species for which behaviors would be expected to be similar to the species of interest. The parameters used in JASMINE describe animat movement in both the vertical and horizontal planes (*e.g.*, direction, travel rate, ascent and descent rates, depth, bottom following, reversals, inter-dive surface interval).

Animats were modeled to move throughout the three-dimensional sound fields produced by each construction schedule for the entire construction period. For PTS exposures, both SPL_{pk} and SEL_{cum} were calculated for each species based on the corresponding acoustic criteria. Once an animat is taken within a 24-hour period, the model does not allow it to be taken a second time in that same period, but rather resets the 24-hour period on a sliding scale across 7 days of exposure. Specifically, an individual animat’s accumulated energy levels (SEL_{cum}) are summed over that 24-hour period to determine its total received energy, and then compared to the PTS threshold. Takes by behavioral harassment are predicted when an animat enters an area ensounded by sound levels exceeding the associated behavioral harassment threshold.

It is important to note that the calculated or predicted takes represent a take instance or event within 1 day and likely overestimate the number of individuals taken for some species. Specifically, as the 24-hour evaluation window means that individuals exposed on multiple days are counted as multiple takes. For example, 10 takes may represent 10 takes of 10 different individual marine mammals occurring within 1 day each, or it may represent take of 1 individual on 10 different days; information about the species’

daily and seasonal movement patterns helps to inform the interpretation of these take estimates. Also note that animal aversion was not incorporated into the JASMINE model runs that were the basis for the take estimate for any species.

Empire Wind also calculated acoustic ranges which represent the distance to a harassment threshold based on sound propagation through the environment (*i.e.*, independent of any receiver). As described above, applying animal movement and behavior within the modeled noise fields allows for a more realistic indication of the distances at which PTS acoustic thresholds are reached that considers the accumulation of sound over different durations. Acoustic ranges (R_{95%}) to the Level A harassment SEL_{cum} metric thresholds are considered overly conservative, as the accumulation of acoustic energy does not account for animal movement and behavior and therefore assumes that animals are essentially stationary at that distance for the entire duration of the pile installation, a scenario that does not reflect realistic animal behavior. The acoustic ranges to the SEL_{cum} Level A harassment thresholds for WTG and OSS foundation installation can be found in tables 16–18 in Empire Wind’s application but will not be discussed further in this analysis. Because NMFS Level B harassment threshold is an instantaneous exposure, acoustic ranges are more relevant to the analysis and are used to derive mitigation and monitoring measures. Acoustic ranges to the Level B harassment threshold for each activity are provided in the activity-specific subsections below. The differences between exposure ranges and acoustic ranges for Level B harassment are minimal given it is an instantaneous method. Of note, in some cases (*e.g.*, 9.6 m difficult-to-drive piles), distances to PTS peak thresholds exceed SEL_{cum} thresholds. However, those distances are small (less than 1 km) and only applicable to harbor porpoise. Please see tables 34–37 in Küsel *et al.* (2022) for more peak threshold modeling results.

TABLE 20—MAXIMUM ACOUSTIC RANGES (R_{95%}) TO LEVEL A HARASSMENT (PTS (PEAK)) AND LEVEL B HARASSMENT THRESHOLDS (160 dB SPL) FOR 9.6-m WTG MONOPILE (TYPICAL AND DIFFICULT-TO-DRIVE SCENARIOS), 11-m WTG MONOPILE, AND 2.5-m OSS PIN PILES (SUMMER AND WINTER), ASSUMING 10-dB ATTENUATION

Foundation type	Modeled maximum impact hammer energy (kJ)	Marine mammal group	Level A harassment Pk (in km)		Level B harassment 160 dB SPL (in km)	
			R _{95%} (summer)	R _{95%} (winter)	R _{95%} (summer)	R _{95%} (winter)
WTG—9.6-m monopile	2,300 kJ (5,500 kJ)	LF	-b (-b)	-b (-b)	3.51 ^g (5.05 ⁱ)	3.77 ^g (5.49 ⁱ)

TABLE 20—MAXIMUM ACOUSTIC RANGES (R_{95%}) TO LEVEL A HARASSMENT (PTS (PEAK)) AND LEVEL B HARASSMENT THRESHOLDS (160 dB SPL) FOR 9.6-m WTG MONOPILE (TYPICAL AND DIFFICULT-TO-DRIVE SCENARIOS), 11-m WTG MONOPILE, AND 2.5-m OSS PIN PILES (SUMMER AND WINTER), ASSUMING 10-dB ATTENUATION—Continued

Foundation type	Modeled maximum impact hammer energy (kJ)	Marine mammal group	Level A harassment P _k (in km)		Level B harassment 160 dB SPL (in km)	
			R _{95%} (summer)	R _{95%} (winter)	R _{95%} (summer)	R _{95%} (winter)
WTG—11-m monopiles	2,500 kJ	MF	.b (-b)	.b (-b)	h 3.64	h 3.92
		HF	0.11 ^c (0.15 ^d)	0.11 ^c (0.17 ^d)		
		PW	.b (-b)	.b (-b)		
		LF	.b	.b		
		MF	.b	.b		
OSS—2.5-m pin pile ^a	3,200 kJ	MF	^e 0.11	^e 0.12	i 1.19	i 1.17
		HF	.b	.b		
		PW	.b	.b		
		LF	.b	.b		
		MF	.b	.b		
		HF	^f 0.01	^f 0.01		
		PW	.b	.b		

LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

- ^a Assumes a 2-dB post-piling shift.
- ^b A dash (-) indicates that the threshold was not exceeded.
- ^c Found in table H-11 in Küsel *et al.*, 2022 (appendix H).
- ^d Found in table H-47 in Küsel *et al.*, 2022 (appendix H).
- ^e Found in table H-31 in Küsel *et al.*, 2022 (appendix H).
- ^f Found in table H-51 in Küsel *et al.*, 2022 (appendix H).
- ^g Found in table H-343 in Küsel *et al.*, 2022 (appendix H).
- ^h Found in table H-439 in Küsel *et al.*, 2022 (appendix H).
- ⁱ Found in table H-495 in Küsel *et al.*, 2022 (appendix H).
- ^j Found in table H-479 in Küsel *et al.*, 2022 (appendix H).

To conservatively estimate the number of animals likely to be exposed above thresholds, Empire Wind assumed that a maximum of 24 monopiles could be installed per month, with a maximum of 96 WTG monopiles and two OSS foundations installed in the first year of pile driving (2025) and the remaining 51 WTG monopile foundations installed in year 2 of pile driving (2026). In year 1 of pile driving, Empire Wind assumed that 24

monopiles would be installed in the four highest-density months for each species during the May to December period, and that the two OSSs would be installed in the highest and second-highest-density months. Empire Wind also assumed that all 17 difficult-to-drive piles would be installed in the first year, but that the distribution would be spread relatively evenly among the four highest months (*i.e.*, four piles per month except the highest-

density month which assumed 5 difficult-to-drive piles, for a total of 17 piles). In the second year, 24 monopiles would be installed in the two highest-density months and the remaining 3 monopiles would be installed in the third-highest-density month. This approach is reflected in table 21. Thus, each species was presumed to be exposed to the maximum amount of pile driving based on their monthly densities.

TABLE 21—MOST CONSERVATIVE CONSTRUCTION SCHEDULE FOR ESTIMATING LEVEL B HARASSMENT [One monopile per day/two pin piles per day]¹

Foundation type	Year 1				Year 2			
	Days of impact pile driving				Days of impact pile driving			
	1st highest density month	2nd highest density month	3rd highest density month	4th highest density month	1st highest density month	2nd highest density month	3rd highest density month	4th highest density month
WTG monopile—typical ...	19	20	20	20	24	24	3	0
WTG monopile—difficult ..	5	4	4	4	0	0	0	0
OSS 1 pin pile	0	6	0	0	0	0	0	0
OSS 2 pin pile	6	0	0	0	0	0	0	0
Total # of piles	30	30	24	24	24	24	3	0

¹ Maximum number of piles to be driven per month for each foundation type in each of the four highest-density months for each species during the May to December period.

In summary, exposures were estimated as follows:

(1) The characteristics of the sound output from the proposed pile-driving

activities were modeled using the GRLWEAP (*i.e.*, wave equation analysis of pile driving) model and JASCO's PDSM;

(2) Acoustic propagation modeling was performed within the exposure model framework using JASCO's MONM and FWRAM that combined the

outputs of the source model with the spatial and temporal environmental context (e.g., location, oceanographic conditions, seabed type) to estimate sound fields;

(3) Animal movement modeling integrated the estimated sound fields with species-typical behavioral parameters in the JASMINE model to estimate received sound levels for the animals that may occur in the operational area; and

(4) The number of potential exposures above Level A Harassment and Level B harassment thresholds were calculated.

Empire Wind modeled all possible construction scenarios (see Küsel *et al.*, 2022). Construction Schedule 1, consisting of one monopile and two pin piles per day, was determined to be the most conservative due to the highest modeled exposure estimates for ESA-listed species (*i.e.*, fin and sei whales), and was carried forward to the take analysis. The results of marine mammal exposure modeling for each year of pile driving (2025, 2026) based upon Construction Schedule 1 are shown in tables 22 and 23 below. These values were presented by Empire Wind after the habitat-based density models were updated; please see the “Revised Density and Take Estimate Memo” available at: https://www.fisheries.noaa.gov/action/incidental-take-authorization-empire-offshore-wind-llc-construction-empire-wind-project-ew1?check_logged_in=1.

Based on the exposure estimates for impact-pile-driving activities related to WTGs and OSS installation (monopile foundations and jacket foundations with pin piles), the authorized take is shown below in tables 22 and 23. To determine the authorized take numbers, the calculated exposures were rounded to the next whole number if the calculated exposure was greater than 0.5 animals. Where the calculated take was less than 0.5 animals, the proposed take was reduced to zero.

A review of Empire Wind’s PSO sightings data ranging from 2018 to 2021 for the Project Area indicated that exposure estimates based on the exposure modeling methodology above were likely an underestimate for humpback whales, fin whales, and pilot whales (A.I.S. Inc., 2019; Alpine Ocean Seismic Survey, 2018; Gardline, 2021a, 2021b; Geoquip Marine, 2021; Marine Ventures International, 2021; RPS, 2021; Smultea Environmental Sciences, 2019, 2020, 2021). For these species, the highest daily averages per day were multiplied by the maximum potential number of days of pile driving associated with wind turbine and OSS foundation installation. In the event that one monopile or one pin pile is installed per day, up to 120 days of pile driving (*i.e.*, 96 days of monopile installation and 24 days of pin pile installation) could occur in 2025, and up to 51 days of pile driving (*i.e.*, 51 days of monopile installation) could occur in 2026.

For certain species for which the exposure modeling methodology described previously above may result in potential underestimates of take, and for which Empire Wind’s PSO sightings data were relatively low, adjustments to the authorized take were made based on the best available information on marine mammal group sizes to ensure conservatism. For species considered rare with the potential to occur in the Project Area, authorized take by Level B harassment was adjusted to one group size per year. NMFS concurs with this assessment and has authorized take by Level B harassment of 3 sperm whales per year in 2026 and 2026 (Barkaszi *et al.*, 2012); 45 Atlantic spotted dolphins per year in 2025 and 2026 (Kenney and Vigness-Raposa, 2010); and 100 Risso’s dolphins per year in 2025 and 2026 (100 individuals; Jefferson *et al.*, 2015).

For species considered relatively common in the Project Area, authorized

take by Level B harassment was adjusted to one group size per month. These include Atlantic white-sided dolphins (52 individuals, Jefferson *et al.*, 2015) and North Atlantic right whales. The group size determination for North Atlantic right whales was derived based on consultation with NOAA Fisheries. A group size of one animal was used for months with mean monthly densities less than 0.01, while a group size of two animals, reflective of the potential for a mother and calf, was used for months with mean monthly densities greater than 0.01 (based on the Roberts *et al.* (2023) predictive densities). For the months when pile-driving activities may occur (May through December), those criteria result in a group size of one animal for the months of June through October, and two animals for the months of May, November, and December. This group size determination is intended to account for the potential presence of mother-calf pairs. Therefore, Empire Wind requested and NMFS has authorized 11 takes of North Atlantic right whale by Level B harassment per year in 2025 and 2026 and 416 takes of Atlantic white-sided dolphin by Level B harassment per year in 2025 and 2026.

Common dolphins and bottlenose dolphins are considered common in the Project Area as well. For these species, authorized take by Level B harassment was adjusted to one group size per day. These include common dolphins (30 individuals, Reeves *et al.*, 2002), and bottlenose dolphins (15 individuals, Jefferson *et al.*, 2015). Empire Wind has requested, and NMFS has authorized, 3,600 and 1,530 takes of common dolphins by Level B harassment per year in 2025 and 2026. Empire Wind has also requested, and NMFS has authorized, 1,800 and 765 takes of bottlenose dolphins by Level B harassment per year in 2025 and 2026, respectively.

TABLE 22—CALCULATED EXPOSURES AND AUTHORIZED TAKE FROM LEVEL A HARASSMENT AND LEVEL B HARASSMENT RESULTING FROM MONOPILE AND OSS JACKET FOUNDATION IMPACT PILE DRIVING INSTALLATION [Year 2]

Hearing group	Species	Calculated exposures		Calculated exposures	Authorized take	Authorized take
		Level A harassment				
		LE	LpK	Level B harassment	Level A harassment	Level B harassment
				Lp		
LF	Fin ^a	1.15	0	8.78	^b 4	^c 133
	Humpback	0.36	<0.01	8.12	0	^c 60
	Minke	3.72	0	65.05	4	65
	North Atlantic Right Whale ^a	0.1	0	2.36	0	^f 11
	Sei ^a	0.27	<0.01	2.78	0	3
MF	Atlantic white-sided dolphin	0	0	116.00	0	^f 416
	Atlantic spotted dolphin	0	0	0	0	^d 45

TABLE 22—CALCULATED EXPOSURES AND AUTHORIZED TAKE FROM LEVEL A HARASSMENT AND LEVEL B HARASSMENT RESULTING FROM MONOPILE AND OSS JACKET FOUNDATION IMPACT PILE DRIVING INSTALLATION—Continued
[Year 2]

Hearing group	Species	Calculated exposures		Calculated exposures	Authorized take	Authorized take
		Level A harassment					Level B harassment
		LE	LpK	Lp	Level A harassment	Level B harassment
	Common dolphin	0	0	902.19	0	^d 3,600
	Bottlenose dolphin	0	0	226.02	0	^d 1,800
	Risso's dolphin	0	0	5.96	0	^d 100
	Pilot whales	0	0	0	0	^c 161
	Sperm whale ^a	0	0	0.56	0	^d 3
HF	Harbor porpoise	0	0.09	133.70	0	134
PW	Gray seal ^g	0.18	0	179.34	0	179
	Harbor seal ^g	0	0	339.96	0	340

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^aListed as Endangered under the ESA.

^bBased upon the average group size of fin whales in the Project Area (1.25 whales; Palka *et al.*, 2021), NMFS has increased estimated take by Level A harassment to four fin whales (two groups) from one whale in 2025 and two fin whales (one group) from one whale in 2026.

^cRequested take adjusted based on PSO sighting data from 2018 to 2021 (A.I.S., 2019; Alpine Ocean Seismic Survey, 2018; Gardline, 2021a, 2021b; Geoquip Marine, 2021; Marine Ventures International, 2021; RPS, 2021; Smultea Environmental Sciences, 2019, 2020, 2021); 0.5 hump-back whales per day, 1.11 fin whales per day, 1.34 pilot whales per day.

^dRequested take adjusted based on 1 group size per year as follows: 3 sperm whales (Barkaszi *et al.*, 2012), 45 Atlantic spotted dolphins (Kenney and Vigness-Raposa, 2010), and 100 Risso's dolphins (Jefferson *et al.*, 2015).

^eRequested take adjusted by 1 group size per day as follows: 30 short-beaked common dolphins (Reeves *et al.*, 2002), 15 bottlenose dolphins (Jefferson *et al.*, 2015).

^fRequested take adjusted by 1 group size per month of 52 Atlantic white-sided dolphins (Jefferson *et al.*, 2015) and 1 (monthly density <0.01) or 2 (monthly density >0.01) of North Atlantic right whales (Roberts and Halpin, 2022).

^gGray seal and harbor seal exposure estimates and take have been updated since the proposed rule based upon updated methodology.

TABLE 23—CALCULATED EXPOSURES AND AUTHORIZED TAKE FROM LEVEL A HARASSMENT AND LEVEL B HARASSMENT RESULTING FROM MONOPILE AND OSS JACKET FOUNDATION IMPACT PILE DRIVING INSTALLATION
[Year 3]

Hearing group	Species	Calculated exposures		Calculated exposures	Authorized take	Authorized take
		Level A harassment					Level B harassment
		LE	LpK	Lp	Level A harassment	Level B harassment
LF	Fin whale ^a	0.52	0	4	^c 2	^d 57
	Humpback whale	0.14	0	3.82	0	^d 26
	Minke whale	2.18	0	47.73	2	48
	North Atlantic Right whale ^a	0.05	0	1.57	^b 0	^g 11
	Sei whale ^a	0.16	0	1.66	0	2
MF	Atlantic white-sided dolphin	0	0	59.23	0	^g 416
	Atlantic spotted dolphin	0	0	0	0	^e 45
	Common dolphin	0	0	560.75	0	^f 1,530
	Bottlenose dolphin	0	0	110.28	0	^f 765
	Risso's dolphin	0	0	4.09	0	^e 100
	Pilot whales	0	0	0	0	^d 68
	Sperm whale ^a	0	0	0.29	0	^e 3
HF	Harbor porpoise	0	0	98.43	0	98
PW	Gray seal ^h	0	0	123.58	0	124
	Harbor seal ^h	0	0	219.26	0	219

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

^aListed as Endangered under the ESA.

^bJASCO's modeling estimated 0.01 Level A harassment exposures for North Atlantic right whales in 2025 and 0.05 Level A harassment exposures for North Atlantic right whales in 2026, but due to mitigation measures (see the Mitigation section), no Level A harassment takes are expected or authorized.

^cBased upon the average group size of fin whales in the Project Area (1.25 whales; Palka *et al.*, 2021), NMFS has increased estimated take by Level A harassment to two fin whales (one group) from one whale in 2026.

^dAuthorized take adjusted based on PSO sighting data from 2018 to 2021 (A.I.S., 2019; Alpine Ocean Seismic Survey, 2018; Gardline, 2021a, 2021b; Geoquip Marine, 2021; Marine Ventures International, 2021; RPS, 2021; Smultea Environmental Sciences, 2019, 2020, 2021); 0.5 hump-back whales per day, 1.11 fin whales per day, 1.34 pilot whales per day.

^eAuthorized take adjusted based on 1 group size per year as follows: 3 sperm whales (Barkaszi *et al.*, 2012), 45 Atlantic spotted dolphins (Kenney and Vigness-Raposa, 2010), and 100 Risso's dolphins (Jefferson *et al.*, 2015).

^fAuthorized take adjusted by 1 group size per day as follows: 30 common dolphins (Reeves *et al.*, 2002), 15 bottlenose dolphins (Jefferson *et al.*, 2015).

^gAuthorized take adjusted by 1 group size per month of 52 Atlantic white-sided dolphins (Jefferson *et al.*, 2015) and 1 (when monthly density <0.01) or 2 (when monthly density >0.01) of North Atlantic right whales (Roberts *et al.*, 2023).

^h Gray seal and harbor seal exposure estimates and take have been updated since the proposed rule based upon updated methodology.

Temporary Cofferdam and/or Goal Post Installation and Removal (Vibratory Pile Driving) Take Estimates

As many as two temporary cofferdams may be installed for Empire Wind 1 and as many as three temporary cofferdams may be installed for Empire Wind 2. For vibratory pile driving of cofferdams, Empire Wind estimated source levels and frequency spectra assuming a 1,800-kilonewton (kN) vibratory force. Modeling was accomplished using adjusted one-third-octave band vibratory pile driving source levels cited for similar vibratory pile-driving activities conducted during cofferdam installation for the Block Island Wind Farm (Tetra Tech, 2012; Schultz-von Glahn *et al.*, 2006). The assumed sound source level for vibratory pile driving corresponded to 195 dB SEL re 1 μPa and 195 dB rms at 10 m (Schultz-von Glahn *et al.*, 2006). The frequency distribution of the vibratory pile driving sound source is displayed in figure 5 in Küsel *et al.* (2022). A transmission loss coefficient of 15logR (cylindrical spreading) was assumed for both cofferdams and goal posts. The anticipated duration is 1 hour of active pile driving per day.

Underwater sound propagation modeling for cofferdam installation was completed using dBSea, a software for the prediction of underwater noise in a variety of environments. The 3D model is built by importing bathymetry data and placing noise sources in the environment. Each source can consist of equipment chosen from either the standard or user-defined databases. Noise mitigation methods may also be included. The user has control over the seabed and water properties including sound speed profile (SSP), temperature, salinity, and current.

The dBSeaPE solver uses the PE method. For high frequencies, the dBSeaRay ray tracing solver is used, which forms a solution by tracing rays from the source to the receiver. Many rays leave the source covering a range of angles, and the sound level at each point in the receiving field is calculated by coherently summing the components from each ray. This is currently the only computationally efficient method at high frequencies. The underwater acoustic modeling analysis used a split solver, with a specific, parabolic equation model (*i.e.*, dBSeaPE) evaluating the 12.5 Hz to 800 Hz and

dBSeaRay addressing 1,000 to 20,000 Hz.

Given the short duration of the activity and shallow, near coast location, animal exposure modeling was not conducted for cofferdams and goal posts installation and removal to determine potential exposures from pile driving. Rather, the modeled acoustic range distances to isopleths corresponding to the relatively small Level A harassment and Level B harassment threshold values were used to calculate the area (*i.e.*, the Ensonified Area) around the cofferdams and goal posts predicted to be ensonified daily to levels that exceed the thresholds. The Ensonified Area is calculated as the following:

$$\text{Ensonified Area} = \pi r^2,$$

where *r* is the linear acoustic range distance from the source to the isopleth to Level A harassment or Level B harassment thresholds. Resulting distances to NMFS harassment isopleths for cofferdam installation and ensonified areas for Level B harassment isopleths are provided in table 24 (note that very shallow water depths (3–4 m) at the cofferdam pile driving site is responsible for the limited acoustic propagation of vibratory driving noise).

TABLE 24—DISTANCES (METERS) TO THE LEVEL A AND LEVEL B HARASSMENT THRESHOLD ISOPLETHS FOR VIBRATORY PILE DRIVING FOR COFFERDAMS AND ESTIMATED AREA OF LEVEL B HARASSMENT ZONE

Location	PTS onset by hearing group (m)				Behavioral harassment	Area within estimated Level B harassment zone (km ²)
	LF	MF	HF	PW	ALL	
	199 LE, 24 hr	198 LE, 24 hr	173 LE, 24 hr	201 LE, 24 hr	120 SPL RMS	
Empire Wind 1	122	0	44	62	1,985	2.679
Empire Wind 2	13	0	12	11	1,535	1.672

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

Installation of goal posts would be done using a traditional impact hammer. The casing pipe may be installed using a pneumatic hammer; hence, the number of strikes would be considered high. Empire Wind estimated distances to Level A harassment and Level B harassment

thresholds using the NMFS’ Multi-Species Calculator Tool (NMFS, 2018) and parameter inputs are shown in table 25 below. Modeling for impact driving of goal posts assumed a single strike SEL of 174 dB. Empire Wind did not propose to employ any noise mitigation during impact pile driving of goal posts

or vibratory driving for cofferdams. NMFS does not require noise mitigation in the Mitigation section; therefore, no abatement is applied or assumed. The resulting distances to NMFS thresholds for casing pipe and goal post installation are provided in table 26.

TABLE 25—ESTIMATED SOURCE LEVELS (AT 10 m) AND INSTALLATION RATES FOR CASING PIPE AND GOAL POST INSTALLATION

Structure	dB SEL	dB rms	#strikes per pile	Piles per day	Transmission loss
Casing pipe	166	182	43,200	1	15 log.
Goal Posts	174	184	2,000	2	

TABLE 26—DISTANCES (METERS) TO THE LEVEL A AND LEVEL B HARASSMENT THRESHOLD ISOPLETHS FOR CASING PIPE AND GOAL POST IMPACT PILE DRIVING

Scenario	PTS onset by hearing group (m)								Behavioral harassment SPL (m)
	LF		MF		HF		PW		
	peak	SEL	peak	SEL	peak	SEL	peak	SEL	
Pile	219	183	230	185	202	155	218	185	160
42-inch casing pipe	0.3	904.5	0.1	32.2	4.6	1,077.4	0.4	484	293
12-inch steel goal post	0	632.1	0	22.5	7.4	752.9	0	338.3	398.1

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

As described above, either cofferdams or goal post and casing pipe installation may occur as part of cable landfall activities, but not both. For goal post installation, 2 hours per goal post (2 piles), for 3 goal posts (6 piles) per HDD, for a total of 18 piles and 36 total hours of pile driving are anticipated. For cofferdams, there is 1 hour per day for 6 days (installation and removal) per cofferdam for a total of 18 hours pile driving anticipated. While modeled distances to the Level A harassment threshold for goal post pile driving were larger than for cofferdam vibratory driving based on the SEL_{cum} metric, it should be noted that modeled distances based on the SEL_{cum} metric are based on the assumption that an individual animal remains at that distance for the entire duration of pile driving in order to incur PTS. This is not considered

realistic as marine mammals are highly mobile. As modeled distances to the Level B harassment threshold and zones of influence for Level B harassment were orders of magnitude larger for cofferdam vibratory driving compared to goal post pile driving (compare tables 24 and 26), the amount of take resulting from cofferdam vibratory driving activities were determined to be greater than that of the alternative goal post and casing pipe scenario. Therefore, to be conservative the cofferdam scenario was carried forward for the analysis of potential takes by harassment from cable landfall activities. As such, goal post pile driving is not analyzed further.

Animal movement and exposure modeling was not performed by JASCO to determine potential exposures from vibratory pile driving. Rather, Empire Wind considered the ensonified areas

and density estimates to calculate potential exposures (table 28). Empire Wind overlaid the Robert *et al.* (2023) densities on the modeled Level B harassment zones to estimate exposures. The maximum monthly densities for each marine mammal species were averaged by season (table 27; Roberts *et al.*, 2023): spring (March through May), summer (June through August), fall (September through November), and winter (December through February). To be conservative, the maximum average seasonal density for each species was then carried forward in the take calculations. As the noise from cofferdam installation would not extend beyond the 20-m isobath where the coastal bottlenose dolphin stock predominates, it is expected that only the coastal stock of bottlenose dolphins is likely to be taken by this activity.

