Vineyard Wind Offshore Wind Energy Project Biological Assessment Supplement

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For the National Marine Fisheries Service

U.S. Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
ALWTRP	Atlantic Large Whale Take Reduction Plan
ASV	autonomous surface vehicle
BA	Biological Assessment
BACI	Before After Control Impact Study
BOEM	Bureau of Ocean Energy Management
CI	confidence interval
COP	Construction and Operations Plan
dB	decibel
DPS	distinct population segment
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
HRG	high-resolution geophysical
Hz	hertz
IHA	Incidental Harassment Authorization
ITS	Incidental Take Statement
MADMF	Massachusetts Division of Marine Fisheries
MMPA	Marine Mammal Protection Act
NA	not applicable
NARW	North Atlantic right whale
NE	no effect
NEAMAP	Northeast Area Monitoring and Assessment Program
NEFSC	Northeast Fisheries Science Center
NLAA	not likely to adversely affect
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PAM	passive acoustic monitoring
PSO	Protected Species Observer
PTS	permanent threshold shift
ROD	Record of Decision
SMAST	University of Massachusetts Dartmouth School for Marine Science and Technology
TTS	temporary threshold shift
Vineyard Wind	Vineyard Wind LLC
WDA	Wind Development Area
WTG	wind turbine generators

1. INTRODUCTION

On September 11, 2020, the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) completed formal consultation under Section 7(a)(2) of the Endangered Species Act (ESA) with the Bureau of Ocean Energy Management (BOEM) as the lead Federal agency on the effects of the construction, operations, maintenance, and eventual decommissioning of the Vineyard Wind 1 Offshore Wind Project (Project; Lease OCS-A 0501) on ESA-listed marine mammals, sea turtles, fish, and designated critical habitat that occur in the Action Area. On 28 January 28, 2019, Vineyard Wind submitted a revised application for an incidental harassment authorization (IHA) to take marine mammals incidental to the construction of the Project. Neither Vineyard Wind, BOEM, nor the NMFS expects serious injury or mortality to result from the Proposed Action and NMFS determined that an IHA is appropriate. A complete description of the Action Area, species addressed, the Proposed Action, and effects determinations are provided in BOEM Biological Assessment (BA; BOEM 2019) and the associated NMFS Biological Opinion (Opinion; NMFS 2020) and summarized below. This supplemental BA describes the proposed post-construction monitoring and surveys associated with the Project that were not fully addressed in the BA or the subsequent Opinion. In addition, additional information regarding the status of the North Atlantic right whale (NARW; *Eubalaena glacialis*) has become available since the publication of the BA (BOEM 2019) and subsequent Opinion (NMFS 2020). This supplemental BA also includes a discussion of the NARW population status.

2. CONSULTATION HISTORY

The September 11, 2020 Opinion (NMFS 2020) concluded that the Proposed Action and any effects of interrelated and interdependent actions, and cumulative effects, is not likely to jeopardize the continued existence of fin (*Balaenoptera physalus*), sei (*Balaenoptera borealis borealis*), sperm (*Physeter macrocephalus*), or North Atlantic right whales or the Northwest Atlantic Distinct Population Segment (DPS) of loggerhead (*Caretta caretta*), North Atlantic DPS of green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), or leatherback (*Dermochelys coriacea*) sea turtles. NMFS also determined that the Proposed Action is not likely to adversely affect blue whales (*Balaenoptera musculus*), shortnose sturgeon (*Acipenser brevirostrum*), giant manta ray (*Manta birostris*), hawksbill sea turtles (*Eretmochelys imbricata*), Gulf of Maine DPS of Atlantic salmon (*Salmo salar*), oceanic white tip shark (*Carcharhinus longimanus*), the Northeast Atlantic DPS of loggerhead sea turtles, or any DPS of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). As such, the construction, operation, maintenance, and eventual decommissioning of the proposed Vineyard Wind 1 Project is not likely to jeopardize the continued existence of these species. The Opinion also concluded that there would be no effects on any critical habitat designated for listed species or other listed species considered for consultation, but discounted for the potential of any adverse effects occurring.

The Opinion found that pile driving activities associated with the Proposed Action is likely to adversely affect sea turtles during pile driving and cause temporary and permanent threshold

shift (PTS), behavioral response, and stress, but no serious injury or mortality. Exposure to other project-related noise would have insignificant effects or would otherwise be extremely unlikely to occur (NMFS 2020). NMFS expects that project vessels are likely to adversely affect sea turtles by vessel strike during the course of project construction, operation, and decommissioning.

The Opinion found that pile driving activities are likely to adversely affect ESA-listed marine mammals by temporary threshold shift (TTS), behavior response, and stress of NARW, fin, sei, and sperm whales (NMFS 2020). Exposure to all other project related noise would be insignificant or extremely unlikely to occur (NMFS 2020). Finally, with the implementation of vessel strike risk reduction measures, strike of a listed whale by a project vessel is extremely unlikely to occur and considered to be discountable.