TABLE 27—AVERAGE SEASONAL MARINE MAMMAL DENSITIES (ANIMALS PER 100 km²) FOR VIBRATORY PILE DRIVING OF EMPIRE WIND’S COFFERDAM INSTALLATION AND REMOVAL

Marine mammal species	Empire Wind 1 cofferdams (2024) and Empire Wind 2 cofferdams (2024–2025) average seasonal density
Fin whale ^a	0.097
Humpback whale	0.099
Minke whale	0.526
North Atlantic right whale ^a	0.073
Sei whale ^a	0.03
Sperm whale ^a	0.006
Atlantic spotted dolphin	0.058
Atlantic white-sided dolphin	0.469
Bottlenose dolphin (coastal stock) ^b	6.299
Common dolphin	2.837
Pilot whale spp. ^c	0.019
Risso’s dolphin	0.034
Harbor porpoise	3.177
Gray seal ^d	13.673
Harbor seal ^d	13.673

^a Species listed under the ESA.

^b Bottlenose dolphin density values from Duke University (Roberts *et al.*, 2023) reported as “bottlenose” and not identified to stock. Given the noise from cofferdam installation would not extend beyond the 20 m isobath, where the coastal stock predominates, it is expected that all estimated takes by Level B harassment of bottlenose dolphins from cofferdam installation will accrue to the coastal stock.

^c Pilot whale density values from Duke University (Roberts *et al.*, 2023) reported as “*Globicephala* spp.” and not species-specific.

^d Pinniped density values from Duke University (Roberts *et al.*, 2022) are reported as “seals” and are not species-specific.

Estimates of take are computed according to the following formula as provided by NOAA Fisheries (Personal Communication, November 24, 2015):

Estimated Take = $D \times ZOI \times d$,
where:

D = average highest seasonal species density (number per km²)

ZOI = maximum ensonified area to MMPA threshold for impulsive noise (160 dB RMS 90 percent re 1 μPa)
 d = number of days

The area ensonified to the Level B harassment threshold, as well as the projected duration of cofferdam installation and removal at each respective vibratory pile driving location, was then used to produce the

results of take calculations provided in table 28. As previously stated, Empire Wind anticipates that cofferdam or casing pipe or goal post installation and removal would occur during years 1 and 2 (2024–2025; refer to table 1). It is expected to take 3 days to install and 3 days to remove each cofferdam. Therefore, 6 days of vibratory pile driving/removal at each location were

included. It should be noted that calculations do not take into account whether a single animal is harassed multiple times or whether each exposure is a different animal. Therefore, the numbers in table 28 represent the predicted number of exposures above the Level B harassment threshold using the methods and assumptions described above.

TABLE 28—ESTIMATED LEVEL B HARASSMENT EXPOSURES FROM VIBRATORY PILE INSTALLATION AND REMOVAL RELATED TO COFFERDAMS

Species	Estimated Level B harassment exposures		Total estimated Level B harassment exposures
	Empire Wind 1 cofferdams (2024)	Empire Wind 2 cofferdams (2024–2025)	
Fin Whale	0.03	0.03	0.06
Humpback Whale	0.03	0.03	0.06
Minke Whale	0.17	0.16	0.33
North Atlantic Right Whale	0.02	0.02	0.04
Sei Whale	0.01	0.01	0.02
Sperm Whale	0	0	0
Bottlenose dolphin (Western N.A. Northern Migratory Coastal Stock) ^a	2.03	1.9	3.93
Atlantic Spotted Dolphin	0.02	0.02	0.04
Common dolphin	0.91	0.85	1.76
Atlantic White-sided Dolphin	0.15	0.14	0.29
Risso's dolphin	0.01	0.01	0.02
Pilot whales spp. ^b	0.01	0.01	0.02
Harbor porpoise	1.02	0.96	1.98
Harbor seal ^c	2.2	2.06	4.26
Gray seal ^c	2.2	2.06	4.26

^aBottlenose dolphin density values from Duke University (Roberts *et al.*, 2023) reported as “bottlenose” and not identified to stock. Given the noise from cofferdam installation would not extend beyond the 20 m isobath, where the coastal stock predominates, it is expected that all estimated takes by Level B harassment of bottlenose dolphins from cofferdam installation will accrue to the coastal stock.

^bPilot whale density values from Duke University (Roberts *et al.*, 2022) reported as “*Globicephala* spp.” and not species-specific.

^cPinniped density values from Duke University (Roberts *et al.*, 2023) are reported as “seals” and are not species-specific, therefore, 50 percent of estimated exposures are expected to accrue to harbor seals and 50 percent to gray seals.

For some species, group size data demonstrate that the density-based exposure calculations underestimate the potential for take. Hence, the amount of authorized take varies from exposure estimates (table 29). As the density models do not account for group size and the resulting calculated exposures

were very small, the predicted take was increased to account for the exposure of one average-sized group per day each of bottlenose and common dolphins. Due to the presence of several seal haul outs in the cable landfall area, the Roberts *et al.* (2023), density-based exposure estimates may underestimate potential

seal occurrence, and 10 takes of seals by Level B harassment per day over the course of 9 days were estimated. Table 29 includes the maximum number of takes that are reasonably likely to occur during vibratory pile driving.

TABLE 29—AUTHORIZED LEVEL B HARASSMENT TAKE RESULTING FROM VIBRATORY PILE DRIVING ASSOCIATED WITH THE INSTALLATION AND REMOVAL OF TEMPORARY COFFERDAMS OVER 2 YEARS

Species	Authorized take by Level B harassment		
	Empire Wind 1 cofferdams (2024)	Empire Wind 2 cofferdams (2024–2025)	Total authorized take
Fin Whale	0	0	0
Humpback Whale	0	0	0
Minke Whale	0	0	0
North Atlantic Right Whale	0	0	0
Sei Whale	0	0	0
Sperm Whale	0	0	0
Bottlenose dolphin (Western N.A. Northern Migratory Coastal Stock) ^a	180	270	450
Atlantic Spotted Dolphin	0	0	0
Common dolphin ^b	360	540	900
Atlantic White-sided Dolphin	0	0	0
Risso's dolphin	0	0	0
Pilot whales spp. ^c	0	0	0

TABLE 29—AUTHORIZED LEVEL B HARASSMENT TAKE RESULTING FROM VIBRATORY PILE DRIVING ASSOCIATED WITH THE INSTALLATION AND REMOVAL OF TEMPORARY COFFERDAMS OVER 2 YEARS—Continued

Species	Authorized take by Level B harassment		
	Empire Wind 1 cofferdams (2024)	Empire Wind 2 cofferdams (2024–2025)	Total authorized take
Harbor porpoise	1	1	2
Harbor seal ^d	60	90	150
Gray seal ^d	60	90	150

^a Bottlenose dolphin authorized take was adjusted to account for one group size, 15 individual bottlenose dolphins (Jefferson *et al.*, 2015) per day (18 days).

^b Common dolphin authorized take was adjusted to account for one group size, 30 individual common dolphins (Reeves *et al.*, 2002) per day (18 days).

^c Pilot whale density values (Roberts *et al.*, 2023) reported as “*Globicephala* spp.” and not species-specific.

^d Pinniped density values (Roberts *et al.*, 2023) reported as “seals” and not species-specific, therefore, 50 percent of expected takes by Level B harassment are expected to accrue to harbor seals and 50 percent to gray seals. Due to the presence of several seal haul outs in the area, authorized level B harassment seal takes were calculated by estimating 10 individuals per day (9 days) (Woo and Biolsi, 2018), divided evenly between harbor seals and gray seals.

^e Data was not available for harp seals for which take was authorized.

Marina Activities

Pile driving at the onshore substation C constitutes a small amount of work. Empire Wind assumed source levels during pile driving sheet piles at onshore substation C would be similar to that during installation of the cofferdams for cable landfall

construction. Since densities are not available for the specific inshore region where the activity will occur, potential take by harassment for marine mammals using density could not be calculated. Instead, to be conservative, 10 takes by Level B harassment of seals per day (49 days) were estimated based on pinniped

observations in New York City between 2011 and 2017 (Woo and Biolsi, 2018), which were split evenly between harbor and gray seals (table 6). Similarly, the authorized take of bottlenose dolphins was adjusted to account for one group size of 15 individuals (Jefferson *et al.*, 2015) per day for 49 days.

TABLE 30—DISTANCES (METERS) TO THE LEVEL A AND LEVEL B HARASSMENT THRESHOLD ISOPLETH DISTANCES FOR VIBRATORY DRIVING AT ONSHORE SUBSTATION C LOCATION MARINA

Location	PTS onset by hearing group (Level A harassment)				Behavioral response (Level B harassment)
	LF	MF	HF	PW	
		199 L _E , 24hr			
Marina Bulkhead Work (Sheet pile installation)	43.2	3.8	63.8	26.2	1,000
Marina Berthing Pile Removal	43.5	3.9	64.3	26.5	1,600

Note: LF = low-frequency cetaceans; MF = mid-frequency cetaceans; HF = high-frequency cetaceans; PW = pinnipeds in water.

TABLE 31—AUTHORIZED TAKES BY LEVEL B HARASSMENT FROM MARINA PILE DRIVING

Species	Marina work (2024)
	Authorized take by Level B harassment
Bottlenose dolphin (Western N.A. Northern Migratory Coastal Stock) ^a	735
Harbor seal ^b	245
Gray seal ^b	245

^a Given the noise from cofferdam installation would not extend beyond the 20 m isobath, where the coastal stock predominates, it is expected that all estimated takes by Level B harassment of bottlenose dolphins from cofferdam installation will accrue to the coastal stock. The authorized take was adjusted to account for one group size, 15 individuals (Jefferson *et al.*, 2015) per day of bottlenose.

^b Pinniped density values from Duke University (Roberts *et al.*, 2023) are reported as “seals” and are not species-specific, therefore, 50 percent of expected takes by Level B harassment are expected to accrue to harbor seals and 50 percent to gray seals.

HRG Surveys

Empire Wind’s planned HRG survey activity includes the use of non-impulsive sources (*i.e.*, CHIRP sub bottom profiler (SBP)) that have the potential to harass marine mammals. Of the list of equipment described in table 2 of the proposed rule (88 FR 22696,

April 13, 2023), Ultra-Short BaseLine (USBL), multibeam echosounder (MBES), side scan sonar (SSS), and the Innomar SBP were removed from further analysis due to either the extremely low likelihood of the equipment resulting in marine mammal harassment (*i.e.*, USBL, MBES, select

SSS) or due to negligible calculated isopleth distances corresponding to the Level B harassment threshold (<2 m) (*i.e.*, select SSS and Innomar SBP). No boomers or sparkers will be used.

Authorized takes will be by Level B harassment only in the form of disruption of behavioral patterns for

individual marine mammals resulting from exposure to noise from certain HRG acoustic sources. Based primarily on the characteristics of the signals produced by the acoustic sources planned for use, Level A harassment is neither anticipated, even absent mitigation, nor authorized. Therefore, the potential for Level A harassment is not evaluated further in this document. Empire Wind did not request, and NMFS has not authorized, take by Level A harassment incidental to HRG surveys. No serious injury or mortality is anticipated to result from HRG survey activities.

Specific to HRG surveys, in order to better consider the narrower and directional beams of the sources, NMFS

has developed a tool for determining the sound pressure level (SPL_{rms}) at the 160-dB isopleth for the purposes of estimating the extent of Level B harassment isopleths associated with HRG survey equipment (NMFS, 2020). This methodology incorporates frequency-dependent absorption and some directionality to refine estimated ensonified zones. Empire Wind used NMFS' methodology with additional modifications to incorporate a seawater absorption formula and account for energy emitted outside of the primary beam of the source. For sources that operate with different beamwidths, the maximum beam width was used, and the lowest frequency of the source was

used when calculating the frequency-dependent absorption coefficient.

The isopleth distances corresponding to the Level B harassment threshold for each type of HRG equipment with the potential to result in harassment of marine mammals were calculated per "NOAA Fisheries' Interim Recommendation for Sound Source Level and Propagation Analysis for High Resolution Geophysical Sources." The distances to the 160-dB RMS re 1 μPa isopleth for Level B harassment are presented in table 32. Please refer to section 6.3.2 of the LOA application for a full description of the methodology and formulas used to calculate distances to the Level B harassment threshold.

TABLE 32—ISOPLETH DISTANCES IN METERS (m) CORRESPONDING TO LEVEL B HARASSMENT THRESHOLD FOR HRG EQUIPMENT

HRG survey equipment	Source level (SL _{RMS}) (dB re 1μPa)	Lateral distance (m) to Level B harassment threshold
Edgetech DW106	194	50
Edgetech 424	180	8.75
Teledyne Benthos Chirp III—TTV 170	219	50.05

The survey activities that have the potential to result in Level B harassment (160 dB_{RMS90%} re 1 μPa) include the noise produced by various non-parametric sub-bottom profilers (table 32), of which the Teledyne Benthos Chirp III results in the greatest calculated distance to the Level B harassment criteria at 50.05 m (164 ft). Therefore, to be conservative, Empire Wind has applied the estimated distance of 50.05 m (164 ft) to the 160 dB_{RMS90%} re 1 μPa Level B harassment criteria as the basis for determining potential take from all HRG sources.

The basis for the take estimate is the number of marine mammals that would be exposed to sound levels in excess of

the Level B harassment threshold (160 dB). Typically, this is determined by estimating an ensonified area for the activity, by calculating the area associated with the isopleth distance corresponding to the Level B harassment threshold. This area is then multiplied by marine mammal density estimates in the Project Area and then corrected for seasonal use by marine mammals, seasonal duration of Project-specific noise-generating activities, and estimated duration of individual activities when the maximum noise-generating activities are intermittent or occasional.

The estimated distance of the daily vessel track line was determined using

the estimated average speed of the vessel and the 24-hour operational period within each of the corresponding survey segments. All noise-producing survey equipment is assumed to be operated concurrently. Using the distance of 50.05 m (164 ft) to the 160 dB_{RMS90%} re 1 μPa Level B harassment isopleth (table 32), the estimated daily vessel track of approximately 177.792 km (110.475 mi) for 24-hour operations, inclusive of an additional circular area to account for radial distance at the start and end of a 24-hour cycle, estimates of the total area ensonified to the Level B harassment threshold per day of HRG surveys were calculated (table 33).

TABLE 33—ESTIMATED NUMBER OF SURVEY DAYS, ESTIMATED SURVEY DISTANCE PER DAY, AND ESTIMATED DAILY ENSONIFIED AREA FOR HRG SURVEYS, FROM 2024 THROUGH 2029

Survey segment	Number of active survey vessel days	Estimated distance per day (km)	Calculated daily ensonified area (km ²)
2024 Survey Effort	41	177.792	17.805
2025 Survey Effort	191		
2026 Survey Effort	150		
2027 Survey Effort	100		
2028 to January 2029 Survey Effort	100		

As described in the LOA application, density data were mapped within the boundary of the Project Area (figure 1 in the LOA application) using geographic information systems; these data were

updated based on the revised data from Roberts *et al.* (2023) (table 6). Maximum monthly densities as reported by Roberts *et al.* (2023) were averaged by season over the survey duration, for

winter (December through February), spring (March through May), summer (June through August), and fall (September through November), for the entire HRG Project Area. To be

conservative, the maximum average seasonal density within the HRG survey schedule for each species (table 7), was then carried forward in the take calculations to generate exposure estimates (table 34).

TABLE 34—CALCULATED ANNUAL MAXIMUM LEVEL B HARASSMENT EXPOSURES OF MARINE MAMMALS RESULTING FROM ANNUAL DAYS OF HRG SURVEYS

Species	2024— Calculated exposures	2025— Calculated exposures	2026— Calculated exposures	2027— Calculated exposures	2028 to January 2029—calculated exposures
Fin Whale	0.707	3.295	2.588	1.725	1.725
Humpback Whale	0.722	3.363	2.641	1.761	1.761
Minke Whale	3.836	17.87	14.034	9.356	9.356
North Atlantic Right Whale	0.532	2.48	1.948	1.298	1.298
Sei Whale	0.219	1.019	0.8	0.534	0.534
Sperm Whale	0.044	0.204	0.16	0.107	0.107
Pilot whales spp	0.139	0.645	0.507	0.338	0.338
Bottlenose dolphin ^a	45.937	213.997	168.06	112.04	112.04
Atlantic White-sided Dolphin	3.42	15.933	12.513	8.342	8.342
Common dolphin	20.689	96.382	75.693	50.462	50.462
Atlantic Spotted Dolphin	0.423	1.97	1.547	1.032	1.032
Risso's dolphin	0.255	1.189	0.934	0.623	0.623
Harbor porpoise	23.169	107.933	84.764	56.509	56.509
Harbor seal ^b	48.857	232.258	182.401	121.601	121.601
Gray seal ^b	48.857	232.258	182.401	121.601	121.601

^a Estimated take is not distinguished between bottlenose dolphin coastal and offshore stocks as degree of survey effort cannot be differentiated in relation to the 20-m isobath.

^b Pinniped density values from Duke University (Roberts *et al.*, 2023) reported as “seals,” so take allocated by 50 percent accrued to harbor seals and 50 percent accrued to gray seals.

The calculated exposure estimates based on the exposure modeling methodology described above were compared with the best available information on marine mammal group sizes and with Empire Wind’s PSO sightings data ranging from 2018 to 2021 for the Project Area to ensure authorized take numbers associated with HRG survey activities were conservative and based on best available information. As a result of this comparison, it was determined that the calculated number of potential takes by Level B harassment based on the exposure modeling methodology above may be underestimates for some species and therefore warranted adjustment to ensure conservatism in requested take numbers. Despite the relatively small modeled Level B harassment zone (50 m) for HRG survey activities, it was determined that adjustments to the requested numbers of take by Level B harassment for some dolphin species was warranted in some cases to be conservative, based on the expectation

that dolphins may approach or bow ride near the survey vessel. No adjustments were made to take requests for large whale species as a result of HRG survey activities due to the relatively small Level B harassment zone (50 m) and the low likelihood that large whales would be encountered within such a short distance of the vessel except in rare circumstances.

For certain species for which the density-based methodology described above may result in potential underestimates of take and Empire Wind’s PSO sightings data were relatively low, adjustments to the exposure estimates were made based on the best available information on marine mammal group sizes to ensure conservatism. For species considered common in the Project Area, authorized takes by Level B harassment were adjusted to one group size per HRG survey day (n-191) that may occur anytime from January through December. These species include bottlenose dolphins (15 individuals;

Jefferson *et al.*, 2015) and common dolphins (30 individuals; Reeves *et al.*, 2002). Note that these adjustments to take estimates were made previously and are included in the LOA application. For species considered less common in the Project Area, requested takes by Level B harassment were adjusted to one group size per month of HRG surveys. These species include Atlantic white-sided dolphins (52 individuals; Jefferson *et al.*, 2015). For species considered rare but which still have the potential to occur in the Project Area, authorized takes by Level B harassment were adjusted to one group size per year of HRG surveys. These species include Atlantic spotted dolphin (45 individuals; Kenney & Vigness-Raposa, 2010) and Risso’s dolphin (100 individuals; Jefferson *et al.*, 2015). The authorized take for pilot whales was adjusted based on PSO data by multiplying the maximum reported daily density (1.34 individuals; Geoquip Marine, 2021) by the annual days of operation.

TABLE 35—AUTHORIZED LEVEL B HARASSMENT TAKE RESULTING FROM HRG SITE CHARACTERIZATION SURVEYS OVER 5 YEARS

Species	2024— Authorized take	2025— Authorized take	2026— Authorized take	2027— Authorized take	2028 to January 2029— authorized take	Total authorized take across 5 years
Fin Whale	1	3	3	2	2	11
Humpback Whale	1	3	3	2	2	11
Minke Whale	4	18	14	9	9	54
North Atlantic Right Whale	1	2	2	1	1	7
Sei Whale	0	1	1	1	1	4

TABLE 35—AUTHORIZED LEVEL B HARASSMENT TAKE RESULTING FROM HRG SITE CHARACTERIZATION SURVEYS OVER 5 YEARS—Continued

Species	2024—Authorized take	2025—Authorized take	2026—Authorized take	2027—Authorized take	2028 to January 2029—authorized take	Total authorized take across 5 years
Sperm Whale	0	0	0	0	0	0
Pilot whales spp	55	256	201	134	134	^a 780
Bottlenose dolphin ^b	615	2,865	2,250	1,500	1,500	^b 8,730
Atlantic White-sided Dolphin	71	331	260	173	173	^c 1,008
Common dolphin	1,230	5,730	4,500	3,000	3,000	17,460
Atlantic Spotted Dolphin	45	45	45	45	45	^d 225
Risso’s dolphin	100	100	100	100	100	^d 500
Harbor porpoise	23	108	85	57	57	330
Harbor seal ^e	50	232	182	122	122	708
Gray seal ^e	50	232	182	122	122	708

^a Authorized take adjusted based on PSO sighting data from 2018 to 2021 (A.I.S., 2019; Alpine Ocean Seismic Survey, 2018; Gardline, 2021a, 2021b; Geoquip Marine, 2021; Marine Ventures International, 2021; RPS, 2021; Smultea Environmental Sciences, 2019, 2020, 2021).

^b Bottlenose dolphin density values from Duke University (Roberts *et al.*, 2023) reported as “bottlenose dolphin” and not identified to stock. HRG survey activities were not differentiated by region relative to the 20-m isopleth and therefore bottlenose takes are not identified to stock. As Roberts and Halpin does not account for group size, the estimated take was adjusted to account for one group size, 15 individual bottlenose dolphins (Jefferson *et al.*, 2015) per day and 30 individual common dolphins (Reeves *et al.*, 2002), per day.

^c As Roberts *et al.* (2023) does not account for group size, the authorized take was adjusted to account for one group size, 52 individuals (Jefferson *et al.*, 2015) per month of Atlantic white-sided dolphins.

^d As Roberts *et al.* (2023) does not account for group size, the authorized take was adjusted to account for one group size, 100 individuals (Jefferson *et al.*, 2015), per year of Risso’s dolphins and 45 individuals (Kenney and Vigness-Raposa, 2010) per year of Atlantic spotted dolphins.

^e Pinniped density values from Duke University (Roberts *et al.*, 2023) reported as “seals,” so take allocated by 50 percent accrued to harbor seals and 50 percent accrued to gray seals.

Total Takes Across All Activity Types

The amount of Level A harassment and Level B harassment NMFS is authorizing incidental to all project activities combined (*i.e.*, impact pile driving to install WTG and OSS monopile and jacket foundations, vibratory pile driving to install and remove temporary cofferdams, marina activities, and HRG surveys) are shown in table 34. The annual amount of take that would occur in each year based on Empire Wind’s current schedules is provided in table 36. NMFS notes that while HRG surveys are expected to occur across all 5 years (2024–2029) of the effective period of the rulemaking (a total of 582 days across all 5 years), survey effort will vary. Year 1 (2024) take estimates include 41 days of HRG surveys, cofferdams or goal posts installation and removal, and marine activities. Year 2 (2025) includes 191 days of HRG surveys, WTG impact installation using monopile foundations, OSS impact installation using pin piles for jacket foundations, and cofferdams or goal post installation and removal. Year 3 (2026) includes 150 days of HRG surveys, WTG impact installation using monopile foundations, and OSS impact installation using pin piles for jacket foundations. Years 4 and 5 include 100 days each of HRG surveys. All activities are expected to be completed by 2029, equating to the five years of activities, as described in this preamble.

For the species for which modeling was conducted, the authorized take is considered conservative for a number of reasons. The amount of authorized take assumes the most impactful scenario with respect to project design and schedules. As described in the Description of Specific Activities section, Empire Wind plans to use monopile and jacket foundations for all permanent structures (*i.e.*, WTGs and OSSs). If Empire Wind decides to use suction-buckets or gravity-based foundations to install bottom-frame WTG and OSS foundations, take would not occur as noise levels would not be elevated to the degree there is a potential for take (*i.e.*, no pile driving is involved with installing suction buckets or gravity-based foundations). The authorized take for impact pile driving assumed a maximum piling schedule of two monopiles and three pin piles installed per 24-hour period. The authorized take from vibratory pile driving assumed temporary cofferdams using sheet piles would be installed, versus the alternative installation of a gravity-cell cofferdam, for which no take would be expected nor authorized. The authorized take numbers for pile driving are conservatively based on the maximum densities across the construction months. The authorized take numbers for Level A harassment do not fully account for the likelihood that marine mammals would avoid a stimulus when possible before the individual accumulates enough acoustic

energy to potentially cause auditory injury, nor do these numbers account for the effectiveness of the required mitigation measures. Lastly, the amount of authorized take for nearshore installation of cofferdams and goal posts is based on a simple calculation (density × area × number of days of activity), which is thought to already be inherently conservative.

Authorized takes by Level A harassment and Level B harassment for the combined activities of impact pile driving during the impact installation of monopiles and pin piles (assuming 10 dB of sound attenuation), vibratory pile driving and removal for the temporary cofferdams, vibratory removal of berthing piles and installation of sheet piles at the Onshore Substation C marina, and HRG surveys are provided in table 36. NMFS also presents the percentage of each marine mammal stock estimated to be taken based on the total amount of annual take in table 38. Table 37 provides the total authorized take from the entire 5-year effective period of the rulemaking and issued LOA. NMFS recognizes that schedules may shift due to a number of planning and logistical constraints such that take may be redistributed throughout the 5 years. However, the total 5-year amount of take for each species, shown in table 37, and the maximum amount of take in any one year (table 35) would not be exceeded. Additionally, to reduce impacts to marine mammals, NMFS has required several mitigation and

monitoring measures, provided in the Mitigation and Monitoring and Reporting sections, which are activity-

specific and are designed to minimize

acoustic exposures to marine mammal species.

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Table 36 -- Level A Harassment and Level B Harassment Takes for All Activities Authorized During the Construction and Development of the Project

Marine Mammal Species	NMFS Stock Abundance	2024 (Year 1)		2025 (Year 2)		2026 (Year 3)		2027 (Year 4)		2028 (Year 5)	
		Level A harassment	Level B harassment								
Mysticetes											
Fin Whale*	6,802	0	1	4	136	2	60	0	2	0	2
Humpback Whale	1,396	0	1	0	63	0	29	0	2	0	2
Minke Whale	21,968	0	4	4	83	2	62	0	9	0	9
North Atlantic Right Whale*	338	0	1	0	13	0	13	0	1	0	1
Sei Whale*	6,292	0	0	0	4	0	3	0	1	0	1
Odontocetes											
Atlantic Spotted Dolphin	39,921	0	45	0	90	0	90	0	45	0	45
Atlantic White-sided Dolphin	93,233	0	71	0	747	0	676	0	178	0	173

Bottlenose dolphin (Western North Atlantic, Offshore stock) ^a	62,851	0	0	0	1,800	0	765	0	0	0	0
Bottlenose dolphin (Western North Atlantic, Coastal Stock) ^a	6,639	0	1,185	0	270	0	0	0	0	0	0
Bottlenose dolphin (Western North Atlantic, Offshore and Coastal Stocks) ^b	69,490	0	615	0	2,865	0	2,250	0	1,500	0	1,500
Common Dolphin	172,974	0	2,130 ^f	0	9,870	0	6,030	0	3,000	0	3,000
Harbor Porpoise	95,543	0	25	0	243	0	183	0	57	0	57
Pilot Whale ^c	68,139	0	55	0	417	0	269	0	134	0	134
Risso's Dolphin	35,215	0	100	0	200	0	200	0	100	0	100
Sperm Whale*	1,180	0	0	0	3	0	3	0	0	0	0
Phocid (pinnipeds)											

Gray Seal ^d	27,300	0	455	0	501	0	306	0	122	0	122
Harbor Seal ^d	61,336	0	455	0	662	0	401	0	122	0	122
Harp Seal ^e	7.6 M	0	4	0	4	0	4	0	4	0	4

* Denotes species listed under the ESA.

a - Represents estimated take from impact pile driving, vibratory driving for cofferdams, and marina construction activities. For year 1, estimated take for the bottlenose dolphin coastal stock includes cofferdam construction from years 1 and 2 as a portion of year 2 construction may occur in year 1.

b - Bottlenose dolphin density values from Duke University (Roberts *et al.*, 2023) reported as "bottlenose dolphin" and not identified to stock. Given the noise from cofferdam installation would not extend beyond the 20-m isobath, where the coastal stock predominates, all estimated takes by Level B harassment of bottlenose dolphins from cofferdam installation were attributed to the coastal stock. Takes from impact pile driving were attributed to each stock (coastal and offshore) according to delineation along the 20-m isobath during the animat modeling process. Takes from HRG survey activities were not differentiated.

c - Pilot whale density values from Duke University (Roberts *et al.*, 2023) reported as "*Globicephala* spp." and not species-specific.

d - Pinniped density values from Duke University (Roberts *et al.*, 2023) reported as "seals" and not species-specific, so take allocated by 50 percent accrued to harbor seals and 50 percent accrued to gray seals for cable landfall construction, marina construction, and HRG surveys. Scaling based on local occurrence was used for WTG and OSS foundation installation. For year 1, estimated take by Level B harassment also includes cofferdam activities for year 2 for harbor and gray seals, as a portion of the year 2 cofferdam activities may take place during year 1.

e - Harp seal occurrence is anticipated to be rare. Anecdotal stranding data indicate only a few harp seals are sighted within the vicinity of the Project each year. Therefore, four harp seal Level B takes have been requested per year of the Project.

f - Estimated take by Level B harassment also includes estimated take for cofferdam construction during year 2 as a portion of these activities may take place during year 1.

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TABLE 37—TOTAL 5-YEAR AUTHORIZED TAKES (LEVEL A HARASSMENT AND LEVEL B HARASSMENT) FOR ALL ACTIVITIES DURING THE CONSTRUCTION AND DEVELOPMENT OF THE PROJECT

Marine mammal species	NMFS stock abundance	5-Year totals		
		Authorized Level A harassment	Authorized Level B harassment	5-Year sum (Level A harassment + Level B harassment)
Mysticetes				
Fin Whale *	6,802	6	201	207
Humpback Whale	1,396	0	97	97
Minke Whale	21,968	6	167	173
North Atlantic Right Whale *	336	0	29	29
Sei Whale *	6,292	0	9	9
Odontocetes				
Atlantic Spotted Dolphin	39,921	0	315	315
Atlantic White-sided Dolphin	93,221	0	1,840	1,840
Bottlenose Dolphin (Western North Atlantic Offshore) ^a	62,851	0	2,565	2,565
Bottlenose Dolphin (Northern Migratory Coastal) ^a	6,639	0	1,455	1,455
Bottlenose Dolphin (WNA Offshore and Northern Migratory Coastal) ^a	69,490	0	8,730	8,730
Common Dolphin	172,974	0	24,030	24,030
Harbor Porpoise	95,543	0	565	565
Pilot Whales	68,139	0	1,009	1,009

TABLE 37—TOTAL 5-YEAR AUTHORIZED TAKES (LEVEL A HARASSMENT AND LEVEL B HARASSMENT) FOR ALL ACTIVITIES DURING THE CONSTRUCTION AND DEVELOPMENT OF THE PROJECT—Continued

Marine mammal species	NMFS stock abundance	5-Year totals		
		Authorized Level A harassment	Authorized Level B harassment	5-Year sum (Level A harassment + Level B harassment)
Risso's Dolphin	35,215	0	700	700
Sperm Whale *	4,349	0	6	6
Phocid (pinnipeds)				
Gray Seal	27,300	0	1,496	1,496
Harbor Seal	61,336	0	1,752	1,752
Harp Seal ^b	UNK	0	20	20

* Denotes species listed under the ESA.

^a Total estimated 5-year take by Level B harassment represents estimated take from HRG surveys, estimated take for the offshore stock, and estimated take for the coastal stock. The estimated take for the coastal stock of year 2 cofferdam construction (270) is subtracted from the total 5-year take as this estimate is incorporated into cofferdam estimated take for years 1 and 2.

^b Harp seal occurrence is anticipated to be rare. Anecdotal stranding data indicate only a few harp seals are sighted within the vicinity of the Project each year. Therefore, four harp seal Level B harassment takes have been requested per year of the Project.

In making the negligible impact determination and the necessary small numbers finding, NMFS assesses the greatest number of takes of marine mammals that could occur within any one year (which in the case of this rule is based on the predicted year 2 for all species), although the negligible impact

determination also examines the cumulative impact over the 5-year period. In this calculation, the maximum estimated number of Level A harassment takes in any one year is summed with the maximum estimated number of Level B harassment takes in any one year for each species to yield

the highest number of estimated take that could occur in any year (table 38). We recognize that certain activities could shift within the 5-year effective period of the rule; however, the rule allows for that flexibility and the takes are not expected to exceed those shown in table 38 in any year.

TABLE 38—MAXIMUM NUMBER OF AUTHORIZED TAKES (LEVEL A HARASSMENT AND LEVEL B HARASSMENT) IN ANY ONE YEAR OF THE PROJECT AND THE PERCENT STOCK THAT WOULD BE TAKEN BASED ON THE MAXIMUM ANNUAL AUTHORIZED TAKE

Marine mammal species	NMFS stock abundance	Maximum annual take authorized			
		Maximum Level A harassment	Maximum Level B harassment	Maximum annual take ^a	Total percent stock taken based on maximum annual take ^b
Mysticetes					
Fin Whale *	6,802	4	136	140	2.06.
Humpback Whale	1,396	0	63	63	4.51.
Minke Whale	21,968	4	83	87	0.40.
North Atlantic Right Whale *	338	0	13	13	3.85.
Sei Whale *	6,292	0	4	4	0.06
Odontocetes					
Sperm Whale *	4,349	0	3	3	0.07.
Atlantic Spotted Dolphin	39,921	0	90	90	0.23.
Atlantic White-sided Dolphin	93,221	0	747	747	0.80.
Bottlenose Dolphin (Western North Atlantic Offshore) ^c .	62,851	0	1,800 (pile driving only).	1,800 (pile driving only).	2.86.
Bottlenose Dolphin (Northern Migratory Coastal) ^c .	6,639	0	1,185 (pile driving only).	1,185 (pile driving only).	17.85.
Bottlenose Dolphin (WNA Offshore and Northern Migratory Coastal) ^d .	62,851 Western North Atlantic Offshore; 6,639 Northern Migratory Coastal.	0	2,865 (HRG survey).	2,865 (HRG survey).	See text description in the Small Numbers section.
Common Dolphin	172,974	0	9,870	9,870	5.71.
Harbor Porpoise	95,543	0	243	243	0.25.
Pilot Whale spp	68,139	0	417	417	1.06.
Risso's Dolphin	35,215	0	200	200	0.57.

TABLE 38—MAXIMUM NUMBER OF AUTHORIZED TAKES (LEVEL A HARASSMENT AND LEVEL B HARASSMENT) IN ANY ONE YEAR OF THE PROJECT AND THE PERCENT STOCK THAT WOULD BE TAKEN BASED ON THE MAXIMUM ANNUAL AUTHORIZED TAKE—Continued

Marine mammal species	NMFS stock abundance	Maximum annual take authorized			
		Maximum Level A harassment	Maximum Level B harassment	Maximum annual take ^a	Total percent stock taken based on maximum annual take ^b
Phocid (pinnipeds)					
Gray Seal	27,300	0	501	501	1.84.
Harbor Seal	61,336	0	662	662	1.08.
Harp Seal	7,600,000	0	4	4	0.00005.

* Denotes species listed under the ESA.

^a Calculations of the maximum annual take are based on the maximum requested Level A harassment take in any one year + the total requested Level B harassment take in any one year.

^b Calculations of percentage of stock taken are based on the maximum requested Level A harassment take in any one year + the total requested Level B harassment take in any one year and then compared against the best available abundance estimate. For this action, the best available abundance estimates are derived from the NMFS SARs (Hayes *et al.*, 2023).

^c Bottlenose dolphin density values from Duke University (Roberts *et al.*, 2023) reported as “bottlenose dolphin” and not identified to stock. Given the noise from cofferdam installation would not extend beyond the 20-m isobath, where the coastal stock predominates, all estimated takes by Level B harassment of bottlenose dolphins from cofferdam installation were attributed to the coastal stock. Takes from impact pile driving were attributed to each stock (coastal and offshore) according to delineation along the 20-m isobath during the animat modeling process. Takes from HRG survey activities were not differentiated.

^d The values presented here assume that all of the take from HRG surveys (n=2,865) that could occur in any given year to either the offshore stock or the Northern Migratory coastal stock would occur to the offshore stock. While NMFS does not believe this is a likely outcome given Empire Wind would conduct an undefined amount of HRG work outside of the offshore stock’s habitat, we have presented it here as is for simplicity.

Mitigation

As noted in the Changes from the Proposed to Final Rule section, NMFS has added several new mitigation requirements and clarified a few others and has increased the minimum visibility zone for mysticetes and shutdown zone for North Atlantic right whales. These changes are described in detail in the sections below. Besides these changes, the required measures remain the same as those described in the proposed rule. However, NMFS has also re-organized and simplified the section to avoid full duplication of the specific requirements that are fully described in the regulatory text.

In order to promulgate a rulemaking under section 101(a)(5)(A) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable adverse impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS’ regulations require applicants for ITAs to include information about the availability and feasibility (*e.g.*, economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or

stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (*e.g.*, likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (*i.e.*, the probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (*i.e.*, the probability if implemented as planned); and

(2) The practicability of the measures for applicant implementation, which may consider factors such as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

The mitigation strategies described below are consistent with those required and successfully implemented under previous ITAs issued in association with in-water construction activities

(*e.g.*, soft-start, establishing shutdown zones). Additional measures have also been incorporated to account for the fact that the construction activities would occur offshore. Modeling was performed to estimate harassment zones, which were used to inform mitigation measures for the Project’s activities to minimize Level A harassment and Level B harassment to the extent practicable, while providing estimates of the areas within which Level B harassment might occur.

Generally speaking, the mitigation measures considered and required here fall into three categories: temporal (*i.e.*, seasonal and daily) and spatial work restrictions, real-time measures (*e.g.*, shutdown, clearance, and vessel strike avoidance), and noise attenuation/reduction measures. Temporal and spatial work restrictions are designed to avoid or minimize operations when marine mammals are concentrated or engaged in behaviors that make them more susceptible or make impacts more likely, in order to reduce both the number and severity of potential takes, and are effective in reducing both chronic (longer-term) and acute effects. Real-time measures, such as implementation of shutdown and clearance zones, as well as vessel strike avoidance measures, are intended to reduce the probability or severity of harassment by taking steps in real time once a higher-risk scenario is identified (*e.g.*, once animals are detected within an impact zone). Noise attenuation

measures such as bubble curtains are intended to reduce the noise at the source, which reduces both acute impacts, as well as the contribution to aggregate and cumulative noise that may result in longer term chronic impacts.

Below, we briefly describe the required training, coordination, and vessel strike avoidance measures that apply to all activity types, and in the following subsections we describe the measures that apply specifically to foundation installation, nearshore installation and removal activities for cable laying and marina activities, and HRG surveys. Details on specific requirements can be found in 50 CFR part 217, subpart CC, set out at the end of this rulemaking.

Training and Coordination

NMFS requires all Empire Wind employees and contractors conducting activities on the water, including but not limited to, all vessel captains and crew to be trained in marine mammal detection and identification, communication protocols, and all required measures to minimize impacts on marine mammals and support Empire Wind's compliance with the LOA, if issued. Additionally, all relevant personnel and the marine mammal species monitoring team(s) are required to participate in joint, onboard briefings prior to the beginning of project activities. The briefing must be repeated whenever new relevant personnel (*e.g.*, new PSOs, construction contractors, relevant crew) join the Project before work commences. During this training, Empire Wind is required to instruct all project personnel regarding the authority of the marine mammal monitoring team(s). For example, the HRG acoustic equipment operator, pile driving personnel, *etc.*, is required to immediately comply with any call for a delay or shutdown by the Lead PSO. Any disagreement between the Lead PSO and the Project personnel must only be discussed after delay or shutdown has occurred. In particular, all captains and vessel crew must be trained in marine mammal detection and vessel strike avoidance measures to ensure marine mammals are not struck by any project or project-related vessel.

Prior to the start of in-water construction activities, vessel operators and crews will receive training about marine mammals and other protected species known or with the potential to occur in the Project Area, making observations in all weather conditions, and vessel strike avoidance measures. In addition, training will include information and resources available regarding applicable Federal laws and

regulations for protected species. Empire Wind will provide documentation of training to NMFS. Since the proposed rule, NMFS has added requirements for a description of the training program to be provided to NMFS at least 60 days prior to the initial training before in-water activities begin and for confirmation of all required training to be documented on a training course log sheet and reported to NMFS Office of Protected Resources prior to initiating project activities. These measures were added in response to several commenters' concerns regarding strengthening mitigation and monitoring measures.

North Atlantic Right Whale Awareness Monitoring

Empire Wind must use available sources of information on North Atlantic right whale presence, including daily monitoring of the Right Whale Sightings Advisory System, monitoring of Coast Guard VHF Channel 16 throughout each day to receive notifications of any sightings, and information associated with any regulatory management actions (*e.g.*, establishment of a zone identifying the need to reduce vessel speeds). Maintaining daily awareness and coordination affords increased protection of North Atlantic right whales by understanding North Atlantic right whale presence in the area through ongoing visual and PAM efforts and opportunities (outside of Empire Wind's efforts), and allows for planning of construction activities, when practicable, to minimize potential impacts on North Atlantic right whales. The vessel strike avoidance measures apply to all vessels associated with the Project within U.S. waters and on the high seas.

Vessel Strike Avoidance Measures

This final rule contains numerous vessel strike avoidance measures that reduce the risk that a vessel and marine mammal could collide. While the likelihood of a vessel strike is generally low, they are one of the most common ways that marine mammals are seriously injured or killed by human activities. Therefore, enhanced mitigation and monitoring measures are required to avoid vessel strikes to the extent practicable. While many of these measures are proactive intending to avoid the heavy use of vessels during times when marine mammals of particular concern may be in the area, several are reactive and occur when a marine mammal is sighted by project personnel. The mitigation requirements are described generally here and in

detail in the regulatory text at the end of this final rule (see 50 CFR 217.284(b)). Empire Wind will be required to comply with these measures, except under circumstances when doing so would create an imminent and serious threat to a person or vessel, or to the extent that a vessel is unable to maneuver and, because of the inability to maneuver, the vessel cannot comply.

While underway, Empire Wind is required to monitor for and maintain a safe distance from marine mammals, and operate vessels in a manner that reduces the potential for vessel strike. Regardless of the vessel's size, all vessel operators, crews, and dedicated visual observers (*i.e.*, PSO or trained crew member) must maintain a vigilant watch for all marine mammals and slow down, stop their vessel, or alter course as appropriate to avoid striking any marine mammal. The dedicated visual observer, equipped with suitable monitoring technology (*e.g.*, binoculars, night vision devices), must be located at an appropriate vantage point for ensuring vessels are maintaining required vessel separation distances from marine mammals (*e.g.*, 500 m from North Atlantic right whales).

In the event that any project-related vessel, regardless of size, observes any large whale, any mother/calf pair, or large assemblages of non-delphinid cetaceans within 500 m of the vessel, the vessel is required to immediately reduce speeds to 10 kn or less. Additionally, all project vessels, regardless of size, must maintain a 100-m minimum separation zone from sperm whales and non-North Atlantic right whale baleen species. Vessels are also required to keep a minimum separation distance of 50 m from all delphinid cetaceans and pinnipeds, with an exception made for those species that approach the vessel (*i.e.*, bow-riding dolphins). If any of these non-North Atlantic right whale marine mammals are sighted, the underway vessel must shift its engine to neutral and the engines must not be engaged until the animal(s) have been observed to be outside of the vessel's path and beyond 100 m (for sperm whales and non-North Atlantic right whale large whales) or 50 m (for delphinids and pinnipeds).

All of the Project-related vessels are required to comply with existing NMFS vessel speed restrictions for North Atlantic right whales and the measures within this rulemaking for operating vessels around North Atlantic right whales and other marine mammals. When NMFS vessel speed restrictions are not in effect and a vessel is traveling at greater than 10 kn, in addition to the

required dedicated visual observer, Empire Wind is required to monitor the transit corridor in real-time with PAM prior to and during transits. To maintain awareness of North Atlantic right whale presence in the Project Area, vessel operators, crew members, and the marine mammal monitoring team will monitor U.S. Coast Guard VHF Channel 16, WhaleAlert, the Right Whale Sighting Advisory System (RWSAS), and the PAM system. Any North Atlantic right whale or large whale detection will be immediately communicated to PSOs, PAM operators, and all vessel captains. All vessels will be equipped with an AIS and Empire Wind must report all Maritime Mobile Service Identify (MMSI) numbers to NMFS Office of Protected Resources prior to initiating in-water activities. The requirement for vessels to be equipped with AIS has been added since the proposed rule to increase the accountability of project vessels. Empire Wind will submit a NMFS-approved North Atlantic right whale vessel strike avoidance plan at least 90 days prior to commencement of vessel use.

Compliance with these measures would reduce the likelihood of vessel strike by increasing awareness of marine mammal presence in the Project Area (e.g., monitoring, communication), reducing vessel speed when marine mammals are detected (by PSOs, PAM, and/or through another source (e.g., RWSAS)), and maintaining separation distances when marine mammals are encountered. While visual monitoring is useful, reducing vessel speed is one of the most effective, feasible options available to minimize the likelihood of a vessel strike and, if a strike does occur, decreases the potential for serious injury or lethal outcomes. Numerous studies have indicated that slowing the speed of vessels reduces the risk of lethal vessel collisions, particularly in areas where right whales are abundant, vessel traffic is common, and vessels are traveling at high speeds (Vanderlaan and Taggart, 2007; Conn and Silber, 2013; Van der Hoop *et al.*, 2014; Martin *et al.*, 2015; Crum *et al.*, 2019).

Given the vessel strike avoidance measures included herein, NMFS considers the potential for vessel strike to be *de minimis* and does not authorize take from this activity.

Seasonal and Daily Restrictions

Temporal restrictions in places where marine mammals are concentrated, engaged in biologically important behaviors, and/or present in sensitive life stages are effective measures for reducing the magnitude and severity of

human impacts. The temporal restrictions required here are built around the protection of North Atlantic right whales. Based upon the best scientific information available (Roberts *et al.*, 2023), the highest densities of North Atlantic right whales in the Project Area are expected during the months of January through April, with an increase in density starting in December. However, North Atlantic right whales may be present in the Project Area throughout the year, although the numbers of North Atlantic right whales would not be as large as would be expected in a foraging or calving ground.

NMFS is requiring seasonal work restrictions to minimize the risk of noise exposure to North Atlantic right whales incidental to certain specified activities to the extent practicable. These seasonal work restrictions are expected to greatly reduce the number of takes of North Atlantic right whales. These seasonal restrictions also afford protection to other marine mammals that are known to use the Project Area with greater frequency during winter months, including other baleen whales.

As described previously, no impact-pile-driving activities may occur January 1 through April 30. A new measure included in this final rule requires that Empire Wind install the foundations as quickly as possible and avoid pile driving in December to the maximum extent practicable; however, pile driving may occur in December if it is unavoidable upon approval from NMFS. Furthermore, pile driving will be limited to daylight hours only, subject to the exceptions described below, to reduce impacts on migrating species (e.g., North Atlantic right whales) and to ensure that visual PSOs can confirm appropriate clearance of the site prior to pile-driving activities.

No more than two foundation monopiles or three pin piles for jacket foundations would be installed per day. Monopiles must be no larger than 11-m in diameter and pin piles must be no larger than 2.5-m in diameter. For all monopiles and pin piles, the minimum amount of hammer energy necessary to effectively and safely install and maintain the integrity of the piles must be used. Hammer energies must not exceed 5,500 kJ for monopile installation or 3,200 kJ for pin pile installation.

Impact pile driving will be initiated only during daylight hours no earlier than 1 hour after civil sunrise. Impact pile driving will not be initiated later than 1.5 hours before civil sunset. Generally, pile driving may continue after dark when the installation of the

same pile began during daylight (1.5 hours before civil sunset), when clearance zones were fully visible for at least 30 minutes and must proceed for human safety or installation feasibility reasons. The exception to this would be if Empire Wind submits, and NMFS approves, an Alternative Monitoring Plan as part of the Pile Driving and Marine Mammal Monitoring Plan that reliably demonstrates the efficacy of detecting marine mammals at night with its proposed devices. Impact pile driving will not be initiated when the minimum visibility zones cannot be fully visually monitored, as determined by the lead PSO on duty.

Empire Wind has planned to construct the cofferdams or a casing pipe with goal posts anytime within the year during the first and second years of the effective period of the regulations and LOA. However, NMFS is not requiring any seasonal restrictions due to the relatively short durations in which work would occur (*i.e.*, low associated impacts). Although North Atlantic right whales do migrate in coastal waters, they do not typically migrate very close to shore off of New York and/or within New York bays where work would be occurring. Given the distance to the Level B harassment isopleth is conservatively modeled at approximately 2 km, any exposure to vibratory pile driving during cofferdams would be at levels closer to the 120-dB Level B harassment threshold and not at louder source levels. Empire Wind will be required, however, to conduct vibratory pile driving associated with cofferdams or casing pipe and goal post installation during daylight hours only.

Given the very small harassment zones resulting from HRG surveys and that the best available science indicates that any harassment from HRG surveys, should a marine mammal be exposed, the exposure would manifest as minor behavioral harassment only (e.g., potentially some avoidance of the vessel). Thus, NMFS is not requiring any seasonal and daily restrictions for HRG surveys.

More information on activity-specific seasonal and daily restrictions can be found in the regulatory text at the end of this rulemaking.

Noise Abatement Systems

Empire Wind is required to employ noise abatement systems (NASs) during all foundation installation (*i.e.*, impact pile driving) activities to reduce the sound pressure levels that are transmitted through the water in an effort to reduce ranges to acoustic thresholds and minimize any acoustic impacts resulting from these activities.

Empire Wind is required to use at least two NASs to ensure that measured sound levels do not exceed the levels modeled for a 10-dB sound level reduction for foundation installation, which is likely to include a double big bubble curtain, as well as the adjustment of operational protocols to minimize noise levels. This requirement has been updated since the proposed rule as a single bubble curtain, alone or in combination with another NAS device, may not be used for either pile driving as received SFV data reveals this approach is unlikely to attenuate sounds to the degree distances to harassment thresholds are at or smaller than those modeled assuming 10 dB of attenuation. As part of adaptive management should the research and development phase of newer systems demonstrate effectiveness, Empire Wind may submit data on the effectiveness of these systems and request approval from NMFS to use them during foundation installation activities.

Two categories of NASs exist: primary and secondary. A primary NAS would be used to reduce the level of noise produced by foundation installation activities at the source, typically through adjustments on to the equipment (e.g., hammer strike parameters). Primary NASs are still evolving and will be considered for use during mitigation efforts when the NAS has been demonstrated as effective in commercial projects. However, as primary NASs are not fully effective at eliminating noise, a secondary NAS would be employed. The secondary NAS is a device or group of devices that would reduce noise as it was transmitted through the water away from the pile, typically through a physical barrier that would reflect or absorb sound waves and therefore, reduce the distance the higher energy sound propagates through the water column. Together, these systems must reduce noise levels to those not exceeding modeled ranges to Level A harassment and Level B harassment isopleths corresponding to those modeled assuming 10-dB sound attenuation, pending results of SFV (see the *Sound Field Verification* section below and 50 CFR part 217).

Noise abatement systems, such as bubble curtains, are used to decrease the sound levels radiated from a source. Bubbles create a local impedance change that acts as a barrier to sound transmission. The size of the bubbles determines their effective frequency band, with larger bubbles needed for lower frequencies. There are a variety of bubble curtain systems, confined or unconfined bubbles, and some with

encapsulated bubbles or panels. Attenuation levels also vary by type of system, frequency band, and location. Small bubble curtains have been measured to reduce sound levels but effective attenuation is highly dependent on depth of water, current, and configuration and operation of the curtain (Austin *et al.*, 2016; Koschinski and Lüdemann, 2013). Bubble curtains vary in terms of the sizes of the bubbles and those with larger bubbles tend to perform a bit better and more reliably, particularly when deployed with two separate rings (Bellmann, 2014; Koschinski and Lüdemann, 2013; Nehls *et al.*, 2016). Encapsulated bubble systems (e.g., Hydro Sound Dampers (HSDs)), can be effective within their targeted frequency ranges (e.g., 100–800 Hz), and when used in conjunction with a bubble curtain appear to create the greatest attenuation. The literature presents a wide array of observed attenuation results for bubble curtains. The variability in attenuation levels is the result of variation in design as well as differences in site conditions and difficulty in properly installing and operating in-water attenuation devices. Dähne *et al.* (2017) found that single bubble curtains that reduce sound levels by 7 to 10 dB reduced the overall sound level by approximately 12 dB when combined as a double bubble curtain for 6-m steel monopiles in the North Sea. During installation of monopiles (consisting of approximately 8-m in diameter) for more than 150 WTGs in comparable water depths (>25 m) and conditions in Europe indicate that attenuation of 10 dB is readily achieved (Bellmann, 2019; Bellmann *et al.*, 2020) using single BBCs for noise attenuation. When a double big bubble curtain is used (noting a single bubble curtain is not allowed), Empire Wind is required to maintain numerous operational performance standards. These standards are defined in the regulatory text at the end of this rulemaking, and include, but are not limited to, construction contractors must train personnel in the proper balancing of airflow to the bubble ring and Empire Wind must submit a performance test and maintenance report to NMFS within 72 hours following the performance test. Corrections to the attenuation device to meet regulatory requirements must occur prior to use during foundation installation activities. In addition, a full maintenance check (e.g., manually clearing holes) must occur prior to each pile being installed. If Empire Wind uses a noise mitigation device in addition to a double big bubble curtain, similar quality control measures are

required. Should the research and development phase of newer systems demonstrate effectiveness, as part of adaptive management, Empire Wind may submit data on the effectiveness of these systems and request approval from NMFS to use them during foundation installation activities.

Empire Wind is required to submit an SFV plan to NMFS for approval at least 180 days prior to installing foundations. They are also required to submit interim and final SFV data results to NMFS and make corrections to the NASs in the case that any SFV measurements demonstrate noise levels are above those modeled assuming 10 dB. These frequent and immediate reports allow NMFS to better understand the sound fields to which marine mammals are being exposed and require immediate corrective action should they be misaligned with anticipated noise levels within our analysis.