An Incidental Take Statement (ITS) for the above effects of the Proposed Action was provided in the Opinion, along with non-discretionary Reasonable and Prudent Measures and implementing terms and conditions to minimize the impacts of the incidental take. As described in the ITS, NMFS calculated that no more than 18 leatherback, 17 Northwest Atlantic DPS loggerhead, 2 North Atlantic DPS green, and 2 Kemp's ridley sea turtles will be struck and killed during the course of the Proposed Action. Additionally, NMFS calculated the number of whales and sea turtles that are likely to be injured or harassed due to exposure to pile driving noise, based on the maximum-case scenario (i.e., that would result in the maximum amount of take; one pile per day, 6 dB attenuation, 90 monopile foundations, 12 jacket foundations). Table 1 outlines the anticipated level of take that is expected to occur as a result of exposure to pile driving noise under the maximum-case scenario.

Table 1. Take of marine mammals and sea turtles due to pile driving noise under the maximum-case scenario (90 monopile foundations, 12 jacket foundations, one pile per day, 6 dB attenuation).

Species	Harassment (TTS/Behavior)	Injury (PTS)
North Atlantic right whale	20	NA
fin whale	34	5
sperm whale	5	NA
sei whale	4	2
NWA DPS loggerhead sea turtle	3	NA
NA DPS green sea turtle	1	NA
Kemp's ridley sea turtle	1	NA
leatherback sea turtle	7	NA

NWA DPS – Northwest Atlantic Distinct Population Segment
NA DPS – North Atlantic Distinct Population Segment
NA – none anticipated

3. CURRENT STATUS OF THE NORTH ATLANTIC RIGHT WHALE

The annual NARW Report Card for 2020 was published in January 2021 (Pettis et al. 2021) following completion of consultation and issuance of the Opinion on Vineyard Wind 1 Project. The overall reduction in population size in the latest NARW Report Card ranges in an upper and lower limit of four animals between 2020 (343 to 727 animals) and 2021 (339 to 723 animals). The NARW abundance is provided as a range, with the middle estimate considered to be the "best estimate," bounded by lower and higher estimates. The best estimate of NARW abundance, as defined in Pettis et al. (2021) is 468 individuals. Although the Final Environmental Impact Statement (FEIS), BA, and Opinion did not specifically incorporate the latest NARW Report Card information, the FEIS and NOAA's draft Marine Mammal Protection Action (MMPA) IHA already consider updated NARW density information that was used to update exposure modeling in Fall 2020. In addition to updated population estimates provided in Pettis et al. (2021), additional modeled NARW densities in the wind development area (WDA) have become available since publication of the BA and subsequent Opinion. As discussed in Appendix F of the Vineyard Wind 1 Project FEIS, to estimate marine mammal densities in the Action Area (animals per square kilometers) for exposure modeling, Pyć et al. (2018) used the Duke University Marine Geospatial Ecological Laboratory model results (Roberts et al. 2016a) and an unpublished updated model for NARW densities (Roberts et al. 2016b) that incorporates more sighting data, including those from the Atlantic Marine Assessment Program for Protected Species (2010 to 2014). In 2020, the Duke University Marine Geospatial Ecological Laboratory published updated density models for NARWs in the project area (Roberts et al. 2020) that incorporated additional sighting data in the Rhode Island and Massachusetts Lease Areas spanning 2011–2015 and 2017–2018 (Kraus et al. 2016; Quintana et al. 2018), which represents the best available seasonal density information regarding the potential presence of NARW in the Action Area during Project construction. The recent Roberts et al. (2020) data show higher densities during the time of year when no pile driving would occur (January 1 through April 30) and lower densities when pile driving activities are planned (May 1 through December 31). From a modeling perspective, incorporating the reduced NARW Report Card numbers and new density information in the project area slightly reduces the number of expected exposures from pile driving, but does not appreciably change any of the impact analysis or conclusions reached for NARWs. Notably, impacts do not increase in numbers or magnitude.

The new information in the Report Card was discussed with NOAA, and it was determined that no additional measures above those already developed were warranted. The Report Card information does not change the conclusions already made for NARWs in the Opinion. It is noted that the Report Card is a report completed by the North Atlantic Right Whale Consortium and does not represent an official marine mammal stock assessment used by the U.S. Government. Although NMFS may consider the Report Card information in their next Marine Mammal Stock Assessment Report, the Report Card does not represent the annual population assessment for endangered NARWs completed by NMFS under the MMPA, which is considered to be the best available science for marine mammals stocks in the U.S.

BOEM further considered the effects of climate change driving distribution changes, including NARWs potentially occurring in the Action Area year-round, but NARWs are still likely to be

most abundant during the prohibited pile driving period between January 1-April 30, and increase in abundance during the enhanced mitigation periods identified in the Opinion. The new information for NARWs does not change the analysis nor conclusions reached for NARWs in the Opinion. BOEM's supplemental analysis concludes that the new Report Card information does not meet any of the re-initiation triggers under (50 CFR § 402.16 (a)) that warrant re-initiation of consultation on the existing Opinion. In addition to this new information for NARWs, BOEM further considers the effects of the newly proposed monitoring plans on the potential to adversely affect NARWs and other listed species below.