Noise abatement devices are not required during HRG surveys, cofferdam (*i.e.*, sheet pile), goal post (*i.e.*, pipe pile) installation/removal, and marina piling activities. Regarding cofferdam sheet pile and goal post pipe pile installation and removal as well as marina piling activities, NAS is not practicable to implement due to the physical nature of linear sheet piles and angled pipe piles, and is of low risk for impacts to marine mammals due to the short work duration and lower noise levels produced during the activities. Regarding HRG surveys, NAS cannot practicably be employed around a moving survey ship, but Empire Wind is required to make efforts to minimize source levels by using the lowest energy settings on equipment that has the potential to result in harassment of marine mammals (e.g., CHIRPs) and turning off equipment when not actively surveying. Overall, minimizing the amount and duration of noise in the ocean from any of the Project's activities through use of all means necessary (e.g., noise abatement, turning off power) will effect the least practicable adverse impact on marine mammals.

Clearance and Shutdown Zones

NMFS requires the establishment of both clearance and, where technically feasible, shutdown zones during project activities that have the potential to result in harassment of marine mammals. The purpose of "clearance" of a particular zone is to minimize potential instances of auditory injury and more severe behavioral disturbances by delaying the commencement of an activity if marine mammals are near the activity. The purpose of a shutdown is to prevent a

specific acute impact, such as auditory injury or severe behavioral disturbance of sensitive species, by halting the activity.

All relevant clearance and shutdown zones during project activities would be monitored by NMFS-approved PSOs and PAM operators as described in the regulatory text at the end of this rulemaking. At least one PAM operator must review data from at least 24 hours prior to foundation installation and must actively monitor hydrophones for 60 minutes prior to commencement of impact-pile-driving activities. Any North Atlantic right whale sighting at any distance by foundation installation PSOs, or acoustically detected within the PAM monitoring zone (10 km), triggers a delay to commencing pile driving and shutdown. Any large whale sighted by a PSO or acoustically 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.

Prior to the start of certain specified activities (*i.e.*, foundation installation, cofferdam install and removal, HRG surveys, and marina activities), Empire Wind must ensure designated areas (*i.e.*, clearance zones as provided in tables 39–41) are clear of marine mammals prior to commencing activities to minimize the potential for and degree of harassment. For foundation installation, PSOs must visually monitor clearance zones for marine mammals for a minimum of 60 minutes. During this period, the clearance zones will be monitored by both PSOs and a PAM operator. Prior to the start of impact-pile-driving activities, Empire Wind will ensure the area is clear of marine mammals, per the clearance zones in table 39, to minimize the potential for, and the degree of, harassment. All clearance zones must be confirmed to be free of marine mammals for 30 minutes immediately prior to starting a soft-start of pile driving. If a marine mammal is observed within a clearance zone during the pre-start clearance period, impact pile driving will be delayed and may not begin until the animal(s) has been observed exiting its respective zone, or until an additional time period has elapsed with no further sightings (*i.e.*, 15 minutes for small odontocetes and pinnipeds and 30 minutes for all other species). In addition, impact pile driving will be delayed upon a confirmed PAM detection of a North Atlantic right whale if the PAM detection is confirmed to have been located within the 5 km North Atlantic right whale PAM Clearance zone. Any large whale sighted by a PSO within 1,000 m of the pile that cannot be

identified to species must be treated as if it were a North Atlantic right whale. PSO and PAM must continue throughout the duration of monopile installation and for 30 minutes post-completion of installation.

Clearance and shutdown zones have been developed in consideration of modeled distances to relevant PTS thresholds with respect to minimizing the potential for take by Level A harassment. The clearance and shutdown zones for North Atlantic right whales during monopile and OSS foundation installation is any distance from PSOs or any acoustic detection within the PAM monitoring zone (10km). The visual and acoustic clearance zones for large whales other than North Atlantic right whales are 2,000 m, which corresponds to the largest modeled exposure range (ER_{95%}) distances to Level A harassment thresholds (SEL and peak) under all scenarios for all whales, rounded up to the nearest 0.5 km (tables 12 and 13). The visual and acoustic shutdown zones for large whales other than North Atlantic right whales are 1,500 m for all typical piles and one difficult-to-drive pile for all other large whales, and 2,000 m for two difficult-to-drive piles for all other large whales. These distances are also larger than the largest Level A harassment modeled exposure range (ER_{95%}). For other species, the clearance and shutdown zones represent the lowest practicable adverse impact (LPAI) and minimize the amount of take by Level B harassment. For North Atlantic right whales, there is an additional requirement that the clearance zone may only be declared clear if no confirmed North Atlantic right whale acoustic detections (in addition to visual) have occurred during the 60-minute monitoring period.

Once an activity begins, any marine mammal entering their respective shutdown zone would trigger the activity to cease. In the case of pile driving, the shutdown requirement may be waived if it is not practicable due to imminent risk of injury or loss of life to an individual, risk of damage to a vessel that creates risk of injury or loss of life for individuals, or where the lead engineer determines there is pile refusal or pile instability. In situations when shutdown is called for during impact pile driving, but Empire Wind determines shutdown is not practicable due to aforementioned emergency reasons, reduced hammer energy must be implemented when the lead engineer determines it is practicable. Specifically, pile refusal or pile instability could result in not being able to shut down pile driving immediately.

Pile refusal occurs when the pile driving sensors indicate the pile is approaching refusal and a shut-down would lead to a stuck pile which then poses an imminent risk of injury or loss of life to an individual, or risk of damage to a vessel that creates risk for individuals. Pile instability occurs when the pile is unstable and unable to stay standing if the piling vessel were to “let go.” During these periods of instability, the lead engineer may determine a shut-down is not feasible because the shut-down combined with impending weather conditions may require the piling vessel to “let go”, which then poses an imminent risk of injury or loss of life to an individual, or risk of damage to a vessel that creates risk for individuals. Empire Wind must document and report to NMFS all cases where the emergency exemption is taken.

After shutdown, impact pile driving may be reinitiated once all clearance zones are clear of marine mammals for the minimum species-specific periods, or, if required to maintain pile stability, at which time the lowest hammer energy must be used to maintain stability. If pile driving has been shut down due to the presence of a North Atlantic right whale, pile driving must 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. Upon re-starting pile driving, soft-start protocols must be followed if pile driving has ceased for 30 minutes or longer.

The clearance and shutdown zone sizes vary by species and are shown in tables 39, 40, and 41. Empire Wind is allowed to request modification to these zone sizes pending results of SFV (see the regulatory text at the end of this rulemaking). Any changes to zone size would be part of adaptive management and would require NMFS’ approval. The 10 km PAM monitoring zone for North Atlantic right whales has been added to this final rule. In addition, the visual shutdown, PAM clearance, and PAM shutdown zones for North Atlantic right whales have been increased to any distance to align with the North Atlantic right whale visual clearance zone and with the updated BiOp requirements. The increase to these zones also increases protections for North Atlantic right whales during impact pile driving. A 10-km distance is a reasonable distance for a PAM system to monitor; thus, 10 km was added as the requirement for the PAM monitoring zone.

In addition to the clearance and shutdown zones that would be

monitored both visually and acoustically, Empire Wind will establish a minimum visibility zone to ensure both visual and acoustic methods are used in tandem to detect marine mammals, resulting in maximum detection capability. For foundation installation, the minimum visibility zone would extend 1.5 km from the pile driving source (table 39). This value corresponds to the largest modeled ER_{95%} distance to the Level A

harassment isopleth of all marine mammals when up to two typical piles per day are installed (summer or winter; see tables 12 and 13) or one difficult-to-drive pile is installed in summer (*i.e.*, when Empire intends to complete all pile driving; see table 12), rounded up to the closest 0.5 km for PSO implementation ease. This distance also corresponds to approximately the Level B harassment isopleth for OSS foundation installation, assuming 10-dB

attenuation. The minimum visibility zone has been increased from 1.2 km, as was provided in the proposed rule, to 1.5 km to be consistent with the shutdown zone for mysticetes as well as to be consistent with the increase in the minimum visibility zone in the BiOp. The entire minimum visibility zone must be visible (*i.e.*, not obscured by dark, rain, fog, *etc.*) for a full 30 minutes immediately prior to commencing impact pile driving.

TABLE 39—MINIMUM VISIBILITY, CLEARANCE, SHUTDOWN, AND LEVEL B HARASSMENT 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				
Clearance Zone ²	Any visual distance	2,000	200	400	200
PAM Clearance Zone ²	Any distance	2,000	200	400	200
Shutdown Zone ³	Any visual distance	1,500 (2,000)	200	400	200
PAM Shutdown Zone ³	Any distance	1,500 (2,000)	n/a	n/a	n/a
PAM Monitoring Zone	10,000 m				
Maximum Level B Harassment (Exposure Range, R _{95percent})	Monopiles: 5.35 km; Pin Piles: 1.14 km				

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, see tables 12 and 13) or one difficult-to-drive pile is installed in summer (when Empire intends to complete all pile driving; see table 12), rounded up to the closest 0.5 km (for PSO implementation ease).

² 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 clearance zones for pilot whales and delphinids, harbor porpoises, and seals represent LPAI and minimize the amount of take by Level B harassment.

³ 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. Otherwise, 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. The shutdown zones for pilot whales and delphinids, harbor porpoises, and seals represent LPAI and minimize the amount of take by Level B harassment.

For cofferdam and goal post pile driving, HRG surveys, and marina activities, monitoring must be conducted for 30 minutes prior to initiating activities, and the clearance zones must be free of marine mammals during that time. For vibratory pile-driving activities associated with sheet pile installation and impact/pneumatic hammering for casing pipe installation, Empire Wind will establish clearance and shutdown zones, as shown in table 40. PSOs would monitor the clearance zone for 30 minutes before the start of cable landfall activities, during pile driving associated with cable landfall,

and for 30 minutes after pile driving of cable landfall. If a marine mammal is observed entering or is observed within the respective zones, activities will not commence until the animal has exited the zone or a specific amount of time has elapsed since the last sighting (*i.e.*, 30 minutes for large whales and 15 minutes for dolphins, porpoises, and pinnipeds). If a marine mammal is observed entering or is within the respective shutdown zone after vibratory pile driving or pneumatic hammering has begun, the PSO will call for a temporary cessation of the activity. Pile driving or hammering must not be

restarted until either the marine mammal(s) has voluntarily left the specific clearance zones and has been visually confirmed beyond that clearance zone or when specific time periods have elapsed with no further sightings or acoustic detections have occurred (*i.e.*, 15 minutes for small odontocetes and 30 minutes for all other marine mammal species). Because a vibratory hammer can grip a pile without operating, pile instability should not be a concern and no caveat for re-starting pile driving due to pile instability is planned.

TABLE 40—CLEARANCE AND SHUTDOWN ZONES FOR SHEET PILE VIBRATORY DRIVING FOR COFFERDAMS AND IMPACT/PNEUMATIC HAMMERING FOR CASING PIPES FOR GOAL POSTS (m)

Hearing group (species)	Clearance zone (m) ¹	Shutdown zone (m) ¹
Low-Frequency (North Atlantic right whale, all other mysticetes) ²	1,600	1,600
High-Frequency (harbor porpoise) ³	100	100
Mid-Frequency (dolphins and pilot whales) ³	50	50
Phocid Pinniped (seals) ⁴	100	100

¹ Clearance and shutdown zones apply to both cofferdam and goal post installation.

² For low-frequency cetaceans, the clearance and shutdown zones are larger than the distance to the Level B harassment threshold for Empire Wind 2.

³ For mid-frequency cetaceans and harbor porpoises, the clearance and shutdown zones are larger than the distance to the Level A harassment threshold.

⁴ The shutdown zone and clearance zone for pinnipeds has been increased from 50 m to 100 m to encompass the distance to PTS onset for these activities (62 m) as pinniped take by Level A harassment is not authorized.

For HRG surveys, there are no mitigation measures prescribed for sound sources operating at frequencies greater than 180 kHz, as these would be expected to fall outside of marine mammal hearing ranges and would not result in harassment. However, all HRG survey vessels would be subject to the aforementioned vessel strike avoidance measures described earlier in this section. Furthermore, due to the frequency range and characteristics of some of the sound sources, shutdown, clearance, and ramp-up procedures are not planned to be conducted during HRG surveys utilizing only non-impulsive sources (e.g., USBL and other parametric sub-bottom profilers), with exception to usage of SBPs and other non-parametric sub-bottom profilers. PAM would not be required during HRG surveys. While NMFS agrees that PAM can be an important tool for augmenting detection capabilities in certain circumstances, its utility in further reducing impacts during HRG survey activities is limited. We have provided a thorough description of our reasoning for not requiring PAM during HRG surveys in several **Federal Register** notices (e.g., 87 FR 40796, July 8, 2022; 87 FR 52913, August 3, 2022; 87 FR 51356, August 22, 2022).

Empire Wind will be required to implement a 30-minute clearance period of the clearance zones (table 39) immediately prior to the commencing of the survey, or when there is more than a 30-minute break in survey activities and PSOs have not been actively

monitoring. If a marine mammal is observed within a clearance zone during the clearance period, ramp up (described below) may not begin until the animal(s) have been observed voluntarily exiting its respective clearance zone or until an additional time period has elapsed with no further sighting (i.e., 15 minutes for small odontocetes and seals, and 30 minutes for all other species). When the clearance process has begun in conditions with good visibility, including via the use of night vision equipment (i.e., infrared (IR)/thermal camera), and the Lead PSO has determined that the clearance zones are clear of marine mammals, survey operations would be allowed to commence (i.e., no delay is required) despite periods of inclement weather and/or loss of daylight.

Once the survey has commenced, Empire Wind would be required to shut down SBPs if a marine mammal enters a respective shutdown zone (table 39). In cases where the shutdown zones become obscured for brief periods due to inclement weather, survey operations would be allowed to continue (i.e., no shutdown is required) so long as no marine mammals have been detected. The use of SBPs will not be allowed to commence or resume until the animal(s) has been confirmed to have left the shutdown 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. Any large whale sighted by a

PSO within 1,000 m of the SBPs that cannot be identified as a non-North Atlantic right whale would be treated as if it were a North Atlantic right whale.

Once the survey has commenced, Empire Wind would be required to shut down SBPs if a marine mammal enters a respective shutdown zone (table 39). In cases when the shutdown zones become obscured for brief periods due to inclement weather, survey operations would be allowed to continue (i.e., no shutdown is required) so long as no marine mammals have been detected. The use of SBPs will not be allowed to commence or resume until the animal(s) has been confirmed to have left the shutdown 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. Any large whale sighted by a PSO within 1,000 m of the SBPs that cannot be identified as a non-North Atlantic right whale would be treated as if it were a North Atlantic right whale.

If a SBP is shut down for reasons other than mitigation (e.g., mechanical difficulty) for less than 30 minutes, it would be allowed to be activated again without ramp-up only if (1) PSOs have maintained constant observation, and (2) no additional detections of any marine mammal occurred within the respective shutdown zones. If a SBP was shut down for a period longer than 30 minutes, then all clearance and ramp-up procedures would be required, as previously described.

TABLE 41—LEVEL B HARASSMENT THRESHOLD RANGES AND MITIGATION ZONES DURING HRG SURVEYS

Marine mammal species	Level B harassment zone (m) for CHIRPs	Clearance zone (m)	Shutdown zone (m)
Low-frequency cetacean (North Atlantic right whale)	50.05	500	500
Other ESA-listed marine mammals (i.e., fin, sei, sperm whale)		500	100
All other marine mammal species ¹		100	100

¹ With the exception of seals and delphinid(s) from the genera *Delphinus*, *Lagenorhynchus*, *Stenella*, or *Tursiops*, as described above.

For any other in-water construction heavy machinery activities (e.g., trenching, cable laying, etc.), if a marine mammal is on a path towards or comes within 10 m (32.8 ft) of equipment, Empire Wind is required to 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.

Soft-Start/Ramp-Up

The use of a soft-start or ramp-up procedure is believed to provide additional protection to marine mammals by warning them or providing

them with a chance to leave the area, prior to the hammer or HRG equipment operating at full capacity. Soft-start typically involves initiating hammer operation at a reduced energy level relative to full operating capacity followed by a waiting period. NMFS notes that it is difficult to specify a reduction in energy for any given hammer because of variation across drivers and installation conditions. Typically, NMFS requires a soft-start procedure of the applicant performing four to six strikes per minute at 10 to 20 percent of the maximum hammer energy, for a minimum of 20 minutes.

NMFS notes that it is difficult to specify a reduction in energy for any given hammer because of variation across drivers and installation conditions. Empire Wind has expressed concern with this approach as it could potentially damage the impact pile driving hammer as well as result in safety issues, particularly if pile driving stops before target pile penetration depth is reached which may result in pile refusal. As such, while general soft start requirements are incorporated into the regulatory text, specific soft start protocols considering final design details, including site-specific soil

properties and other considerations, are not included in the regulatory text but will be incorporated into the LOA. Empire Wind, with approval from NMFS, may also modify the soft start procedures through adaptive management.

HRG survey operators are required to ramp-up sources when the acoustic sources are used unless the equipment operates on a binary on/off switch. The ramp-up would involve starting from the smallest setting to the operating level over a period of approximately 30 minutes.

Soft-start and ramp-up will be required at the beginning of each day's activity and at any time following a cessation of activity of 30 minutes or longer. Prior to soft-start or ramp-up beginning, the operator must receive confirmation from the PSO that the clearance zone is clear of any marine mammals.

Fishery Monitoring Surveys

While the likelihood of Empire Wind's fishery monitoring surveys impacting marine mammals is minimal, NMFS requires Empire Wind to adhere to gear and vessel mitigation measures to reduce potential impacts to the extent practicable. In addition, all crew undertaking the fishery monitoring survey activities are required to receive protected species identification training prior to activities occurring and attend the aforementioned onboarding training. The specific requirements that NMFS has set for the fishery monitoring surveys can be found in the regulatory text at the end of this rulemaking.

Based on our evaluation of the mitigation measures, as well as other measures considered by NMFS, NMFS has determined that these measures will provide the means of affecting the least practicable adverse impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

As noted in the Changes from the Proposed to Final Rule section, we have added, modified, or clarified a number of monitoring and reporting measures since the proposed rule. These changes are described in detail below. Since the proposed rule, we have increased the number of required active PSOs per platform (*i.e.*, pile driving vessel or dedicated PSO vessel, if used) during impact pile driving from two to three PSOs. This requirement will increase monitoring effort to promote more effective detection of marine mammals during impact-pile-driving activities. In

addition, we have added specific requirements for SFV monitoring.

In order to promulgate a rulemaking for an activity, section 101(a)(5)(A) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (*i.e.*, individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (*i.e.*, behavioral or physiological) to acoustic stressors (*i.e.*, acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and/or
- Mitigation and monitoring effectiveness.

Separately, monitoring is also regularly used to support mitigation implementation (*i.e.*, mitigation monitoring) and monitoring plans typically include measures that both support mitigation implementation and increase our understanding of the

impacts of the activity on marine mammals.

During the planned activities, visual monitoring by NMFS-approved PSOs would be conducted before, during, and after all impact pile driving, vibratory pile driving, and HRG surveys. PAM would also be conducted during all impact pile driving. Visual observations and acoustic detections would be used to support the activity-specific mitigation measures (*e.g.*, clearance zones). To increase understanding of the impacts of the activity on marine mammals, PSOs must record all incidents of marine mammal occurrence at any distance from the piling locations and near the HRG acoustic sources. PSOs would document all behaviors and behavioral changes, in concert with distance from an acoustic source. The required monitoring is described below, beginning with PSO measures that are applicable to all the aforementioned activities, followed by activity-specific monitoring requirements.

Protected Species Observer and PAM Operator Requirements

Empire Wind is required to employ NMFS-approved PSOs and PAM operators. PSOs are trained professionals who are tasked with visually monitoring for marine mammals during pile driving and HRG surveys. The primary purpose of a PSO is to carry out the monitoring, collect data, and, when appropriate, call for the implementation of mitigation measures. In addition to visual observations, NMFS requires Empire Wind to conduct PAM by PAM operators during impact pile driving and vessel transit.

The inclusion of PAM, which would be conducted by NMFS-approved PAM operators, following a standardized measurement, processing methods, reporting metrics, and metadata standards for offshore wind, alongside visual data collection is valuable to provide the most accurate record of species presence as possible. These two monitoring methods are well understood to provide best results when combined (*e.g.*, Barlow and Taylor, 2005; Clark *et al.*, 2010; Gerrodette *et al.*, 2011; Van Parijs *et al.*, 2021). Acoustic monitoring, in addition to visual monitoring, increases the likelihood of detecting marine mammals within the shutdown and clearance zones of project activities, which when applied in combination of required shutdowns helps to further reduce the risk of marine mammals being exposed to sound levels that could otherwise result in acoustic injury or more intense behavioral harassment.

The exact configuration and number of PAM systems depends on the size of the zone(s) being monitored, the amount of noise expected in the area, and the characteristics of the signals being monitored. More closely-spaced hydrophones would allow for more directionality and range to the vocalizing marine mammals. Larger baleen cetacean species (*i.e.*, mysticetes), which produce loud and lower-frequency vocalizations, may be able to be heard with fewer hydrophones spaced at greater distances. However, smaller cetaceans (*e.g.*, mid-frequency delphinids; odontocetes) may necessitate more hydrophones and to be spaced closer together given the shorter range of the shorter, mid-frequency acoustic signals (*e.g.*, whistles and echolocation clicks). As there are no “perfect fit” single-optimal-array configurations, these setups would need to be considered on a case-by-case basis.

NMFS does not formally administer any PSO or PAM operator training programs or endorse specific providers but will approve PSOs and PAM operators that have successfully completed courses that meet the curriculum and training requirements referenced below and further specified in the regulatory text at the end of this rulemaking. PSOs can act as PAM operators or visual PSOs (but not simultaneously) as long as they demonstrate that their training and experience are sufficient to perform each task.

NMFS will provide PSO and PAM operator approvals in the context of the need to ensure that PSOs and PAM operators have the necessary training and/or experience to carry out their duties competently. In order for PSOs and PAM operators to be approved, NMFS must review and approve PSO and PAM operator resumes indicating successful completion of an acceptable training course. PSOs and PAM operators must have previous experience observing marine mammals and must have the ability to work with all required and relevant software and equipment. NMFS may approve PSOs and PAM operators as conditional or unconditional. A conditional approval may be given to one who is trained but has not yet attained the requisite experience. An unconditional approval is given to one who is trained and has attained the necessary experience. The specific requirements for conditional and unconditional approval can be found in the regulatory text at the end of this rulemaking.

Conditionally-approved PSOs and PAM operators would be paired with an

unconditional-approved PSO (or PAM operator, as appropriate) to ensure that the quality of marine mammal observations and data recording is kept consistent. Additionally, activities requiring PSO and/or PAM operator monitoring must have a lead on duty. The visual PSO field team, in conjunction with the PAM team (*i.e.*, marine mammal monitoring team), would have a lead member (designated as the “Lead PSO” or “Lead PAM operator”) who would be required to meet the unconditional approval standard. NMFS has added a requirement that the Lead PSO must also have a minimum of 90 days of at-sea experience and must have obtained this experience within the last 18 months. This requirement was added to ensure that Lead PSOs have adequate and recent observer experience.

Empire Wind is required to request PSO and PAM operator approvals 60 days prior to those personnel commencing work. An initial list of previously approved PSO and PAM operators must be submitted by Empire Wind at least 30 days prior to the start of the Project. Should Empire Wind require additional PSOs or PAM operators throughout the Project, Empire Wind must submit a subsequent list of pre-approved PSOs and PAM operators to NMFS at least 15 days prior to planned use of that PSO or PAM operator. A PSO may be trained and/or experienced as both a PSO and PAM operator and may perform either duty, pursuant to scheduling requirements.

A minimum number of PSOs would be required to actively observe for the presence of marine mammals during certain project activities, with more PSOs being required as the mitigation zone sizes increase. A minimum number of PAM operators would be required to actively monitor for the presence of marine mammals during foundation installation. The types of equipment required (*e.g.*, big eyes on the pile driving vessel) are also designed to increase marine mammal detection capabilities. Specifics on these types of requirements can be found in the regulations at the end of this rulemaking. At least three PSOs must be on duty at a time on the impact pile driving vessel. A minimum of three PSOs must be active on a dedicated PSO vessel or an alternate monitoring technology (*e.g.*, unmanned aircraft system (UAS)) must be used that has been demonstrated as having greater visual monitoring capability compared to three PSOs on a dedicated PSO vessel and is approved by NMFS. If a dedicated PSO vessel is selected, the vessel must be located at the best

vantage point to observe and document marine mammal sightings in proximity to the clearance and shutdown zones. If an alternate monitoring technology is used in place of a dedicated PSO vessel, the technology must be described in the pile driving monitoring plan and demonstrate a greater visual monitoring capability as described above. In summary, at least three PSOs and one PAM operator per acoustic data stream (*i.e.*, equivalent to the number of acoustic buoys) must be on-duty and actively monitoring per platform during impact foundation installation.

At least two PSOs must be on-duty during vibratory pile driving and impact/pneumatic hammering during cable landfall and marina construction activities. At least one PSO must be on-duty during HRG surveys conducted during daylight hours; and at least two PSOs must be on-duty during HRG surveys conducted during nighttime.

In addition to monitoring duties, PSOs and PAM operators are responsible for data collection. The data collected by PSO and PAM operators and subsequent analysis provide the necessary information to inform an estimate of the amount of take that occurred during the Project, better understand the impacts of the Project on marine mammals, address the effectiveness of monitoring and mitigation measures, and to adaptively manage activities and mitigation in the future. Data reported includes information on marine mammal sightings, activity occurring at time of sighting, monitoring conditions, and if mitigative actions were taken. Specific data collection requirements are contained within the regulations at the end of this rulemaking.

Empire Wind is required to submit a Pile Driving Monitoring Plan and a PAM Plan to NMFS 180 days in advance of foundation installation activities. The Plan must include details regarding PSO and PAM monitoring protocols and equipment proposed for use, as described in the regulatory text at the end of this rulemaking. NMFS must approve the plan prior to foundation installation activities commencing. Specific details on NMFS’ PSO or PAM operator qualifications and requirements can be found in 50 CFR part 217, subpart CC, set out at the end of this rulemaking. Additional information can be found in Empire Wind’s Protected Species Mitigation and Monitoring Plan (PSMMP; appendix B) found on NMFS’ website at https://www.fisheries.noaa.gov/action/incidental-take-authorization-empire-offshore-wind-llc-construction-empire-wind-project-ew1?check_logged_in=1.

Sound Field Verification

Empire Wind must conduct SFV measurements during all impact-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 distances to thresholds that are at or below those modeled assuming 10 dB of attenuation. Subsequent SFV measurements are also required should larger piles be installed or additional piles be driven that are anticipated to produce longer distances to harassment isopleths than those previously measured (*e.g.*, higher hammer energy, greater number of strikes, *etc.*). Abbreviated SFV monitoring must be performed on all foundation installations for which the complete SFV monitoring described above is not conducted. In addition, SFV measurements must be conducted upon commencement of turbine operations to estimate turbine operational source levels, in accordance with a NMFS-approved Foundation Installation Pile Driving SFV Plan. The measurements and reporting associated with SFV can be found in the regulatory text at the end of this rulemaking. The requirements are extensive to ensure monitoring is conducted appropriately and the reporting frequency is such that Empire Wind is required to make adjustments quickly (*e.g.*, ensure bubble curtain hose maintenance, check bubble curtain air pressure supply, add additional sound attenuation, *etc.*) to ensure marine mammals are not experiencing noise levels above those considered in this analysis. For recommended SFV protocols for impact pile driving, please consult International Organization for Standardization (ISO) 18406, "Underwater acoustics—Measurement of radiated underwater sound from percussive pile driving" (2017).

Reporting

Prior to any construction activities occurring, Empire Wind will provide a report to NMFS Office of Protected Resources that demonstrates that all Empire Wind personnel, including the vessel crews, vessel captains, PSOs, and PAM operators, have completed all required trainings.

NMFS will require standardized and frequent reporting from Empire Wind during the life of the regulations and the LOA. All data collected relating to the Project will be recorded using industry-standard software (*e.g.*, Mysticetus or a similar software) installed on field laptops and/or tablets. Empire Wind is

required to submit weekly, monthly, annual, and situational reports. The specifics of what we require to be reported can be found in the regulatory text at the end of this final rule.

Weekly Report—During foundation installation activities, Empire Wind would be required to compile and submit weekly marine mammal monitoring reports for foundation installation pile driving to NMFS Office of Protected Resources that document the daily start and stop of all pile-driving activities, the start and stop of associated observation periods by PSOs, details on the deployment of PSOs, a record of all visual and acoustic detections of marine mammals, any mitigation actions (or if mitigation actions could not be taken, provide reasons why), and details on the noise abatement system(s) (*e.g.*, system type, distance deployed from the pile, bubble rate, *etc.*). Weekly performance reports should also be included for abbreviated SFV monitoring. Weekly reports will be due on Wednesday for the previous week (Sunday–Saturday). The weekly reports are also required to identify which turbines become operational and when, and a map must be provided. Once all foundation pile installation is complete, weekly reports would no longer be required.

Monthly Report—Empire Wind is required to compile and submit monthly reports to NMFS Office of Protected Resources 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, and route), number of piles installed, all detections of marine mammals, and any mitigative actions taken. Monthly reports would be due on the 15th of the month for the previous month. The monthly report would also identify which turbines become operational and when, and a map must be provided. Once all foundation pile installation is complete, monthly reports would no longer be required.

Annual Reporting—Empire Wind is required to submit an annual marine mammal monitoring (for both PSOs and PAMs) report to NMFS Office of Protected Resources no later than 90 days following the end of a given calendar year describing, in detail, all of the information required in the monitoring section above. A final annual report must be prepared and submitted within 30 calendar days following receipt of any NMFS comments on the draft report.

Final 5-Year Reporting—Empire Wind must submit its draft 5-year report(s) to NMFS Office of Protected Resources on

all visual and acoustic monitoring conducted under the LOA within 90 calendar days of the completion of activities occurring under the LOA. A final 5-year report must be prepared and submitted within 60 calendar days following receipt of any NMFS comments on the draft report. Information contained within this report is described at the beginning of this section.

Situational Reporting—Specific situations encountered during the development of the Project require immediate reporting. For instance, if a North Atlantic right whale is observed at any time by PSOs or project personnel, the sighting must be immediately reported to NMFS, or, if not feasible, as soon as possible and no longer than 24 hours after the sighting. If a North Atlantic right whale is acoustically detected at any time via a project-related PAM system, the detection must be reported as soon as possible and no longer than 24 hours after the detection to NMFS 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.

If a sighting of a stranded, entangled, injured, or dead marine mammal occurs, the sighting would be reported within 24 hours to NMFS Office of Protected Resources, the NMFS Greater Atlantic Stranding Coordinator for the New England/Mid-Atlantic area (866-755-6622) in the Northeast Region (if in the Southeast Region (NC to FL), contact 877-942-5343), and the U.S. Coast Guard within 24 hours. 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), Empire Wind must call the NMFS Greater Atlantic Stranding Hotline. Separately, Empire Wind must also and immediately report the incident to NMFS Office of Protected Resources and GARFO. Empire Wind must immediately cease all on-water activities, including pile driving, until 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 MMPA. NMFS Office of Protected Resources may impose additional measures covered in the adaptive management provisions of this rule to

minimize the likelihood of further prohibited take and ensure MMPA compliance. Empire Wind may not resume their activities until notified by NMFS.

In the event of any lost gear associated with the fishery surveys, Empire Wind must report to 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.

Sound Field Verification—Empire Wind is required to submit interim SFV reports after each foundation installation monitored as soon as possible but within 48 hours for thorough SFV. Abbreviated SFV reports must be included in the weekly monitoring reports. A final SFV report for all monopile foundation installation will be required within 90 days following completion of acoustic monitoring.

Adaptive Management

These regulations contain an adaptive management component. Our understanding of the effects of offshore wind construction activities (*e.g.*, acoustic stressors) on marine mammals continues to evolve, which makes the inclusion of an adaptive management component both valuable and necessary within the context of 5-year regulations.

The monitoring and reporting requirements in this final rule provide NMFS with information that helps us to better understand the impacts of the Project's activities on marine mammals and informs our consideration of whether any changes to mitigation and monitoring are appropriate. The use of adaptive management allows NMFS to consider new information and modify mitigation, monitoring, or reporting requirements, as appropriate, with input from Empire Wind regarding practicability, if such modifications will have a reasonable likelihood of more effectively accomplishing the goal of the measures.

The following are some of the possible general sources of new information to be considered through the adaptive management process: (1) results from monitoring reports, including the weekly, monthly, situational, and annual reports, as required; (2) results from marine mammal and sound research; and (3) any information which reveals that marine mammals may have been taken in a manner, extent, or number not authorized by these regulations or subsequent LOA. Also, specifically here, mitigation measures for HRG surveys are based upon the required project

design criteria (PDCs) outlined by GARFO's Protected Resources Division (PRD) BOEM 2021 ESA section 7 consultation on offshore wind site assessment and site characterization activities. As mitigation measures are based upon the PDCs, and compliance with PDCs is required to ensure activities do not adversely affect ESA-listed species, updates to the PDCs may result in updates to mitigation measures for HRG surveys as well. During the course of the rule, Empire Wind (and other LOA Holders conducting offshore wind development activities) is required to participate in one or more adaptive management meetings convened by NMFS and/or BOEM, in which the above information will be summarized and discussed in the context of potential changes to the mitigation or monitoring measures.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" by mortality, serious injury, or by Level A harassment and Level B harassment, we consider other factors, such as the likely nature of any behavioral responses (*e.g.*, intensity, duration), the context of any such responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

In the Estimated Take section, we estimated the maximum number of takes by Level A harassment and Level

B harassment that are reasonably likely to occur from Empire Wind's specified activities based on the methods described. The impact that any given take would have is dependent on many case-specific factors that need to be considered in the negligible impact analysis (*e.g.*, the context of behavioral exposures such as duration or intensity of a disturbance, the health of impacted animals, the status of a species that incurs fitness-level impacts to individuals, *etc.*). In this final rule, we evaluate the likely impacts of the enumerated harassment takes that are authorized in the context of the specific circumstances surrounding these predicted takes. We also collectively evaluate this information, as well as other more taxa-specific information and mitigation measure effectiveness, in group-specific discussions that support our negligible impact conclusions for each stock. As described above, no serious injury or mortality is expected or authorized for any species or stock.

The Description of the Specified Activities section describes Empire Wind's specified activities that may result in take of marine mammals and an estimated schedule for conducting those activities. Empire Wind has provided a realistic construction schedule although we recognize schedules may shift for a variety of reasons (*e.g.*, weather or supply delays). However, the total amount of take would not exceed the 5-year totals and maximum annual total in any given year indicated in tables 34 and 35, respectively.

We base our analysis and negligible impact determination on the maximum number of takes that are reasonably likely to occur and are authorized annually and across the effective period of these regulations and extensive qualitative consideration of other contextual factors that influence the degree of impact of the takes on the affected individuals and the number and context of the individuals affected. As stated before, the number of takes, both maximum annual and 5-year total, alone are only a part of the analysis.

Last, we provide a negligible impact determination for each species or stock, providing species or stock-specific information or analysis, where appropriate, for example, for North Atlantic right whales given their population status. Organizing our analysis by grouping species or stocks that share common traits or that would respond similarly to effects of Empire Wind's activities and then providing species- or stock-specific information allows us to avoid duplication while ensuring that we have analyzed the

effects of the specified activities on each affected species or stock. It is important to note that in the group or species sections, we base our negligible impact analysis on the maximum annual take that is predicted under the 5-year rule and that the negligible impact determination also examines the total taking over the 5-year period; however, the majority of the impacts are associated with WTG foundation and OSS foundation installation, which would occur largely during years 2 and 3 (2025 through 2026). The estimated take in the other years is expected to be notably less, which is reflected in the total take that would be allowable under the rule (see tables 33, 34, and 35).

As described previously, no serious injury or mortality is anticipated or authorized in this rule. Any Level A harassment authorized would be in the form of auditory injury (*i.e.*, PTS). The amount of harassment Empire Wind has requested, and NMFS is authorizing, is based on exposure models that consider the outputs of acoustic source and propagation models and other data such as frequency of occurrence or group sizes. Several conservative parameters and assumptions are ingrained into these models, such as assuming forcing functions that consider direct contact with piles (*i.e.*, no cushion allowances) and application of the highest monthly sound speed profile to all months within a given season. The exposure model results do not reflect any mitigation measures (other than 10-dB sound attenuation) or avoidance response. The amount of take requested and authorized also reflects careful consideration of other data (*e.g.*, group size data) and for Level A harassment potential of some large whales, the consideration of mitigation measures. For all species, the amount of take authorized represents the maximum amount of Level A harassment and Level B harassment that is reasonably likely to occur.

Behavioral Disturbance

In general, NMFS anticipates that impacts on an individual that has been harassed are likely to be more intense when exposed to higher received levels and for a longer duration, though this is in no way a strictly linear relationship for behavioral effects across species, individuals, or circumstances, and less severe impacts result when exposed to lower received levels for a brief duration. However, there is also growing evidence of the importance of contextual factors such as distance from a source in predicting marine mammal behavioral response to sound (*i.e.*, sounds of a similar level emanating

from a more distant source have been shown to be less likely to evoke a response of equal magnitude (DeRuiter and Doukara, 2012; Falcone *et al.*, 2017)). As described in the “Potential Effects to Marine Mammals and their Habitat” section of the proposed rule, the intensity and duration of any impact resulting from exposure to Empire Wind’s activities is dependent upon a number of contextual factors including, but not limited to, sound source frequencies, whether the sound source is moving towards the animal, hearing ranges of marine mammals, behavioral state at time of exposure, status of individual exposed (*e.g.*, reproductive status, age class, health) and an individual’s experience with similar sound sources. Southall *et al.* (2021), Ellison *et al.* (2012), and Moore and Barlow (2013), among others, emphasize the importance of context (*e.g.*, behavioral state of the animals, distance from the sound source) in evaluating behavioral responses of marine mammals to acoustic sources. Harassment of marine mammals may result in behavioral modifications (*e.g.*, avoidance, temporary cessation of foraging or communicating, changes in respiration or group dynamics, masking) or may result in auditory impacts such as hearing loss. In addition, some of the lower-level physiological stress responses (*e.g.*, change in respiration, change in heart rate) discussed previously would likely co-occur with the behavioral modifications, although these physiological responses are more difficult to detect and fewer data exist relating these responses to specific received levels of sound. Takes by Level B harassment, then, may have a stress-related physiological component as well; however, we would not expect Empire Wind’s activities to produce conditions of long-term and continuous exposure to noise leading to long-term physiological stress responses in marine mammals that could affect reproduction or survival.

In the range of behavioral effects that might be expected to be part of a response that qualifies as an instance of Level B harassment by behavioral disturbance (which by nature of the way it is modeled/counted, occurs within 1 day), the less severe end might include exposure to comparatively lower levels of a sound, at a greater distance from the animal, for a few or several minutes. A less severe exposure of this nature could result in a behavioral response such as avoiding an area that an animal would otherwise have chosen to move through or feed in for some amount of time, or breaking off one or a few feeding bouts.

More severe effects could occur if an animal gets close enough to the source to receive a comparatively higher level, is exposed continuously to one source for a longer time, or is exposed intermittently to different sources throughout a day. Such effects might result in an animal having a more severe flight response and leaving a larger area for a day or more or potentially losing feeding opportunities for a day. However, such severe behavioral effects are expected to occur infrequently.

Many species perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (*i.e.*, a 24-hour cycle). Behavioral reactions to noise exposure, when taking place in a biologically important context, such as disruption of critical life functions, displacement, or avoidance of important habitat, are more likely to be significant if they last more than 1 day or recur on subsequent days (Southall *et al.*, 2007) due to diel and lunar patterns in diving and foraging behaviors observed in many cetaceans (Baird *et al.*, 2008; Barlow *et al.*, 2020; Henderson *et al.*, 2016; Schorr *et al.*, 2014). It is important to note the water depth in the Project Area is shallow (5 to 44 m) and deep diving species, such as sperm whales, are not expected to be engaging in deep foraging dives when exposed to noise above NMFS harassment thresholds during the specified activities. Therefore, we do not anticipate impacts to deep foraging behavior to be impacted by the specified activities.

It is also important to identify that the estimated number of takes does not necessarily equate to the number of individual animals Empire Wind expects to harass (which is lower) but rather to the instances of take (*i.e.*, exposures above the Level B harassment thresholds) that may occur. These instances may represent either brief exposures of seconds to minutes for HRG surveys or, in some cases, longer durations of exposure within a day (*e.g.*, pile driving). Some individuals of a species may experience recurring instances of take over multiple days throughout the year while some members of a species or stock may experience one exposure as they move through an area, which means that the number of individuals taken is smaller than the total estimated takes. In short, for species that are more likely to be migrating through the area and/or for which only a comparatively smaller number of takes are predicted (*e.g.*, some of the mysticetes), it is more likely that each take represents a different individual whereas for non-migrating species with larger amounts of predicted take, we expect that the total anticipated

takes represent exposures of a smaller number of individuals of which some would be taken across multiple days.

For Empire Wind, impact pile driving of foundation piles is most likely to result in a higher magnitude and severity of behavioral disturbance than other activities (*i.e.*, impact driving of casing pipe, vibratory pile driving, and HRG surveys). Impact pile driving has higher source levels and longer durations (on an annual basis) than any nearshore pile-driving activities. HRG survey equipment also produces much higher frequencies than pile driving, resulting in minimal sound propagation. While foundation installation impact pile driving is anticipated to be most impactful for these reasons, impacts are minimized through implementation of mitigation measures, including soft-starts, use of a sound attenuation system, the implementation of clearance zones that would facilitate a delay of pile driving commencement, and the implementation of shutdown zones. For example, given sufficient notice through the use of soft-start, marine mammals are expected to move away from a sound source that is disturbing prior to becoming exposed to very loud noise levels. The requirement to couple visual monitoring and PAM before and during all foundation installation will increase the overall capability to detect marine mammals compared to one method alone.

Occasional, milder behavioral reactions are unlikely to cause long-term consequences for individual animals or populations, and even if some smaller subset of the takes are in the form of a longer (several hours or a day) and more severe response, if they are not expected to be repeated over numerous or sequential days, impacts to individual fitness are not anticipated. Also, the effect of disturbance is strongly influenced by whether it overlaps with biologically important habitats when individuals are present—avoiding biologically important habitats will provide opportunities to compensate for reduced or lost foraging (Keen *et al.*, 2021). Nearly all studies and experts agree that infrequent exposures of a single day or less are unlikely to impact an individual's overall energy budget (Farmer *et al.*, 2018; Harris *et al.*, 2017; King *et al.*, 2015; National Academy of Science, 2017; New *et al.*, 2014; Southall *et al.*, 2007; Villegas-Amtmann *et al.*, 2015).

Temporary Threshold Shift

TTS is one form of Level B harassment that marine mammals may incur through exposure to Empire Wind's activities and, as described

earlier, the takes by Level B harassment may represent takes in the form of behavioral disturbance, TTS, or both. As discussed in the "Potential Effects of Specified Activities on Marine Mammals and their Habitat" section of the proposed rule, in general, TTS can last from a few minutes to days, be of varying degree, and occur across different frequency bandwidths, all of which determine the severity of the impacts on the affected individual, which can range from minor to more severe. Impact and vibratory pile driving are broadband noise sources but generate sounds in the lower frequency ranges (with most of the energy below 1–2 kHz, but with a small amount energy ranging up to 20 kHz); therefore, in general and all else being equal, we would anticipate the potential for TTS is higher in low-frequency cetaceans (*i.e.*, mysticetes) than other marine mammal hearing groups, and would be more likely to occur in frequency bands in which they communicate. However, we would not expect the TTS to span the entire communication or hearing range of any species given that the frequencies produced by these activities do not span entire hearing ranges for any particular species. Additionally, though the frequency range of TTS that marine mammals might sustain would overlap with some of the frequency ranges of their vocalizations, the frequency range of TTS from Empire Wind's pile-driving activities would not typically span the entire frequency range of one vocalization type, much less span all types of vocalizations or other critical auditory cues for any given species. The required mitigation measures further reduce the potential for TTS in mysticetes.

Generally, both the degree of TTS and the duration of TTS would be greater if the marine mammal is exposed to a higher level of energy (which would occur when the peak dB level is higher or the duration is longer). The threshold for the onset of TTS was discussed previously (refer back to Estimated Take section). However, source level alone is not a predictor of TTS. An animal would have to approach closer to the source or remain in the vicinity of the sound source appreciably longer to increase the received SEL, which would be difficult considering the required mitigation and the nominal speed of the receiving animal relative to the stationary sources such as impact pile driving. The recovery time is also of importance when considering the potential impacts from TTS. In TTS laboratory studies (as discussed in the "Potential Effects of the Specified

Activities on Marine Mammals and their Habitat" section of the proposed rule), some using exposures of almost an hour in duration or up to 217 SEL, almost all individuals recovered within 1 day or less (often in minutes) and we note that while the pile-driving activities last for hours a day, it is unlikely that most marine mammals would stay in the close vicinity of the source long enough to incur more severe TTS. Overall, given the small number of times that any individual might incur TTS, the low degree of TTS and the short anticipated duration, and the unlikely scenario that any TTS overlapped the entirety of a critical hearing range, it is unlikely that TTS (of the nature expected to result from the Project's activities) would result in behavioral changes or other impacts that would impact any individual's (of any hearing sensitivity) reproduction or survival.

Permanent Threshold Shift

NMFS is authorizing a very small amount of take by PTS to some marine mammal individuals. The numbers of authorized annual takes by Level A harassment are relatively low for all marine mammal stocks and species (table 33). The only activity incidental to which we anticipate PTS may occur is from exposure to impact pile driving, which produces sounds that are both impulsive and primarily concentrated in the lower frequency ranges (below 1 kHz) (David, 2006; Krumpel *et al.*, 2021).

There are no PTS data on cetaceans and only one recorded instance of PTS being induced in older harbor seals (Reichmuth *et al.*, 2019). However, available TTS data of mid-frequency hearing specialists exposed to mid- or high-frequency sounds (Southall *et al.*, 2007; NMFS, 2018; Southall *et al.*, 2019) suggest that most threshold shifts occur in the frequency range of the source up to one octave higher than the source. We would anticipate a similar result for PTS. Further, no more than a small degree of PTS is expected to be associated with any of the incurred Level A harassment, given that it is unlikely that animals would stay in the close vicinity of a source for a duration long enough to produce more than a small degree of PTS.

PTS would consist of minor degradation of hearing capabilities occurring predominantly at frequencies one-half to one octave above the frequency of the energy produced by pile driving (*i.e.*, the low-frequency region below 2 kHz) (Cody and Johnstone, 1981; McFadden, 1986; Finneran, 2015), which is not considered a severe hearing impairment.

If hearing impairment occurs from impact pile driving, it is most likely that the affected animal would lose a few decibels in its hearing sensitivity, which in most cases is not likely to meaningfully affect its ability to forage and communicate with conspecifics. Though it could happen, and we have analyzed the potential resulting impacts to any animals that incur PTS, given sufficient notice through use of soft-start prior to implementation of full hammer energy during impact pile driving, marine mammals are expected to move away from a sound source that is disturbing prior to it resulting in severe PTS.

Auditory Masking or Communication Impairment

The ultimate potential impacts of masking on an individual are similar to those discussed for TTS (*e.g.*, decreased ability to communicate, forage effectively, or detect predators), but an important difference is that masking only occurs during the time of the signal, versus TTS, which continues beyond the duration of the signal. Masking may also result from the sum of exposure to multiple signals, none of which might individually cause TTS. Fundamentally, masking is referred to as a chronic effect because one of the key potential harmful components of masking is its duration—the fact that an animal would have reduced ability to hear or interpret critical cues becomes much more likely to cause a problem the longer it is occurring. Inherent in the concept of masking is the fact that the potential for the effect is only present during the times that the animal and the source are in close enough proximity for the effect to occur (and further, this time period would need to coincide with a time that the animal was utilizing sounds at the masked frequency).

As our analysis has indicated, for this project we expect that impact pile driving foundations have the greatest potential to mask marine mammal signals, and this pile driving may occur for several, albeit intermittent, hours per day, for multiple days per year. Masking is fundamentally more of a concern at lower frequencies (which are pile-driving dominant frequencies) because low frequency signals propagate significantly further than higher frequencies. Low frequency signals are also more likely to overlap with the narrower low frequency calls of mysticetes, many non-communication cues related to fish and invertebrate prey, and geologic sounds that inform navigation. However, the area in which masking would occur for all marine mammal species and stocks (*e.g.*,

predominantly in the vicinity of the foundation pile being driven) is small relative to the extent of habitat used by each species and stock.

In summary, the nature of Empire Wind's activities, paired with habitat use patterns by marine mammals, makes it unlikely that the level of masking that could occur would have the potential to affect reproductive success or survival would occur.

Impacts on Habitat and Prey

Construction activities may result in fish and invertebrate mortality or injury very close to the source, and all Empire Wind's activities may cause some fish to leave the area of disturbance. It is anticipated that any mortality or injury would be limited to a very small subset of available prey and the implementation of mitigation measures such as the use of a NAS during impact pile driving would further limit the degree of impact. Behavioral changes in prey in response to construction activities could temporarily impact marine mammals' foraging opportunities in a limited portion of the foraging range but, because of the relatively small area of the habitat that may be affected at any given time (*e.g.*, around a pile being driven), the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Cable presence is not anticipated to impact marine mammal habitat as these would be buried, and any electromagnetic fields emanating from the cables are not anticipated to result in consequences that would impact marine mammals prey to the extent they would be unavailable for consumption.

The presence of wind turbines within the Lease Area could have longer-term impacts on marine mammal habitat, as the Project would result in the persistence of the structures within marine mammal habitat for more than 30 years. The presence of an extensive number of structures such as wind turbines are, in general, likely to result in local and broader oceanographic effects in the marine environment, and may disrupt dense aggregations and distribution of marine mammal zooplankton prey through altering the strength of tidal currents and associated fronts, changes in stratification, primary production, the degree of mixing, and stratification in the water column (Chen *et al.*, 2021; Johnson *et al.*, 2021; Christiansen *et al.*, 2022; Dorrell *et al.*, 2022). However, the scale of impacts is difficult to predict and may vary from hundreds of meters for local individual turbine impacts (Schultze *et al.*, 2020) to

large-scale changes stretching hundreds of kilometers (Christiansen *et al.*, 2022).

As discussed in the "Potential Effects of the Specified Activities on Marine Mammals and their Habitat" section of the proposed rule, the Project would consist of no more than 149 foundations (147 WTGs and 2 OSSs) in the Lease Area, which will gradually become operational following construction completion, by the end of year 4 (2027) of the rule. While there are likely to be oceanographic impacts from the presence of the Project, meaningful oceanographic impacts relative to stratification and mixing that would significantly affect marine mammal habitat and prey over large areas in key foraging habitats during the effective period of the regulations is not anticipated. Although this area supports aggregations of zooplankton (*i.e.*, baleen whale prey) that could be impacted if long-term oceanographic changes occurred, prey densities are typically significantly less in the Project Area than in known baleen whale foraging habitats to the east and north (*e.g.*, south of Nantucket and Martha's Vineyard, Great South Channel). For these reasons, if oceanographic features are affected by the Project during the effective period of the regulations, the impact on marine mammal habitat and their prey is likely to be comparatively minor.

The Empire Wind Biological Opinion provided an evaluation of the presence and operation of the Project on, among other species, listed marine mammals and their prey. While the consultation considered the life of the Project (*i.e.*, 25+ years), we considered the potential impacts to marine mammal habitat and prey within the 5-year effective time frame of this rule. Overall, the Biological Opinion concluded that impacts from loss of soft bottom habitat from the presence of turbines and placement of scour protection as well as any beneficial reef effects, are expected to be so small that they cannot be meaningfully measured, evaluated, or detected and are, therefore, insignificant. The Biological Opinion also concluded that while the presence and operation of the wind farm may change the distribution of plankton with the wind farm, these changes are not expected to affect the oceanographic forces transporting zooplankton into the area. Therefore, the Biological Opinion concluded that an overall reduction in biomass of plankton is not an anticipated outcome of operating the Project. Thus, because changes in the biomass of zooplankton are not anticipated, any higher trophic level impacts are also not anticipated. That is, no effects to pelagic fish or benthic

invertebrates that depend on plankton as forage food are expected to occur. Zooplankton, fish, and invertebrates are all considered marine mammal prey and, as fully described in the Biological Opinion, measurable, detectable, or significant changes to marine mammal prey abundance and distribution from wind farm operation are not anticipated.

Mitigation To Reduce Impact on All Species

This rulemaking includes an extensive suite of mitigation measures designed to minimize impacts on all marine mammals, with a focus on North Atlantic right whales. For impact pile driving of foundation piles, ten overarching mitigation measures are required, which are intended to reduce both the number and intensity of marine mammal takes: (1) seasonal/time of day work restrictions; (2) use of multiple PSOs to visually observe for marine mammals (with any detection within specifically designated zones that would trigger a delay or shutdown); (3) use of PAM to acoustically detect marine mammals, with a focus on detecting baleen whales (with any detection within designated zones triggering delay or shutdown); (4) implementation of clearance zones; (5) implementation of shutdown zones; (6) use of soft-start; (7) use of noise attenuation technology; (8) maintaining situational awareness of marine mammal presence through the requirement that any marine mammal sighting(s) by Empire Wind personnel must be reported to PSOs; (9) SFV monitoring; and (10) vessel strike avoidance measures to reduce the risk of a collision with a marine mammal and vessel. For cofferdam and goal post installation and removal, we are requiring five overarching mitigation measures: (1) time of day work restrictions; (2) use of multiple PSOs to visually observe for marine mammals (with any detection with specifically designated zones that would trigger a delay or shutdown); (3) implementation of clearance zones; (4) implementation of shutdown zones; and (5) maintaining situational awareness of marine mammal presence through the requirement that any marine mammal sighting(s) by Empire Wind personnel must be reported to PSOs. Lastly, for HRG surveys, we are requiring six measures: (1) measures specifically for Vessel Strike Avoidance; (2) specific requirements during daytime and nighttime HRG surveys; (3) implementation of clearance zones; (4) implementation of shutdown zones; (5) use of ramp-up of acoustic sources; and (6) maintaining situational awareness of marine mammal presence through the

requirement that any marine mammal sighting(s) by Empire Wind personnel must be reported to PSOs.

For activities with large harassment isopleths, Empire Wind is committed to reducing the noise levels generated to the lowest levels practicable and is required to ensure that they do not exceed a noise footprint above that which was modeled, assuming a 10-dB attenuation. Use of a soft-start during impact pile driving will allow animals to move away from (*i.e.*, avoid) the sound source prior to applying higher hammer energy levels needed to install the pile (*i.e.*, Empire Wind will not use a hammer energy greater than necessary to install piles). Similarly, ramp-up during HRG surveys would allow animals to move away and avoid the acoustic sources before they reach their maximum energy level. For all activities, clearance zone and shutdown zone implementation, which are required when marine mammals are within given distances associated with certain impact thresholds for all activities, will reduce the magnitude and severity of marine mammal take. Additionally, the use of multiple PSOs (*e.g.*, WTG and OSS foundation installation, cable landfall activities, HRG surveys), PAM operators (for impact foundation installation), and maintaining awareness of marine mammal sightings reported in the region during all specified activities will aid in detecting marine mammals that would trigger the implementation of the mitigation measures. The reporting requirements including SFV reporting (for foundation installation and foundation operation), will assist NMFS in identifying if impacts beyond those analyzed in this final rule are occurring, potentially leading to the need to enact adaptive management measures in addition to or in place of the mitigation measures.

Mysticetes

Five mysticete species (comprising five stocks) of cetaceans (*i.e.*, North Atlantic right whale, humpback whale, fin whale, sei whale, and minke whale) may be taken by harassment. These species, to varying extents, utilize the specified geographic region, including the Project Area, for the purposes of migration, foraging, and socializing. Mysticetes are in the low-frequency hearing group.

Behavioral data on mysticete reactions to pile-driving noise are scant. Kraus *et al.* (2019) predicted that the three main impacts of offshore wind farms on marine mammals would consist of displacement, behavioral disruptions, and stress. Broadly, we can

look to studies that have focused on other noise sources such as seismic surveys and military training exercises, which suggest that exposure to loud signals can result in avoidance of the sound source (or displacement if the activity continues for a longer duration in a place where individuals would otherwise have been staying, which is less likely for mysticetes in this area), disruption of foraging activities (if they are occurring in the area), local masking around the source, associated stress responses, impacts to prey, and TTS or PTS (in some cases).

Mysticetes encountered in the Project Area are expected to be migrating or foraging. The extent to which an animal engages in these behaviors in the area is species-specific and varies seasonally. Given that extensive feeding Biologically Important Areas (BIAs) for the North Atlantic right whale, humpback whale, fin whale, sei whale, and minke whale exist to the east and north of the Project Area (LaBrecque *et al.*, 2015; Van Parijs *et al.*, 2015), many mysticetes are expected to predominantly be migrating through the Project Area towards or from these feeding grounds. While we acknowledged above that mortality, hearing impairment, or displacement of mysticete prey species may result locally from impact pile driving, given the very short duration of and broad availability of prey species in the area and the availability of alternative suitable foraging habitat for the mysticete species most likely to be affected, any impacts on mysticete foraging is expected to be minor. Whales temporarily displaced from the Project Area are expected to have sufficient remaining feeding habitat available to them and would not be prevented from feeding in other areas within the biologically important feeding habitats found further north. In addition, any displacement of whales or interruption of foraging bouts would be expected to be relatively temporary in nature.

The potential for repeated exposures is dependent upon the residency time of whales, with migratory animals unlikely to be exposed on repeated occasions and animals remaining in the area to be more likely exposed repeatedly. Here, for mysticetes, where relatively low amounts of species-specific take by Level B harassment are predicted (compared to the abundance of each mysticete species or stock, such as is indicated in table 33) and movement patterns in the area suggest that individuals would not necessarily linger in a particular area for multiple days, each predicted take likely represents an exposure of a different individual. The

behavioral impacts to any individual would, therefore, primarily be expected to occur within a single day within a year—an amount that would clearly not be expected to impact reproduction or survival.

In general, for this project, the duration of exposures would not be continuous throughout any given day and pile driving would not occur on all consecutive days within a given year, due to weather delays or any number of logistical constraints Empire Wind has identified. Species-specific analysis regarding potential for repeated exposures and impacts is provided below.

Fin and minke whales are the only mysticete species for which PTS is anticipated and authorized. As described previously, PTS for mysticetes from some project activities may overlap frequencies used for communication, navigation, or detecting prey. However, given the nature and duration of the activity, the mitigation measures, and likely avoidance behavior, any PTS is expected to be of a small degree, would be limited to frequencies where pile-driving noise is concentrated (*i.e.*, only a small subset of their expected hearing range) and would not be expected to impact reproductive success or survival.

North Atlantic Right Whale

North Atlantic right whales are listed as endangered under the ESA and as both a depleted and strategic stock under the MMPA. As described in the “Potential Effects to Marine Mammals and Their Habitat” section of the proposed rule, North Atlantic right whales are threatened by a low population abundance, higher than average mortality rates, and lower than average reproductive rates. Recent studies have reported individuals showing high stress levels (*e.g.*, Corkeron *et al.*, 2017) and poor health, which has further implications on reproductive success and calf survival (Christiansen *et al.*, 2020; Stewart *et al.*, 2021; Stewart *et al.*, 2022). As described below, a UME has been designated for North Atlantic right whales. Given this, the status of the North Atlantic right whale population is of heightened concern and, therefore, merits additional analysis and consideration. No injury or mortality is anticipated or authorized for this species.

For North Atlantic right whales, this rule authorizes up to 29 takes, by Level B harassment only, over the 5-year period, with a maximum annual allowable take of 13 (equating to approximately 3.85 percent of the stock abundance, if each take were considered

to be of a different individual), with far lower numbers than that expected in the years without foundation installation (*e.g.*, years when only HRG surveys would be occurring). The Project Area is known as a migratory corridor for North Atlantic right whales and given the nature of migratory behavior (*e.g.*, continuous path), as well as the low number of total takes, we anticipate that few, if any, of the instances of take would represent repeat takes of any individual.

The highest density of North Atlantic right whales in the Project Area occurs in the winter (table 7). The New York Bight, including the Project Area, may be a stopover site for migrating North Atlantic right whales moving to or from southeastern calving grounds. As described above, the Project Area represents part of an important migratory area for right whales. Quintana-Rizzo *et al.* (2021) noted that southern New England, northeast of the Project Area, may be a stopover site for migrating right whales moving to or from southeastern calving grounds. The right whales observed during the study period were primarily concentrated in the northeastern and southeastern sections of the MA WEA during the summer (June–August) and winter (December–February). Right whale distribution did shift to the west into the Rhode Island/Massachusetts Wind Energy Area (RI/MA WEA) in the spring (March–May). Overall, the Project Area contains habitat less frequently utilized by North Atlantic right whales than the more northerly southern New England region.

In general, North Atlantic right whales in the Project Area are expected to be engaging in migratory behavior. Given the species’ migratory behavior in the Project Area, we anticipate individual whales would be typically migrating through the area during most months when foundation installation would occur, given the seasonal restrictions on foundation installation from January through April, rather than lingering in the Project Area for extended periods of time). Other work that involves either much smaller harassment zones (*e.g.*, HRG surveys) or is limited in amount (*e.g.*, cable landfall construction) may also occur during periods when North Atlantic right whales are using the habitat for migration. Therefore, it is likely that many of the takes would occur to separate individual whales, each exposed on no more than 1 day. It is important to note that the activities occurring from December through May that may impact North Atlantic right whales would be primarily HRG surveys

and cable landfall construction, neither of which would result in very high received levels, if any at all, because mitigation and monitoring measures avoid or minimize impacts. Across all years, while it is possible an animal could have been exposed during a previous year, the low amount of take being authorized during the 5-year period of the rule makes this scenario possible but unlikely. However, if an individual were to be exposed during a subsequent year, the impact of that exposure is likely independent of the previous exposure and would cause no additive effect given the duration between exposures.

As described in the Description of Marine Mammals in the Geographic Area section, North Atlantic right whales are presently experiencing an ongoing UME (beginning in June 2017). Preliminary findings support human interactions, specifically vessel strikes and entanglements, as the cause of death for the majority of North Atlantic right whales. Given the current status of the North Atlantic right whale, the loss of even one individual could significantly impact the population. No mortality, serious injury, or injury of North Atlantic right whales as a result of the Project is expected or authorized. Any disturbance to North Atlantic right whales due to Empire Wind’s activities is expected to result in temporary avoidance of the immediate area of construction. As no injury, serious injury, or mortality is expected or authorized, and Level B harassment of North Atlantic right whales will be reduced to the level of least-practicable adverse impact through use of mitigation measures, the authorized number of takes of North Atlantic right whales would not exacerbate or compound the effects of the ongoing UME.

As described in the general *Mysticetes* section above, foundation installation is likely to result in the highest amount of annual take and is of greatest concern given loud source levels. This activity would likely be limited to up to 171 days over a maximum of 2 years, during times when, based on the best available scientific data, North Atlantic right whales are less frequently encountered due to their migratory behavior. The potential types, severity, and magnitude of impacts are also anticipated to mirror that described in the general *Mysticetes* section above, including avoidance (the most likely outcome), changes in foraging or vocalization behavior, masking, a small amount of TTS, and temporary physiological impacts (*e.g.*, change in respiration, change in heart rate). Importantly, the effects of the

activities are expected to be sufficiently low-level and localized to specific areas as to not meaningfully impact important behaviors such as migratory behavior of North Atlantic right whales. These takes are expected to result in temporary behavioral reactions, such as slight displacement (but not abandonment) of migratory habitat or temporary cessation of feeding. Further, given these exposures are generally expected to occur to different individual right whales migrating through (*i.e.*, many individuals would not be impacted on more than 1 day in a year), and with some subset potentially being exposed on no more than a few days within the year, they are unlikely to result in energetic consequences that could affect reproduction or survival of any individuals.

Overall, NMFS expects that any behavioral harassment of North Atlantic right whales incidental to the specified activities would not result in changes to their migration patterns or foraging success, as only temporary avoidance of an area during construction is expected to occur. As described previously, North Atlantic right whales migrating through the Project Area are not expected to remain in this habitat for extensive durations, and any temporarily displaced animals would be able to return to or continue to travel through and forage in these areas once activities have ceased.

Although acoustic masking may occur in the vicinity of the foundation installation activities, based on the acoustic characteristics of noise associated with pile driving (*e.g.*, frequency spectra, short duration of exposure) and construction surveys (*e.g.*, intermittent signals), NMFS expects masking effects to be minimal (*e.g.*, effects of impact pile driving) to none (*e.g.*, effects of HRG surveys). In addition, masking would likely only occur during the period of time that a North Atlantic right whale is in the relatively close vicinity of pile driving, which is expected to be intermittent within a day, and confined to the months in which North Atlantic right whales are at lower densities and primarily moving through the area, anticipated mitigation effectiveness, and likely avoidance behaviors. TTS is another potential form of Level B harassment that could result in brief periods of slightly reduced hearing sensitivity, affecting behavioral patterns by making it more difficult to hear or interpret acoustic cues within the frequency range (and slightly above) of sound produced during impact pile driving. However, any TTS would likely be of low amount, limited duration, and

limited to frequencies where most construction noise is centered (*i.e.*, below 2 kHz). NMFS expects that right whale hearing sensitivity would return to pre-exposure levels shortly after migrating through the area or moving away from the sound source.

As described in the “Potential Effects to Marine Mammals and Their Habitat” section of the proposed rule, the distance of the receiver to the source influences the severity of response, with greater distances typically eliciting less severe responses. NMFS recognizes North Atlantic right whales migrating could be pregnant females (in the fall) and mothers with older calves (in the spring) and that these animals may slightly alter their migration course in response to any foundation pile driving. However, as described in the “Potential Effects to Marine Mammals and Their Habitat” section of the proposed rule, we anticipate that course diversion would be of small magnitude. Hence, while some avoidance of the pile-driving activities may occur, we anticipate any avoidance behavior of migratory North Atlantic right whales would be similar to that of gray whales (Tyack *et al.*, 1983), on the order of hundreds of meters up to 1 to 2 km. This diversion from a migratory path otherwise uninterrupted by the Project’s activities is not expected to result in meaningful energetic costs that would impact annual rates of recruitment or survival. NMFS expects that North Atlantic right whales would be able to avoid areas during periods of active noise production while not being forced out of this portion of their habitat.

North Atlantic right whale presence in the Project Area is year-round. However, abundance during summer months is lower compared to the winter months, with spring and fall serving as “shoulder seasons” wherein abundance waxes (fall) or wanes (spring). Given this year-round habitat usage, in recognition that where and when whales may actually occur during project activities is unknown as it depends on the annual migratory behaviors, NMFS is requiring a suite of mitigation measures designed to reduce impacts to North Atlantic right whales to the maximum extent practicable. These mitigation measures (*e.g.*, seasonal/daily work restrictions, vessel separation distances, reduced vessel speed) would not only avoid the likelihood of vessel strikes but also would minimize the severity of behavioral disruptions by minimizing impacts (*e.g.*, through sound reduction using attenuation systems and reduced temporal overlap of project activities and North Atlantic right whales). This

would further ensure that the number of takes by Level B harassment that are estimated to occur are not expected to affect reproductive success or survivorship by detrimental impacts to energy intake or cow/calf interactions during migratory transit. However, even in consideration of recent habitat-use and distribution shifts, Empire Wind would still be installing foundations when the presence of North Atlantic right whales is expected to be lower.

As described in the Description of Marine Mammals in the Geographic Area section, Empire Wind would be constructed within the North Atlantic right whale migratory corridor BIA, which represent areas and months within which a substantial portion of a species or population is known to migrate. The area over which North Atlantic right whales may be harassed is relatively small compared to the width of the migratory corridor. The width of the migratory corridor in this area is approximately 243.6 km while the width of the Lease Area, at the longest point, is approximately 37.6 km. North Atlantic right whales may be displaced from their normal path and preferred habitat in the immediate activity area primarily from pile-driving activities; however, we do not anticipate displacement to be of high magnitude (*e.g.*, beyond a few kilometers). Thereby, any associated bio-energetic expenditure is anticipated to be small. There are no known North Atlantic right whale feeding, breeding, or calving areas within the Project Area. Prey species are mobile (*e.g.*, calanoid copepods can initiate rapid and directed escape responses) and are broadly distributed throughout the Project Area (noting again that North Atlantic right whale prey is not particularly concentrated in the Project Area relative to nearby habitats). Therefore, any impacts to prey that may occur are also unlikely to impact North Atlantic right whales.

The most significant measure to minimize impacts to individual North Atlantic right whales during monopile installations is the seasonal moratorium on impact pile driving of monopiles from January 1 through April 30 when North Atlantic right whale abundance in the Project Area is expected to be highest. NMFS also expects this measure to greatly reduce the potential for mother/calf pairs to be exposed to impact pile driving noise above the Level B harassment threshold during their annual spring migration through the Project Area from calving grounds to primary foraging grounds (*e.g.*, Cape Cod Bay). Further, NMFS expects that exposures to North Atlantic right whales

would be reduced due to the additional mitigation measures that would ensure that any exposures above the Level B harassment threshold would result in only short-term effects to individuals exposed. Impact pile driving may only begin in the absence of North Atlantic right whales, as determined by visual and passive acoustic monitoring. If impact pile driving has commenced, NMFS anticipates North Atlantic right whales would avoid the area, utilizing nearby waters to carry on pre-exposure behaviors. However, impact pile driving must be shut down if a North Atlantic right whale is sighted at any distance, unless a shutdown is not feasible due to risk of injury or loss of life. Shutdown may occur anywhere if North Atlantic right whales are seen within or beyond the Level B harassment zone, further minimizing the duration and intensity of exposure. NMFS anticipates that if North Atlantic right whales go undetected and are exposed to impact pile driving noise, it is unlikely a North Atlantic right whale would approach the impact pile driving locations to the degree that they would purposely expose themselves to very high noise levels. These measures are designed to avoid PTS and also reduce the severity of Level B harassment, including the potential for TTS. While some TTS could occur, given the planned mitigation measures (e.g., delay pile driving upon a sighting or acoustic detection and shutting down upon a sighting or acoustic detection), the potential for TTS to occur is low.

The clearance and shutdown measures are most effective when detection efficiency is maximized, as the measures are triggered by a visual or acoustic detection. To maximize detection efficiency, NMFS requires the combination of PAM and visual observers. NMFS is requiring communication protocols with other project vessels, and other heightened awareness efforts (e.g., daily monitoring of North Atlantic right whale sighting databases) such that as a North Atlantic right whale approaches the source, and thereby could be exposed to higher noise energy levels, PSO detection efficacy would increase, the whale would be detected, and a delay to commencing foundation installation or shutdown (if feasible) would occur. In addition, the implementation of a soft-start for impact pile driving would provide an opportunity for whales to move away from the source if they are undetected, reducing their received levels. Further, Empire Wind will not install two monopile foundations or OSS foundations simultaneously. North

Atlantic right whales would, therefore, not be exposed to concurrent impact pile driving on any given day and the area ensounded at any given time would be limited.

The temporary cofferdam Level B harassment zones are relatively small (i.e., 1,985 m for Empire Wind 1 and 1,535 m for Empire Wind 2), and the cofferdams would be installed within Narragansett Bay over a short timeframe (i.e., 56 hours total; 28 hours for installation and 28 hours for removal). Therefore, it is unlikely that any North Atlantic right whales would be exposed to vibratory installation noises.

For HRG surveys, the maximum distance to the Level B harassment threshold is 50.05 m. The estimated take, by Level B harassment only, associated with HRG surveys is to account for any North Atlantic right whale sightings PSOs may miss when HRG acoustic sources are active. However, because of the short maximum distance to the Level B harassment isopleth (50.05 m), the requirement that vessels maintain a distance of 500 m from any North Atlantic right whales, the fact whales are unlikely to remain in close proximity to an HRG survey vessel for any length of time, and that the acoustic source would be shut down if a North Atlantic right whale is observed within 500 m of the source, any exposure to noise levels above the harassment threshold (if any) would be very brief. To further minimize exposures, ramp-up of sub-bottom profilers must be delayed during the clearance period if PSOs detect a North Atlantic right whale, or any other ESA-listed species, within 500 m of the acoustic source. With implementation of the mitigation requirements, take by Level A harassment is unlikely and, therefore, not authorized. Potential impacts associated with Level B harassment would include low-level, temporary behavioral modifications, most likely in the form of avoidance behavior. Given the high level of precautions taken to minimize both the amount and intensity of Level B harassment on North Atlantic right whales, it is unlikely that the anticipated low-level exposures would lead to reduced reproductive success or survival.

As described above, no serious injury or mortality, or Level A harassment, of North Atlantic right whale is anticipated or authorized. Extensive North Atlantic right whale-specific mitigation measures beyond the robust suite required for all species are expected to further minimize the amount and severity of Level B harassment. Given the documented habitat use within the area, the majority

of the individuals predicted taken (i.e., no more than 29 instances of take, by Level B harassment only, over the course of the 5-year rule, with an annual maximum of no more than 13 takes) would be impacted on only 1, or maybe 2, days in a year, and any impacts to North Atlantic right whales are expected to be in the form of lower-level behavioral disturbance. Given the magnitude and severity of the impacts discussed above, and in consideration of the required mitigation and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take, by Level B harassment only, anticipated and authorized would have a negligible impact on the North Atlantic right whale.

Fin Whale

The fin whale is listed as Endangered under the ESA, and the western North Atlantic stock is considered both Depleted and Strategic under the MMPA. No UME has been designated for this species or stock. No serious injury or mortality is anticipated or authorized for this species.

The rule authorizes up to 207 takes, by harassment only, over the 5-year period. The maximum annual allowable take by Level A harassment and Level B harassment, would be 4 and 136, respectively. Combined, this annual take (n=140) equates to approximately 2.06 percent of the stock abundance, if each take were considered to be of a different individual, with far lower numbers than that expected in the years without foundation installation (e.g., years when only HRG surveys would be occurring). As described previously, the Project Area is located 140 km southwest of a fin whale feeding BIA that is active from March to October. It is likely that some subset of the individual whales exposed could be taken several times annually. However, any impacts from any of the planned activities to feeding activities would be minor. In addition, monopile installations have seasonal work restrictions, such that the temporal overlap between these project activities and the active BIA timeframe would exclude the months of March or April. There is no spatial overlap of the Project Area and the feeding BIA.

Level B harassment is expected to be in the form of behavioral disturbance, primarily resulting in avoidance of the Project Area where foundation installation is occurring, and some low-level TTS and masking that may limit

the detection of acoustic cues for relatively brief periods of time. Any potential PTS would be minor (*i.e.*, limited to a few dB) and any TTS would be of short duration and concentrated at half or one octave above the frequency band of pile-driving noise with most sound below 2 kHz, which does not include the full predicted hearing range of fin whales.

Fin whales are present in the waters off of New York year-round and are one of the most frequently observed large whales and cetaceans in continental shelf waters, principally from Cape Hatteras in the Mid-Atlantic northward to Nova Scotia, Canada (Sergeant, 1977; Sutcliffe and Brodie, 1977; Cetacean and Turtle Assessment Program (CETAP), 1982; Hain *et al.*, 1992; Geo-Marine, 2010; BOEM, 2012; Edwards *et al.*, 2015; Hayes *et al.*, 2022).

Fin whales have high relative abundance in the New York Bight and Project Area with lower densities occurring during the fall (Roberts *et al.*, 2023). Fin whales typically feed in waters off of New England and within the Gulf of Maine, areas north of the Project Area (Hayes *et al.*, 2023), although feeding also takes place in the small feeding BIA, offshore of Montauk Point, described above (Hain *et al.*, 1992; LaBrecque *et al.*, 2015).

Given the documented habitat use within the area, some of the individuals taken would likely be exposed on multiple days. However, as described the Project Area does not include areas where fin whales are known to concentrate for feeding or reproductive behaviors and the predicted takes are expected to be in the form of lower-level impacts.

Given the magnitude and severity of the impacts discussed above, including no more than 207 takes by harassment only over the course of the 5-year rule, and a maximum annual allowable take by Level A harassment and Level B harassment, of 4 and 136, respectively, and in consideration of the required mitigation and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on the western North Atlantic stock of fin whales.

Humpback Whale

The West Indies DPS of humpback whales is not listed as threatened or endangered under the ESA. However, as described in the Description of Marine

Mammals in the Geographic Area, humpback whales along the Atlantic Coast have been experiencing an active UME as elevated humpback whale mortalities have occurred along the Atlantic coast from Maine through Florida since January 2016. Of the cases examined, approximately 40 percent had evidence of human interaction (*i.e.*, vessel strike or entanglement). The UME does not yet provide cause for concern regarding population-level impacts and take from vessel strike and entanglement is not authorized. Despite the UME, the relevant population of humpback whales (the West Indies breeding population, or DPS of which the Gulf of Maine stock is a part) remains stable at approximately 12,000 individuals.

The rule authorizes up to 97 takes by Level B harassment only over the 5-year period. No take by Level A harassment is authorized. The maximum annual allowable take by Level B harassment would be 63, respectively (this maximum annual take (n=63) equates to approximately 4.5 percent of the stock abundance, if each take were considered to be of a different individual), with far lower numbers than that expected in the years without foundation installation (*e.g.*, years when only HRG surveys would be occurring). Among the activities analyzed, impact pile driving is likely to result in the highest amount of Level B harassment annual take (*i.e.*, 63) of humpback whales.

A recent study examining humpback whale occurrence in the New York Bight area has shown that humpback whales exhibit extended occupancy (mean 37.6 days) in the Bight area and were likely to return from one year to the next (mean 31.3 percent). Whales were also seen at a variety of other sites in the New York Bight within the same year, suggesting that they may occupy this broader area throughout the feeding season. The majority of whales were seen during summer (July–September, 62.5 percent), followed by autumn (October–December, 23.5 percent), and spring (April–June, 13.9 percent) (Brown *et al.*, 2022). These data suggest that the 0 and 63 maximum annual instances of predicted takes by Level A harassment and Level B harassment, respectively, could consist of individuals exposed to noise levels above the harassment thresholds once during migration through the Project Area and/or individuals exposed on multiple days if they are utilizing the area as foraging habitat. The Lease Area, which is 321 km², comprises only a minor portion of the New York Bight area (43,388 km²), and a few repeated takes of the same individuals would be

unlikely to meaningfully impact the energetics of any individuals given the availability of favorable foraging habitat across the Bight.

For all the reasons described in the *Mysticetes* section above, we anticipate any potential PTS and TTS would be concentrated at one half or one octave above the frequency band of pile-driving noise (most sound is below 2 kHz), which does not include the full predicted hearing range of baleen whales. If TTS is incurred, hearing sensitivity would likely return to pre-exposure levels relatively shortly after exposure ends. Any masking or physiological responses would also be of low magnitude and severity for reasons described above.

Given the magnitude and severity of the impacts discussed above, including no more than 97 takes over the course of the 5-year rule, and a maximum annual allowable take by Level B harassment of 63, and in consideration of the required mitigation measures and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on the Gulf of Maine stock of humpback whales.

Minke Whale

Minke whales are not listed under the ESA, and the Canadian East Coast stock is neither considered depleted nor strategic under the MMPA. There are no known areas of specific biological importance in or adjacent to the Project Area. As described in the Description of Marine Mammals in the Geographic Area section, a UME has been designated for this species but is pending closure. No serious injury or mortality is anticipated or authorized for this species.

The rule authorizes up to 173 takes, by harassment only, over the 5-year period. The maximum annual allowable take by Level A harassment and Level B harassment would be 4 and 83, respectively (combined, this annual take (n=87) equates to approximately 0.4 percent of the stock abundance, if each take were considered to be of a different individual), with far lower numbers than that expected in the years without foundation installation (*e.g.*, years when only HRG surveys would be occurring).

Minke whales are common offshore the U.S. Eastern Seaboard with a strong seasonal component in the continental shelf and in deeper, off-shelf waters (CETAP, 1982; Hayes *et al.*, 2022). In the

Project Area, minke whales are predominantly migratory and their known feeding areas are to the north, including a feeding BIA in the southwestern Gulf of Maine and George's Bank. Therefore, they would be more likely to be moving through the Project Area, with each take representing a separate individual. However, it is possible that some subset of the individual whales exposed could be taken up to a few times annually.

As described in the Description of Marine Mammals in the Geographic Area section, there is a UME for Minke whales, along the Atlantic coast from Maine through South Carolina, with highest number of deaths in Massachusetts, Maine, and New York, and preliminary findings in several of the whales have shown evidence of human interactions or infectious diseases. However, we note that the population abundance is greater than 21,000 and the take authorized through this action is not expected to exacerbate the UME in any way.

We anticipate the impacts of this harassment to follow those described in the general *Mysticetes* section above. Any potential PTS would be minor (*i.e.*, limited to a few dB) and any TTS would be of short duration and concentrated at one half or one octave above the frequency band of pile-driving noise (most sound is below 2 kHz), which does not include the full predicted hearing range of minke whales. Level B harassment would be temporary, with primary impacts being temporary displacement of the Project Area but not abandonment of any migratory or foraging behavior.

Given the magnitude and severity of the impacts discussed above (including no more than 173 takes of the course of the 5-year rule, and a maximum annual allowable take by Level A harassment and Level B harassment, of 4 and 83, respectively), and in consideration of the required mitigation and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on the Canadian Eastern Coastal stock of minke whales.

Sei Whale

Sei whales are listed as Endangered under the ESA, and the Nova Scotia stock is considered both depleted and strategic under the MMPA. There are no known areas of specific biological importance in or adjacent to the Project

Area and no UME has been designated for this species or stock. No serious injury or mortality is anticipated or authorized for this species.

The rule authorizes up to nine takes, by Level B harassment only, over the 5-year period. The maximum annual allowable take by Level B harassment, would be four (this annual take equates to approximately 0.6 percent of the stock abundance, if each take were considered to be of a different individual). NMFS is not authorizing take by Level A harassment. Similar to other mysticetes, we would anticipate the number of takes to represent individuals taken only once or, in rare cases two or three times, as most whales in the Project Area would be migrating. To a small degree, sei whales may forage in the Project Area, although the currently identified foraging habitats (BIAs) are 280 km northeast of the area in which Empire Wind's activities would occur (LaBrecque *et al.*, 2015).

With respect to the severity of those individual takes by behavioral Level B harassment, we would anticipate impacts to be limited to low-level, temporary behavioral responses with avoidance and potential masking impacts in the vicinity of the turbine installation to be the most likely type of response. Any potential PTS and TTS would likely be concentrated at half or one octave above the frequency band of pile-driving noise (most sound is below 2 kHz), which does not include the full predicted hearing range of sei whales. Moreover, any TTS would be of a small degree. Any avoidance of the Project Area due to the Project's activities would be expected to be temporary.

Given the magnitude and severity of the impacts discussed above (including no more than nine takes of the course of the 5-year rule, and a maximum annual allowable take by Level B harassment of four), and in consideration of the required mitigation and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on the Nova Scotia stock of sei whales.

Odontocetes

In this section, we include information that applies to all of the odontocete species and stocks addressed below. Odontocetes include dolphins, porpoises, and all other whales possessing teeth, and we further divide them into the following subsections:

sperm whales, small whales and dolphins, and harbor porpoises. These subsections include more specific information, as well as conclusions, for each stock represented.

All of the takes of odontocetes authorized incidental to Empire Wind's specified activities are by pile driving and HRG surveys. No Level A harassment, serious injury, or mortality is authorized. We anticipate that, given ranges of individuals (*i.e.*, that some individuals remain within a small area for some period of time), and non-migratory nature of some odontocetes in general and especially as compared to mysticetes, these takes are more likely to represent multiple exposures of a smaller number of individuals than is the case for mysticetes, though some takes may also represent one-time exposures to an individual. Foundation installation is likely to disturb odontocetes to the greatest extent compared to HRG surveys. While we expect animals to avoid the area during foundation installation, their habitat range is extensive compared to the area ensounded during these activities.

As described earlier, Level B harassment may include direct disruptions in behavioral patterns (*e.g.*, avoidance, changes in vocalizations (from masking) or foraging), as well as those associated with stress responses or TTS. Odontocetes are highly mobile species, and, similar to mysticetes, NMFS expects any avoidance behavior to be limited to the area near the sound source. While masking could occur during foundation installation, it would only occur in the vicinity of and during the duration of the activity, and would not generally occur in a frequency range that overlaps most odontocete communication or any echolocation signals. The mitigation measures (*e.g.*, use of sound attenuation systems, implementation of clearance and shutdown zones) would also minimize received levels such that the severity of any behavioral response would be expected to be less than exposure to unmitigated noise exposure.

Any masking or TTS effects are anticipated to be of low severity. First, the frequency range of pile driving, the most impactful activity to be conducted in terms of response severity, falls within a portion of the frequency range of most odontocete vocalizations. However, odontocete vocalizations span a much wider range than the low frequency construction activities planned for the Project. As described above, recent studies suggest odontocetes have a mechanism to self-mitigate (*i.e.*, reduce hearing sensitivity) the impacts of noise exposure, which

could potentially reduce TTS impacts. Any masking or TTS is anticipated to be limited and would typically only interfere with communication within a portion of an odontocete's range and as discussed earlier, the effects would only be expected to be of a short duration and, for TTS, which is a relatively small degree.

Furthermore, odontocete echolocation occurs predominantly at frequencies significantly higher than low frequency construction activities. Therefore, there is little likelihood that threshold shift would interfere with feeding behaviors. For HRG surveys, the sources operate at higher frequencies than foundation installation activities. However, sounds from these sources attenuate very quickly in the water column, as described above. Therefore, any potential for PTS and TTS and masking is very limited. Further, odontocetes (e.g., common dolphins, spotted dolphins, and bottlenose dolphins) have demonstrated an affinity to bow-ride actively surveying HRG surveys. Therefore, the severity of any harassment, if it does occur, is anticipated to be minimal based on the lack of avoidance previously demonstrated by these species.

The waters off the coast of New York are used by several odontocete species. However, none except the sperm whale are listed under the ESA, and there are no known habitats of particular importance. In general, odontocete habitat ranges are far-reaching along the Atlantic coast of the United States, and the waters off of New York, including the Project Area, do not contain any particularly unique odontocete habitat features.

Sperm Whale

Sperm whales are listed as endangered under the ESA, and the North Atlantic stock is considered both Depleted and Strategic under the MMPA. The North Atlantic stock spans the East Coast out into oceanic waters well beyond the U.S. exclusive economic zone (EEZ). Although listed as endangered, the primary threat faced by the sperm whale across its range (i.e., commercial whaling) has been eliminated. Current potential threats to the species globally include vessel strikes, entanglement in fishing gear, anthropogenic noise, exposure to contaminants, climate change, and marine debris. There is no currently reported trend for the stock and, although the species is listed as endangered under the ESA, there are no specific issues with the status of the stock that cause particular concern (e.g., no UMEs). There are no known areas of

biological importance (e.g., critical habitat or BIAs) in or near the Project Area. No mortality or serious injury is anticipated or authorized for this species.

The rule authorizes up to six takes, by Level B harassment only, over the 5-year period. No Level A harassment, serious injury, or mortality is authorized. The maximum annual allowable take by Level B harassment would be three, which equates to approximately 0.07 percent of the stock abundance, if each take were considered to be of a different individual, with lower numbers than that expected in the years without foundation installation (e.g., years when only HRG surveys would be occurring). Given sperm whale's preference for deeper waters, especially for feeding, it is unlikely that individuals will remain in the Project Area for multiple days, and therefore, the estimated takes likely represent exposures of different individuals on 1 day annually.

If sperm whales are present in the Project Area during any Project activities, they will likely be only transient visitors and not engaging in any significant behaviors. Further, the potential for TTS is low for reasons described in the general *Odontocetes* section, but if it does occur, any hearing shift would be small and of a short duration. Because whales are not expected to be foraging in the Project Area, any TTS is not expected to interfere with foraging behavior.

Given the magnitude and severity of the impacts discussed above (i.e., no more than six takes, by Level B harassment only, over the course of the 5-year rule, and a maximum annual allowable take of three), and in consideration of the required mitigation and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on the North Atlantic stock of sperm whales.

Dolphins and Small Whales (Including Delphinids)

The seven species and eight stocks included in this group (which are indicated in table 2 in the Delphinidae family) are not listed under the ESA; however, short-finned pilot whales are listed as Strategic under the MMPA. There are no known areas of specific biological importance in or around the Project Area for any of these species and no UMEs have been designated for any

of these species. No serious injury or mortality is anticipated or authorized for these species.

The seven delphinid species with takes authorized for the Project are Atlantic spotted dolphin, Atlantic white-sided dolphin, common bottlenose dolphin, common dolphin, long-finned pilot whale, short-finned pilot whale, and Risso's dolphin. The rule would allow for the authorization of 315 to 24,030 takes (depending on species) by Level B harassment, over the 5-year period. The maximum annual allowable take for these species by Level B harassment, would range from 90 to 9,870, (this annual take equates to approximately 0.23 to 5.71 percent of the stock abundance, depending on each species, if each take were considered to be of a different individual), with far lower numbers than those expected in the years without foundation installation (e.g., years when only HRG surveys would be occurring). No Level A harassment, serious injury, or mortality is authorized.

For common dolphin, given the higher relative number of takes, while many of the takes likely represent exposures of different individuals on 1 day a year, some subset of the individuals exposed could be taken up to a few times annually. For the Northern Migratory coastal stock of bottlenose dolphins, given the higher number of takes relative to the stock abundance, it is likely that the takes represent exposures of different individuals on 1 day a year. However, it is also possible that some subset of the individuals exposed could be taken several times annually. Specifically, Empire Wind was able to estimate the number of takes per bottlenose dolphin stock (i.e., Western North Atlantic offshore and Northern Migratory coastal stocks) incidental to pile driving given the work effort and area were known. For example, all takes incidental to cable landfall construction and marina work are allocated to the Northern Migratory coastal stock because noise from this activity does not extend into offshore stock habitat. NMFS is authorizing a maximum of 1,800 and 1,185 takes in any given year incidental to pile driving to the offshore stock and Northern Migratory coastal stock, respectively. However, Empire Wind was not able to differentiate the amount of take per stock incidental to HRG surveys due to the inability to differentiate between the Western North Atlantic offshore and Northern Migratory coastal stocks of bottlenose dolphin in the underlying density data and that the amount of HRG survey effort in each stock's preferred habitat is

unknown. The predicted maximum annual take by Level B harassment for these two stocks from HRG surveys combined is 2,865. The most likely scenario is that the take is split across the two stocks; however, both stocks can occur within the Project Area and it is challenging to predict with confidence the proportion of the takes that will be incurred to each stock. However, as described in the Small Numbers section below, the Project Area is located at the edge of the northern boundary of the Northern Migratory coastal stock's habitat, though bottlenose dolphins are using the New York-New Jersey Harbor estuary more frequently (*e.g.*, Trabue *et al.*, 2022) than in previous years, likely due to warming waters. In addition, the stock demonstrates strong migratory behavior patterns. Bottlenose dolphins have been rarely observed during cold water months in coastal waters north of the North Carolina/Virginia border (Hayes *et al.*, 2021); therefore, they are limited to the Project Area in warm water months. For these reasons, NMFS estimates approximately 930 takes by Level B harassment from the coastal stock may be expected incidental to HRG surveys, at an estimated group size of 15 per Jefferson *et al.* (2015), per day during warm water months (*i.e.*, 62 days, July and August) (see Small Numbers section below for more details). Overall, it is unlikely that all takes would occur to a different individual given work may occur on consecutive days (thereby increasing chance of repeated exposure if animals were to remain in the area) and, in particular for inshore waters (where cable landfall work and marina work would occur) dolphins are likely to be remaining in the area to forage (*e.g.*, Trabue *et al.*, 2022). Even for these stocks in which some individuals may be exposed on several days within the year, the anticipated intensity of a given exposure and the comparatively small number of annual exposures and their intermittency would not be expected to incur impacts that would affect reproductive success or survival.

Overall, the number of takes, likely movement patterns of the affected dolphin and small whale species, and the intensity of any Level B harassments, combined with the availability of alternate nearby foraging habitat suggests that the likely impacts would not impact the reproduction or survival of any individuals. While delphinids may be taken on several occasions, none of these species are known to have small home ranges significantly overlapping the Project Area or known to be particularly

sensitive to anthropogenic noise. Some TTS can occur in delphinids, but it would be limited to the frequency ranges of the activity and any loss of hearing sensitivity is anticipated to return to pre-exposure conditions shortly after the animals move away from the source or the source ceases.

Given the magnitude and severity of the impacts discussed above and in consideration of the required mitigation and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on all of the dolphin and small whale species and stocks addressed in this section (*i.e.*, Atlantic spotted dolphin, Atlantic white-sided dolphin, bottlenose dolphin (western North Atlantic offshore stock and northern migratory coastal stock), common dolphin, short-finned pilot whale, long-finned pilot whale, and Risso's dolphin).

Harbor Porpoise

Harbor porpoises are not listed as Threatened or Endangered under the ESA, and the Gulf of Maine/Bay of Fundy stock is neither considered depleted or strategic under the MMPA. The stock is found predominantly in northern United States coastal waters, at less than 150 m depth and up into Canada's Bay of Fundy, between New Brunswick and Nova Scotia. Although the population trend is not known, there are no UMEs or other factors that cause particular concern for this stock.

The rule would allow for the authorization of up to 565 takes, by Level B harassment only, over the 5-year period. The maximum annual allowable take by Level B harassment would be 243 (this annual take equates to approximately 0.25 percent of the stock abundance, if each take were considered to be of a different individual), with far lower numbers than that expected in the years without foundation installation (*e.g.*, years when only HRG surveys would be occurring). Given the number of takes, while many of the takes likely represent exposures of different individuals on 1 day a year, some subset of the individuals exposed could be taken up to a few times annually. No Level A harassment, serious injury, or mortality is authorized.

Regarding the severity of takes by Level B harassment, because harbor porpoises are particularly sensitive to noise, it is likely that a fair number of the responses could be of a moderate

nature, particularly to pile driving. In response to pile driving, harbor porpoises are likely to avoid the area during construction, as previously demonstrated in Tougaard *et al.* (2009) in Denmark, in Dahne *et al.* (2013) in Germany, and in Vallejo *et al.* (2017) in the United Kingdom, although a study by Graham *et al.* (2019) may indicate that the avoidance distance could decrease over time. However, foundation installation is scheduled to occur off the coast of New York and, given alternative foraging areas, any avoidance of the area by individuals is not likely to impact the reproduction or survival of any individuals.

PTS is not anticipated or authorized. With respect to TTS, the effects on an individual are likely relatively low given the frequency bands of pile driving (most energy below 2 kHz) compared to harbor porpoise hearing (150 Hz to 160 kHz peaking around 40 kHz). Specifically, TTS is unlikely to impact hearing ability in their more sensitive hearing ranges, or the frequencies in which they communicate and echolocate.

As discussed in Hayes *et al.* (2023), harbor porpoises are seasonally distributed. During fall (October–December) and spring (April–June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south. During winter (January to March), intermediate densities of harbor porpoises can be found in waters off New Jersey to North Carolina, and lower densities are found in waters off New York to New Brunswick, Canada. In non-summer months they have been seen from the coastline to deep waters (*i.e.*, >1800 m; Westgate *et al.*, 1998), although the majority are found over the continental shelf. While harbor porpoises are likely to avoid the area during any of the Project's construction activities, as demonstrated during European wind farm construction, the time of year in which work would occur is when harbor porpoises are not in highest abundance, and any work that does occur would not result in the species' abandonment of the waters off of New York.

Given the magnitude and severity of the impacts discussed above, and in consideration of the required mitigation and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact

on the Gulf of Maine/Bay of Fundy stock of harbor porpoises.

Phocids (Harbor Seals, Gray Seals, and Harp Seals)

The harbor seal, gray seal, and harp seal are not listed under the ESA, and neither the western North Atlantic stock of gray seal, western North Atlantic stock of harp seal, nor the western North Atlantic stock of harbor seal are considered depleted or strategic under the MMPA. There are no known areas of specific biological importance in or around the Project Area. As described in the Description of Marine Mammals in the Geographic Area section, a UME has been designated for harbor seals and gray seals and is described further below. No serious injury or mortality is anticipated or authorized for these species.

For the three seal species, the rule authorizes up to between 20 and 1,752 takes for each species by Level B harassment only over the 5-year period. Level A harassment is not authorized. The maximum annual allowable take for these species by Level B harassment, would range from 4 (harp seals) to 501 (gray seals) to 662 (harbor seals) (this annual take equates to approximately 0.00005 percent of the stock abundance for harp seals, 1.84 percent of the stock abundance for gray seals, and 1.08 percent of the stock abundance for harbor seals, if each take were considered to be of a different individual), with far lower numbers than that expected in the years without foundation installation (e.g., years when only HRG surveys would be occurring). Though gray seals, harbor seals, and harp seals are considered migratory and no specific feeding areas have been designated in the area, the higher number of takes relative to the stock abundance suggests that while some of the takes likely represent exposures of different individuals on 1 day a year, it is likely that some subset of the individuals exposed could be taken several times annually.

Harbor and gray seals occur in New York waters most often in winter, when impact pile driving would not occur. Harp seals are anticipated to be rare but could still occur in the Project Area. Seals are more likely to be close to shore (e.g., closer to the edge of the area ensounded above NMFS' harassment threshold), such that exposure to foundation installation would be expected to be at comparatively lower levels. There are no gray seal pupping colonies or known haul-out sites near the Project Area, although gray seals may haul out at known harbor seal haul out sites. The nearest known gray seal

pupping sites are greater than 250 nautical miles (nmi) (463 km) away, at Muskeget Island in the Nantucket Sound, Monomoy National Wildlife Refuge, and in eastern Maine (Rough, 1995). Known haul out locations are located closer to Monomoy Refuge and on Nantucket in Massachusetts (Kenney and Vigness-Raposa, 2010). Harbor seals have the potential to occur in areas adjacent to the export cable corridors and landfall sites. Although there are no known harbor seal haul outs in the Project Area, harbor seals occur throughout the New York coastline and have the potential to haul out at many beach sites. As the closest documented pinniped haul out sites are located further than 463 km away from the Project Area, NMFS does not expect any harassment to occur and has not authorized any take from in-air impacts on hauled-out seals.

As described in the "Potential Effects to Marine Mammals and Their Habitat" section in the proposed rule, construction of wind farms in Europe resulted in pinnipeds temporarily avoiding construction areas but returning within short time frames after construction was complete (Carroll *et al.*, 2010; Hamre *et al.*, 2011; Hastie *et al.*, 2015; Russell *et al.*, 2016; Brasseur *et al.*, 2010). Effects on pinnipeds that are taken by Level B harassment in the Project Area would likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring). Most likely, individuals would simply move away from the sound source and be temporarily displaced from those areas (Lucke *et al.*, 2006; Edren *et al.*, 2010; Skeate *et al.*, 2012; Russell *et al.*, 2016). Given the low anticipated magnitude of impacts from any given exposure (e.g., temporary avoidance), even potential repeated Level B harassment across a few days of some small subset of individuals, is unlikely to result in impacts on the reproduction or survival of any individuals. Moreover, pinnipeds would benefit from the mitigation measures described in 50 CFR part 217.

As described above, noise from pile driving is mainly low frequency. PTS is not anticipated or authorized. Any TTS that does occur would fall within the lower end of pinniped hearing ranges (i.e., 50 Hz to 86 kHz), TTS would not occur at frequencies where pinniped hearing is most sensitive. In summary, any TSS would be of small degree and not occur across the entire, or even the most sensitive, hearing range. Hence, any impacts from TTS are likely to be of low severity and not interfere with

behaviors critical to reproduction or survival.

Elevated numbers of harbor seal and gray seal mortalities were first observed in July 2018 and occurred across Maine, New Hampshire, and Massachusetts until 2020. Based on tests conducted so far, the main pathogen found in the seals belonging to that UME was phocine distemper virus, although additional testing to identify other factors that may be involved in this UME are underway. Currently, the only active UME is occurring in Maine with some harbor and gray seals testing positive for highly pathogenic avian influenza (HPAI) H5N1. Although elevated strandings continue, neither UME, alone or in combination, provides cause for concern regarding population-level impacts to any of these stocks. For harbor seals, the population abundance is over 61,000 and the annual mortality/serious injury (M/SI; 339) for the seals is well below PBR (i.e., 1,729) (Hayes *et al.*, 2020). The population abundance for gray seals in the United States is over 27,000, with an estimated overall abundance, including seals in Canada, of approximately 450,000. In addition, the abundance of gray seals is likely increasing in the United States Atlantic, as well as in Canada (Hayes *et al.*, 2020). For harp seals, for which there is no recent UME, the total U.S. fishery-related mortality and serious injury for this stock is very low relative to the stock size and can be considered insignificant and approaching zero mortality and serious injury rate (Hayes *et al.*, 2022). The harp seal stock abundance appears to have stabilized (Hayes *et al.*, 2022).

Given the magnitude and severity of the impacts discussed above, and in consideration of the required mitigation and other information presented, Empire Wind's activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and authorized will have a negligible impact on harbor, gray, and harp seals.

Negligible Impact Determination

No mortality or serious injury is anticipated to occur or authorized. As described in the analysis above, the impacts resulting from the Project's activities cannot be reasonably expected to, and are not reasonably likely to, adversely affect any of the species or stocks through effects on annual rates of recruitment or survival. Based on the analysis contained herein of the likely effects of the specified activity on

marine mammals and their habitat, and taking into consideration the implementation of the required mitigation and monitoring measures, NMFS finds that the marine mammal take from all of Empire Wind's specified activities combined will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers; therefore, in practice, and where estimated numbers are available, NMFS compares the number of individuals estimated to be taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is less than one-third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

NMFS is authorizing incidental take by Level A harassment and/or Level B harassment of 17 species of marine mammals (with 18 managed stocks). The maximum number of instances of takes by combined Level A harassment and Level B harassment possible within any 1 year relative to the best available population abundance is less than one-third for all species and stocks potentially impacted. Unless otherwise noted, the small numbers analysis conservatively assumes each take occurs to a different individual in the population.

For 16 stocks, less than 6 percent of the stock abundance is authorized for take by harassment. Specific to the North Atlantic right whale, the maximum amount of take per year, which is by Level B harassment only, is 13, or 3.85 percent of the stock abundance, assuming that each instance of take represents a different individual. Please see table 38 for information relating to this small numbers analysis.

For bottlenose dolphins, Empire Wind was able to identify the amount of take by all activities other than HRG surveys on a per stock basis (offshore or Northern Migratory coastal; see table 38). Taking into account public comment related to these issues, NMFS has taken a finer look at calculating the

percentage of take expected for the two affected stocks of bottlenose dolphins.

The Project Area is located at the northern habitat boundary edge for the Northern Migratory coastal stock. As described in Hayes *et al.* (2021), this stock, as described in its name, migrates along the coast of the U.S. throughout the year. During warm water months (primarily July and August), this stock occupies coastal waters from the shoreline to approximately the 20-m isobath between Assateague, Virginia, and Long Island, New York. The stock occupies more southern coastal waters from approximately Cape Lookout, North Carolina, to the North Carolina/Virginia border during colder months; bottlenose dolphins have been rarely observed during cold water months in coastal waters north of the North Carolina/Virginia border (Hayes *et al.*, 2021). Empire Wind requested, and NMFS has authorized, take equating to one average group size ($n=15$) of bottlenose dolphins on each survey day ($n=191$) which could occur January through December. Habitat distribution alone precludes the Northern Migratory coastal stock from being present within or near the Project Area during cooler months. Therefore, to assume this stock could be taken year-round (*i.e.*, subject to harassment every day HRG surveys would occur) is not reasonable or based on the best available science.

For purposes of this analysis, NMFS has conservatively assumed that every day during summer months (July and August; as identified in Hayes *et al.*, 2021) when it is most likely this stock could occur in the Project Area, one average group size per day could be taken by harassment incidental to HRG surveys. That is, harassment could occur to the coastal stock on approximately 62 days, noting these 62 days could be spread out over a longer time period (*e.g.*, June through September) when waters are warm enough to host this stock. These assumptions equate to 930 takes (*i.e.*, 62 days \times 15 dolphins per day) from HRG surveys. Combined with the take authorized incidental to pile driving (*i.e.*, 1,185 takes), the maximum total take authorized in a given year is 2,115. If one assumes that all takes are of a different individual, this equates to 31.9 percent of the population. However, the assumptions that all takes are of a different individual (*i.e.*, harassment on more than one day could occur to the same individual) and all takes could be attributed to the coastal stock are also not likely scenarios; therefore, in addition to the fact that the Project Area is the most northern boundary of known habitat, the actual percentage of stock

taken by harassment is expected to be less than 31.9 percent.

Regarding the Western North Atlantic offshore stock of bottlenose dolphins, if one assumes that all take authorized for HRG surveys (2,865) occurs to the offshore stock, the total amount of take authorized in any given year (4,655) equates to 7.4 percent of the population (62,851). NMFS expects this percentage to also be an overestimate, given that this estimate assumes each take is of a different individual, an unlikely scenario as discussed above, and assumes that all of the expected bottlenose dolphin takes are attributed to the offshore stock, also a very unlikely scenario.

Based on the analysis contained herein of the activities (including the required mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS finds that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Classification

Endangered Species Act

Section 7(a)(2) of the ESA of 1973 (16 U.S.C. 1531 *et seq.*) requires that each Federal agency ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the promulgation of rulemakings, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, and in this case, consulted with the NOAA GARFO.

The NMFS Office of Protected Resources has authorized the take of four marine mammal species, which are listed under the ESA: the North Atlantic right, sei, fin, and sperm whale. The Permit and Conservation Division requested initiation of section 7 consultation on April 12, 2023, with GARFO for the promulgation of the rulemaking. NMFS issued a Biological Opinion on September 8, 2023,

concluding that the promulgation of the rule and issuance of LOAs thereunder is not likely to jeopardize the continued existence of threatened and endangered species under NMFS' jurisdiction and is not likely to result in the destruction or adverse modification of designated or proposed critical habitat. The Biological Opinion is available at <https://repository.library.noaa.gov/view/noaa/55324>.

Empire Wind is required to abide by the promulgated regulations, as well as the reasonable and prudent measure and terms and conditions of the Biological Opinion and Incidental Take Statement, as issued by NMFS.

National Environmental Policy Act

To comply with NEPA (42 U.S.C. 4321 *et seq.*) and the NOAA Administrative Order (NAO) 216–6A, NMFS must evaluate our proposed action (*i.e.*, promulgation of regulation) and alternatives with respect to potential impacts on the human environment. NMFS participated as a cooperating agency on the BOEM 2023 Final EIS (FEIS), which was finalized on September 11, 2023, and is available at: <https://www.boem.gov/renewable-energy/state-activities/empire-wind-final-eis>. In accordance with 40 CFR 1506.3, NMFS independently reviewed and evaluated the 2023 Empire Wind FEIS and determined that it is adequate and sufficient to meet our responsibilities under NEPA for the promulgation of this rule and issuance of the associated LOA. NMFS, therefore, has adopted the 2023 Empire Wind 1 FEIS through a joint Record of Decision (ROD) with BOEM. The joint ROD for adoption of the 2023 Empire Wind FEIS and promulgation of this final rule and subsequent issuance of a LOA can be found at: <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>.

Executive Order 12866

The Office of Management and Budget has determined that this rule is not significant for purposes of Executive Order 12866.

Regulatory Flexibility Act

Pursuant to the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration during the proposed rule stage that this action would not have a significant economic impact on a substantial number of small entities. The factual basis for the certification was published in the

proposed rule and is not repeated here. No comments were received regarding this certification. As a result, a regulatory flexibility analysis was not required and none was prepared.

Paperwork Reduction Act

Notwithstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid Office of Management and Budget (OMB) control number. These requirements have been approved by OMB under control number 0648–0151 and include applications for regulations, subsequent LOA, and reports. Send comments regarding any aspect of this data collection, including suggestions for reducing the burden, to NMFS.

Coastal Zone Management Act

The Coastal Zone Management Act requires that any applicant for a required Federal license or permit to conduct an activity, within the coastal zone or within the geographic location descriptions (*i.e.*, areas outside the coastal zone in which an activity would have reasonably foreseeable coastal effects), affecting any land or water use or natural resource of the coastal zone be consistent with the enforceable policies of a state's federally approved coastal management program. As required, on June 24, 2021, Empire Wind submitted a Federal consistency certification to New York and voluntarily submitted a Federal consistency certification to New Jersey for approval of the COP by BOEM and the issuance of an Individual Permit by United States Army Corps of Engineers, under sections 10 and 14 of the Rivers and Harbors Act and section 404 of the Clean Water Act (15 CFR part 930, subpart E). New York began its review of the proposed activity pursuant to 15 CFR part 930, subpart D, on November 18, 2022.

NMFS determined that Empire Wind's application for MMPA ITRs is an unlisted activity under the State of New York's coastal management program and, thus, is not subject to Federal consistency requirements in the absence of the receipt and prior approval of an unlisted activity review request from the State by the Director of NOAA's Office for Coastal Management. Pursuant to 15 CFR 930.54, NMFS published a NOR of Empire Wind's application in the **Federal Register** on September 9, 2022 (87 FR 55409), and published the proposed rule on April

13, 2023 (88 FR 22696). The State of New York did not request approval from the Director of NOAA's Office for Coastal Management to review Empire Wind's application as an unlisted activity, and the time period for making such request has expired. Therefore, NMFS has determined the ITA is not subject to Federal consistency review.

Waiver of Delay in Effective Date

The Assistant Administrator for Fisheries has determined that there is a sufficient basis under the Administrative Procedure Act (APA) to waive the 30-day delay in the effective date of the measures contained in the final rule. Section 553 of the APA provides that the required publication or service of a substantive rule shall be made not less than 30 days before its effective date with certain exceptions, including (1) for a substantive rule that relieves a restriction or (2) when the agency finds and provides good cause for foregoing delayed effectiveness 5 U.S.C 553(d)(1) and (d)(3). Here, the issuance of regulations under section 101(a)(5)(A) of the MMPA is a substantive action that relieves the statutory prohibition on the taking of marine mammals, specifically, the incidental taking of marine mammals associated with Empire Wind's specified activities during the construction of the Project offshore of New York. Until the effective date of these regulations, Empire Wind is prohibited from taking marine mammals incidental to the Project.

In addition, good cause exists for waiving the delay in effective date. In order for Empire Wind to start cable landfall construction activities in Spring 2024, which is pertinent for construction activity sequencing and vessel and other services procurement and availability, Empire Wind must submit a certified verification agent reviewed and certified Fabrication and Installation Report, which includes all Federal, State, and local permits, to Bureau of Safety and Environmental Enforcement (BSEE) at least 60 days prior to the start of such activities (30 CFR 285.700).

Moreover, offshore wind projects, such as the Project, that are developed to generate renewable energy have great societal and economic importance, and delays in completing the Project are contrary to the public interest.

Finally, Empire Wind has informed NMFS that it does not require 30 days to prepare for implementation of the regulations and requests that this final rule take effect on or before February 22, 2024. For these reasons, the subject

regulations will be made effective on February 22, 2024.

List of Subjects in 50 CFR Part 217

Administrative practice and procedure, Endangered and threatened species, Fish, Fisheries, Marine mammals, Penalties, Reporting and recordkeeping requirements, Wildlife.

Dated: January 18, 2024.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

PART 217—REGULATIONS GOVERNING THE TAKE OF MARINE MAMMALS INCIDENTAL TO SPECIFIED ACTIVITIES

■ 1. The authority citation for part 217 continues to read:

Authority: 16 U.S.C. 1361 *et seq.*, unless otherwise noted.

■ 2. Add subpart CC, consisting of §§ 217.280 through 217.289, to read as follows:

Subpart CC—Taking Marine Mammals Incidental to the Empire Wind Project Offshore of New York

Sec.

- 217.280 Specified activity and specified geographical region.
- 217.281 Effective dates.
- 217.282 Permissible methods of taking.
- 217.283 Prohibitions.
- 217.284 Mitigation requirements.
- 217.285 Requirements for monitoring and reporting.
- 217.286 Letter of Authorization.
- 217.287 Modifications of Letter of Authorization.
- 217.288—217.289 [Reserved]

Subpart CC—Taking Marine Mammals Incidental to the Empire Wind Project, Offshore New York

§ 217.280 Specified activity and specified geographical region.

(a) Regulations in this subpart apply to activities associated with the Empire Wind Project (hereafter referred to as the “Project”) by Empire Offshore Wind, LLC (hereafter referred to as “LOA Holder”), and those persons it authorizes or funds to conduct activities on its behalf in the area outlined in paragraph (b) of this section. Requirements imposed on LOA Holder must be implemented by those persons it authorizes or funds to conduct activities on its behalf. (b) The specified geographical region is the Mid-Atlantic Bight, 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, and two sea-to-shore transition points located at South Brooklyn Marine Terminal, in Brooklyn, NY (Empire Wind 1), and Long Island, NY (Empire Wind 2).

(c) The specified activities are impact pile driving of up to 147 wind turbine generator (WTGs) and up to two offshore substation (OSSs) foundations; impact and vibratory pile driving associated with cable landfall construction and marina activities; high-resolution geophysical (HRG) site characterization surveys; 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 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.

§ 217.281 Effective dates.

The regulations in this subpart are effective from February 22, 2024, through February 21, 2029.

§ 217.282 Permissible methods of taking.

Under the LOA, issued pursuant to §§ 216.106 and 217.286, LOA Holder, and those persons it authorizes or funds to conduct activities on its behalf, may incidentally, but not intentionally, take marine mammals within the vicinity of BOEM Lease Area OCS-A 0512 Commercial Lease of Submerged Lands for Renewable Energy Development, along export cable routes, and at the two sea-to-shore transition points located at the South Brooklyn Marine Terminal, in Brooklyn, NY (Empire Wind 1), and Long Island, NY (Empire Wind 2), in the following ways, provided LOA Holder is in complete compliance with all terms, conditions, and requirements of the regulations in this subpart and the appropriate LOA:

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

(b) By Level A harassment associated with the acoustic disturbance of marine mammals by impact pile driving of WTG and OSS foundations; (c) Take by mortality (death) or serious injury of any marine mammal species is not authorized; and (d) The incidental take of marine mammals by the activities listed in paragraphs (a) and (b) of this section is limited to the following species:

TABLE 1 TO PARAGRAPH (d)

Marine mammal species	Scientific name	Stock
Fin whale	<i>Balaenoptera physalus</i>	Western North Atlantic.
Humpback whale	<i>Megaptera novaeangliae</i>	Gulf of Maine.
Minke whale	<i>Balaenoptera acutorostrata</i>	Canadian Eastern Coastal.
North Atlantic right whale	<i>Eubalaena glacialis</i>	Western North Atlantic.
Sei whale	<i>Balaenoptera borealis</i>	Nova Scotia.
Atlantic spotted dolphin	<i>Stenella frontalis</i>	Western North Atlantic.
Atlantic white-sided dolphin	<i>Lagenorhynchus acutus</i>	Western North Atlantic.
Bottlenose dolphin	<i>Tursiops truncatus</i>	Western North Atlantic, offshore.
Bottlenose dolphin	<i>Tursiops truncatus</i>	Western North Atlantic, coastal.
Short-beaked common dolphin	<i>Delphinus delphis</i>	Western North Atlantic.
Harbor porpoise	<i>Phocoena phocoena</i>	Gulf of Maine/Bay of Fundy.
Long-finned pilot whale	<i>Globicephala melas</i>	Western North Atlantic.
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	Western North Atlantic.
Risso’s dolphin	<i>Grampus griseus</i>	Western North Atlantic.
Sperm whale	<i>Physeter macrocephalus</i>	North Atlantic.
Gray seal	<i>Halichoerus grypus</i>	Western North Atlantic.
Harbor seal	<i>Phoca vitulina</i>	Western North Atlantic.
Harp seal	<i>Pagophilus groenlandicus</i>	Western North Atlantic.

§ 217.283 Prohibitions.

Except for the takings described in § 217.282 and authorized by an LOA issued under § 217.286 or § 217.287, it is unlawful for any person to do any of the following in connection with the activities described in this subpart:

(a) Violate, or fail to comply with, the terms, conditions, and requirements of this subpart or an LOA issued under § 217.286 or § 217.287;

(b) Take any marine mammal not specified in § 217.282(d);

(c) Take any marine mammal specified in the LOA in any manner other than as specified in the LOA; or

(d) Take any marine mammal specified in § 217.282(d), after NMFS Office of Protected Resources determines such taking results in more than a negligible impact on the species or stocks of such marine mammals.

§ 217.284 Mitigation requirements.

When conducting the activities identified in § 217.280(c) within the area described in § 217.280(b), LOA Holder must implement the mitigation measures contained in this section and any LOA issued under § 217.286 or § 217.287. These mitigation measures include, but are not limited to:

(a) *General conditions.* LOA Holder must comply with the following general measures:

(1) A copy of any issued LOA must be in the possession of LOA Holder 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) LOA Holder 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 activities and vessel

operations, LOA Holder 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;

(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) The LOA Holder 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, LOA Holder must take the required mitigative action. If a shutdown of an activity is called for by the Lead PSO or PAM operator, LOA Holder 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 would 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 Level B harassment zone prior to beginning a specified activity, the activity must be delayed. If the activity is ongoing, it must be shut down

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 and is on a path away from the Level B harassment zone or after 15 minutes for small odontocetes and pinnipeds, and 30 minutes for all other species with no further sightings;

(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 § 217.280(c), if a marine mammal is on a path towards or comes within 10 meters (m) (32.8 feet) of equipment, LOA Holder 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 LOA Holder must report all Maritime Mobile Service Identity (MMSI) numbers to NMFS Office of Protected Resources;

(12) By accepting the issued LOA, LOA Holder 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.* LOA Holder must comply with the following vessel strike avoidance measures, unless an emergency situation presents a threat to the health, safety, or life of a person or when a vessel, actively engaged in emergency rescue or response duties, including vessel-in-distress or environmental crisis response, requires speeds in excess of 10 knots (kn) (18.5 kilometers per hour (km/hr)) to fulfill those

responsibilities, while in the specified geographical region. 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 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 observers' training and understanding of the Incidental Take Authorization (ITA) requirements must be documented on a training course log sheet and reported to NMFS;

(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) or trained crew members, as defined in paragraph (b)(1) of this section. 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 observer 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 dedicated visual observer(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 rule regulations at 50 CFR part 224 (nothing in this subpart exempts vessels from any other applicable marine mammal speed and approach regulations);

(7) Vessels must not travel over 10 kn (18.5 km/hr) from November 1 through April 30, annually, in the specified geographic region, within any active North Atlantic right whale Slow Zone (*i.e.*, DMAs or acoustically-triggered slow zone);

(8) If vessel(s) are traveling at speeds greater than 10 kn (18.5 km/hr) (*i.e.*, no speed restrictions are enacted) in a transit corridor (defined as from a port to the Lease Area or return), in addition to the required dedicated visual observer, LOA Holder 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 (18.5 km/hr) 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 (18.5 km/hr) 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 paragraph (b)(4) of this section)

within 10 km (6.2 miles (mi)) of a transiting vessel(s), that vessel must operate at 10 kn (18.5 km/hr) or less for 24 hours following the reported detection;

(10) All vessel operators, regardless of their vessel's size, must immediately reduce speed to 10 kn (18.5 km/hr) or less when any large whale (other than a North Atlantic right whale- refer back to paragraph (b)(7) of this section), mother/calf pairs, or large assemblages of cetaceans are sighted within 500 m of a 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 (18.5 km/hr) 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 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. If a whale is observed but cannot be confirmed as a species other than a North Atlantic right whale, the vessel operator must assume that it is a North Atlantic right whale and take the vessel strike avoidance measures described in this paragraph (b)(11);

(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 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 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 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);

(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 (SMAs), Slow Zones) and any information regarding North Atlantic right whale sighting locations; and

(17) LOA Holder 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 or approved by NMFS prior to vessel operations, all project vessels must travel at speeds of 10 kn (18.5 km/hr) or less. LOA Holder 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 must not occur January 1 through April 30, 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 kJ for pin pile installation. No more than three pin piles may be installed per day;

(3) LOA Holder 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) LOA Holder must utilize a soft-start protocol as described in the LOA. 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) LOA Holder must establish clearance and shutdown zones, which must be measured using the radial distance from 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 is about to enter, the applicable clearance zones, during this 30-minute 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 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) LOA Holder must deploy at least two functional noise attenuation devices that reduce noise levels to the modeled harassment isopleths, assuming 10-decibels (dB) attenuation, during all

foundation pile driving, and comply with the following measures:

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

(ii) The bubble curtain(s) must distribute air bubbles using an air flow rate of at least 0.5 m³/(minute*m). The bubble curtains 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 curtains 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. LOA Holder 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; and

(vi) Corrections to the bubble rings to meet the performance standards in this paragraph (c)(7) must occur prior to impact pile driving of monopiles. For any noise mitigation device in addition to the bubble curtains, LOA Holder must inspect and carry out appropriate maintenance on the system and ensure the system is functioning properly prior to every pile driving event;

(8) LOA Holder 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 to the pile being driven so that the activities do not mask the PAM system. LOA Holder 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) LOA Holder must utilize PSO(s) and PAM operator(s), as described in § 217.285(c). At least three on-duty PSOs must be on every impact 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 LOA Holder 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 a risk of pile refusal or pile instability. If pile driving is not shutdown in one of these situations, LOA Holder 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 217.285(f));

(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 North Atlantic right whales, 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 or to avoid pile refusal, at which time LOA Holder must use the lowest hammer energy practicable to maintain stability;

(13) LOA Holder must conduct thorough 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 dB of attenuation. Subsequent SFV

measurements are also required should larger piles be installed or if additional piles 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 thorough SFV monitoring, LOA Holder also must conduct abbreviated SFV for all foundations, using at least one acoustic recorder for every foundation for which thorough SFV monitoring is not conducted:

(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 selected such that measurement of Level A harassment and Level B harassment isopleths are accurate, feasible, and avoids extrapolation. 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 systems);

(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) LOA Holder must be prepared with additional equipment (e.g., 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) LOA Holder must submit interim reports within 48 hours after each foundation is measured (see § 217.285(f) section for interim and final reporting requirements);

(vii) LOA Holder must not exceed modeled distances to NMFS marine mammal Level A harassment and Level B harassment thresholds, assuming 10-dB attenuation, for foundation installation. If any of the interim SFV measurement reports submitted for the first three monopiles indicate the modeled distances to NMFS marine mammal Level A harassment and Level B harassment thresholds assuming 10-dB attenuation, then LOA Holder must implement additional sound attenuation measures on all subsequent foundations. LOA Holder 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. LOA Holder must optimize the sound attenuation systems (e.g., ensure hose maintenance, pressure testing, etc.) to meet noise levels modeled, assuming 10-dB attenuation, within three piles or else foundation installation activities must cease until NMFS and LOA Holder can evaluate the situation and ensure future piles must not exceed noise levels modeled assuming 10-dB attenuation;

(viii) If, after additional measurements conducted pursuant to requirements of paragraph (c)(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), LOA Holder 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, LOA Holder must have conducted SFV measurements on

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

(x) LOA Holder 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 LOA Holder 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, LOA Holder must include information in the SFV Plan on how additional sites/scenarios would be selected for SFV measurements. The 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) LOA Holder 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 pile driving and abide by the Plan if approved. LOA Holder 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 and PSO protocols (including number and location of PSOs) for all pile driving. No foundation

pile installation can occur without NMFS' approval of the Plan; and

(15) LOA Holder 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 (impact pile driving) 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 LOA Holder's PAM Plan does not receive approval from NMFS Office of Protected Resources and NMFS Greater Atlantic Regional Fisheries Office Protected Resources Division.

(d) *Cable landfall construction and marina activities.* The following requirements apply to 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) LOA Holder 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) LOA Holder must utilize PSO(s), as described in § 217.285(d). At least two on-duty PSOs must monitor for marine mammals at least 30 minutes before, during, and 30 minutes after impact and vibratory pile driving associated with cofferdam and casing pipe installation and removal and marine activities; and

(4) If a marine mammal is observed entering or within the respective shutdown zone after pile driving has begun, the PSO must call for a shutdown of pile driving. LOA Holder 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, LOA Holder

must document the reason(s) for not shutting down and report the information to NMFS Office of Protected Resources in the next available weekly report (as described in § 217.285(f)).

(5) 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 LOA Holder must use the lowest hammer energy practicable to maintain stability.

(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) LOA Holder must establish and implement clearance and shutdown zones for HRG surveys using visual monitoring, as described in paragraph (c) of this section;

(2) LOA Holder must utilize PSO(s), as described in § 217.285(e);

(3) LOA Holder 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). To the extent that any relevant Best Management Practices (BMPs) described in these PDCs are more stringent than the requirements in this subpart, those BMPs supersede the requirements in this subpart;

(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 PSO, that the clearance zone is clear of any marine mammals, LOA Holder 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). LOA Holder 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 specified in the LOA;

(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 reintiated 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 zone must be visible, except as indicated in paragraph (e)(13) 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) LOA Holder 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 would be allowed to 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, LOA Holder 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) 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) LOA Holder 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; and

(16) If an acoustic source is shut down for a period longer than 30 minutes, all clearance and ramp-up procedures must be repeated. 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.

(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 measures 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) LOA Holder 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 nmi (1.85 km) of the planned location and 15 minutes before gear deployment, then LOA Holder 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, LOA Holder 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) LOA Holder 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, LOA Holder 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 LOA Holder's research gear. All labels and markings on the gear, buoys, and buoy lines must also be compliant with the Atlantic Large Whale Take Reduction Plan regulations at § 229.32, 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 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.

§ 217.285 Requirements for monitoring and reporting.

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

(1) LOA Holder 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. Alternative 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)(4) and (5) 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 activities must be unconditionally approved;

(8) At least one on-duty PSO and PAM operator, where applicable, for each activity (*e.g.*, impact pile driving, vibratory pile driving, and HRG surveys) must be designated as the Lead PSO or Lead PAM operator. The Lead PSO should be unconditionally approved for Tiers 1–3;

(9) LOA Holder must submit NMFS previously approved PSO and PAM operator resumes 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, LOA Holder 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 the PAM system(s) that will be used for the Project; PAM operators must demonstrate 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; where localization of sounds or deriving bearings and distance are possible, the PAM operators need to 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 metrics;

(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 LOA Holder:

(1) 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;

(2) 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 real-time 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;

(3) 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 (*i.e.*, Mysticetus or similar system) who must be responsible for requesting that the designated crewmember implement the necessary mitigation procedures (*i.e.*, delay);

(4) 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 § 217.284(c)(15);

(5) 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;

(6) 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;

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

(8) 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

(9) LOA Holder personnel 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 LOA Holder:

(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 activities. If PSOs cannot visually monitor the minimum visibility zone prior to foundation pile driving at all times using the equipment described in paragraphs (b)(4) and (5) 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. If an aerial platform is used (per § 217.284(e)(7)), at least two on-duty PSOs must be actively searching for marine mammals. Concurrently, at least one PAM operator per acoustic data stream (*i.e.*, equivalent to the number of acoustic buoys) must be actively monitoring for marine mammals 60 minutes before and during, and 30 minutes after impact pile driving in accordance with a NMFS-approved PAM Plan; and

(3) LOA Holder 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 activities.

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

(1) At least two PSOs must be on active duty during all activities related to cable landfall construction. 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, and for 30 minutes after all pile driving activities have ceased. Pile driving 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 acoustic sources that have the potential to result in harassment (*i.e.*, Compressed High Intensity Radiated Pulse (CHIRPs), boomers, and sparkers) and must be implemented by LOA Holder:

(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, LOA Holder 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.* LOA Holder must comply with the following reporting measures:

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

(2) LOA Holder 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.*, vibratory installation/removal, impact pile driving, construction survey), use of any noise attenuation device(s), and the specific phase of the 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 § 217.286;

(4) If a marine mammal is acoustically detected during PAM monitoring, the following information must be recorded and reported to NMFS: location of hydrophone (*i.e.*, latitude 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 UTC. *i.e.*, EST time zone is UTC-5); duration of recordings (*i.e.*, start/end dates and times; in 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. 1µ Pa); 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). The following information must be reported for each detection: species identification (if possible); call type and number of calls (if known); temporal aspects of vocalization (*e.g.*, date, time,

duration, *etc.*; date times in ISO 8601 format); confidence of detection (*i.e.*, 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 the name(s) of PAM operator(s) on duty;

(i) For each detection, the following information the following information must be noted: species identification (if possible); call type and number of calls (if known); temporal aspects of vocalization (*e.g.*, date, time, duration, *etc.*; date times in ISO 8601 format); confidence of detection (*i.e.*, 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 the name(s) of PAM operator(s) on duty;

(ii) [Reserved]

(5) LOA Holder 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 acoustic and visual detections of marine mammals; 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 LOA Holder;

(6) LOA Holder 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) LOA Holder 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. LOA Holder 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 (*e.g.*, number of shutdowns or clearance zone delays, *etc.*) or, if no mitigative actions were taken, why none were taken; operational details (*e.g.*, days and duration of impact and vibratory pile driving, 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.*, impact 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) LOA Holder 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 30 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 30 calendar days of NMFS Office of Protected Resources receipt of the draft report, the report shall be considered final;

(9) For those foundation piles requiring thorough SFV measurements, LOA Holder 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 a 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 ($R_{95\text{percent}}$) 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. LOA Holder 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, LOA Holder must indicate full details of the calibration procedure, results, and any associated issues in the 48-hour interim reports;

(10) LOA Holder must conduct abbreviated SFV for all foundation installations for which the complete SFV monitoring is not carried out (refer back to § 217.284(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 LOA Holder, 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 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 prescribed above for 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 following: 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; the sound levels reported must be in median, arithmetic mean, and L_5 (95 percent exceedance) (*i.e.*, average in linear space), and in dB; range of TL 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 LOA Holder 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, LOA Holder 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, LOA Holder 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 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) LOA Holder 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):

(i) If a North Atlantic right whale is observed at any time by PSOs or project personnel, LOA Holder 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 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 calling NMFS is not possible, reports can also be made to the U.S. Coast Guard via channel 16 or through the WhaleAlert app (<https://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, LOA Holder 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 (not including a North Atlantic right whale) is observed at any time by PSOs or project personnel during vessel transit, LOA Holder must report the sighting to the WhaleAlert app (<https://www.whalealert.org/>);

(iv) In the event that personnel involved in the Project discover a stranded, entangled, injured, or dead marine mammal, LOA Holder 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, LOA Holder must 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 Greater Atlantic Regional Fisheries Office (GARFO; nmfs.gar.incidental-take@noaa.gov, nmfs.gar.stranding@noaa.gov) or, if in the Southeast region (North Carolina to Florida), NMFS Southeast Regional Office (SERO; secmammalreports@noaa.gov), as soon as feasible. The report (via phone or email) must include contact information (e.g., 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; photographs or video footage of the animal(s) if available; 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 the Project activities cause a non-auditory injury or death of a marine mammal, LOA Holder 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, LOA Holder 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 (e.g., 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). LOA Holder 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. LOA Holder may not resume their activities until notified by NMFS Office of Protected Resources; and

(16) LOA Holder must report any lost gear associated with the fishery surveys to the NMFS GARFO Protected Resources Division (nmfs.gar.incidental-take@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.

§ 217.286 Letter of Authorization.

(a) To incidentally take marine mammals pursuant to this subpart, LOA Holder must apply for and obtain an LOA;

(b) An LOA, unless suspended or revoked, may be effective for a period of time not to exceed February 21, 2029, the expiration date of this subpart;

(c) In the event of projected changes to the activity or to mitigation and monitoring measures required by an LOA, LOA Holder must apply for and obtain a modification of the LOA as described in § 217.287;

(d) The LOA must set forth:

(1) Permissible methods of incidental taking;

(2) Means of effecting the least practicable adverse impact (i.e., mitigation) on the species, its habitat, and on the availability of the species for subsistence uses; and

(3) Requirements for monitoring and reporting;

(e) Issuance of the LOA must be based on a determination that the level of taking must be consistent with the findings made for the total taking allowable under the regulations of this subpart; and

(f) Notice of issuance or denial of an LOA must be published in the **Federal Register** within 30 days of a determination.

§ 217.287 Modifications of Letter of Authorization.

(a) An LOA issued under §§ 217.282 and 217.286 or this section for the activity identified in § 217.280(a) shall be modified upon request by LOA Holder, provided that:

(1) The specified activity and mitigation, monitoring, and reporting measures, as well as the anticipated impacts, are the same as those described and analyzed for this subpart (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section); and

(2) NMFS Office of Protected Resources determines that the mitigation, monitoring, and reporting measures required by the previous LOA under this subpart were implemented.

(b) For a LOA modification request by the applicant that includes changes to the activity or the mitigation, monitoring, or reporting (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section), the LOA shall be modified, 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 more than a minor change in the total estimated number of takes (or distribution by species or years); and

(2) NMFS Office of Protected Resources may, if appropriate, publish a notice of proposed modified LOA in the **Federal Register**, including the associated analysis of the change, and

solicit public comment before issuing the LOA.

(c) An LOA issued under §§ 217.282 and 217.286 or this section for the activities identified in § 217.280(a) may be modified by NMFS Office of Protected Resources under the following circumstances:

(1) Through adaptive management, NMFS Office of Protected Resources may modify (*e.g.*, delete, modify, or add to) the existing mitigation, monitoring, or reporting measures after consulting with LOA Holder regarding the practicability of the modifications, if doing so creates a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring.

(i) 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:

(A) Results from LOA Holder's monitoring(s);

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

(C) 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.

(ii) If, through adaptive management, 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.

(2) If NMFS Office of Protected Resources determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals specified in the LOA issued pursuant to §§ 217.282 and 217.286 or this section, an 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.

§§ 217.288–217.289 [Reserved]

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