The Vineyard Wind 1 Project FEIS (see Appendix D), the BA (BOEM 2019), and the Opinion (NMFS 2020) describe a number of measures that will reduce the potential for exposure of NARW to pile driving noise (seasonal pile driving restrictions and enhanced clearance zones in May, November, and December, etc.) and other impacts (use of Protected Species Observers (PSOs), vessel speed restrictions, etc.) that would be triggered when a NARW is sighted or when NOAA designates Slow Zones for NARW. Given these measures, NMFS determined that no physical or auditory injury is expected to occur as a result of construction, operation, maintenance, or eventual decommissioning of the proposed Vineyard Wind 1 Project (NMFS 2020). However, NMFS (2020) expects with implementation of the measures to minimize the effects of exposure to pile driving noise, up to 20 NARW may experience behavioral disturbance, physiological stress, and TTS during the construction period. These effects are expected to be temporary and be resolved within hours, as discussed in the Opinion (NMFS 2020).

The primary behavioral state expected to be impacted in the WDA during the construction period is presumed to be migration, though additional behaviors such as opportunistic resting and foraging may occur. Based upon the best available information, whales are expected to resume normal behaviors quickly once the harassing levels of noise stop. Given that a single pile driving event will take no more than three hours, any exposed NARW(s) would be expected to resume normal behaviors in three hours, or less (NMFS 2020). While there is likely some energetic cost due to avoidance behavior as well as temporary loss of habitat, these disruptions are not expected to affect an individual's capacity to successfully forage, migrate, or participate in future breeding (Southall et al. 2007, NMFS 2020).

As summarized in the Opinion, no serious injury or mortality of NARW is expected. Additionally, no fitness consequences, or subsequent effects on reproductive success are anticipated (NMFS 2020). Given the short-term (3 hours at a time) and intermittent (occurring on 57 to 102 days) nature of impacts associated with pile driving, any effects to the distribution of NARW will be limited to short-term alterations of normal movement patterns and no overall changes to the current distribution of NARW in the Action Area, or throughout their range, is anticipated (NMFS 2020). These conclusions are not expected to change in light of the above described additional information.

4. PROPOSED ACTION

As part of the Proposed Action discussed in the BA and subsequent Opinion and considered by BOEM in the National Environmental Policy Act assessment, there are several monitoring and survey measures that were included to monitor, minimize, and mitigate adverse impacts on environmental resources. It was recently brought to BOEM's attention that in light of recent proposed rulemaking by NMFS for the Atlantic Large Whale Take Reduction Plan (ALWTRP; 85 FR 86878, December 31, 2020), the effects of these monitoring and survey measures should be explicitly analyzed for impacts to ESA-listed species in the BA, particularly fishery monitoring methods. BOEM subsequently decided to review all monitoring requirements to ensure that they are analyzed for potential impacts as part of Proposed Action. As described in Appendix D of the Vineyard Wind 1 Project FEIS and outlined in Table 2 below, these monitoring/survey measures are expected to be required by BOEM as conditions of Construction and Operations Plan (COP) approval. All fishery surveys are anticipated to occur up to six years following issuance of the Record of Decision (ROD): and include up to two years pre-construction, 1 year during construction, and up to three years post construction, as described below. Other monitoring activities described may occur periodically over the operational life of the project.

Table 2. Monitoring and survey measures expected to be required by BOEM and potential impacts to ESA-listed species.

Mitigation #	Mitigation Measure	Impact to ESA-listed species
13	Benthic Monitoring Plan	vessel noise / vessel strike
17	bottom profiling	vessel noise / vessel strike
18	post-installation cable monitoring	vessel noise / vessel strike
19	benthic invertebrate optical sampling	vessel noise / vessel strike
20	scour protection monitoring	vessel noise / vessel strike
22	plankton surveys	vessel noise / vessel strike
23	PAM	vessel noise / vessel strike
24	underwater debris surveys	vessel noise / vessel strike
25	finfish and squid trawl surveys	vessel noise / vessel strike / entanglement
26	ventless trap surveys	vessel noise / vessel strike / entanglement /entrapment

4.1. BENTHIC MONITORING PLAN

As discussed in the COP, Volume III, Appendix D, Vineyard Wind is proposing to conduct benthic monitoring to document the disturbance and recovery of marine benthic habitat and communities resulting from the construction and installation of Project components (Epsilon 2020); including wind turbine generator (WTG) scour protection, as well as the inter-array cabling and the offshore export cable corridor from the WDA to shore. The proposed plan will focus on seafloor habitat and benthic communities and make comparisons to areas unaffected by construction of the proposed Project. Proposed survey equipment and methods include the use of a grab sampler, a multibeam depth sounder, and underwater video. As described in the

Benthic Monitoring Plan, surveys will occur based upon the project construction schedule, but will occur at roughly the same time of year in years, 1, 3, and if necessary, year 5 post-construction. In addition to general benthic sampling, an additional 10 monitoring sites will be surveyed for sand lance using night-time benthic grabs. All survey years may not be completed if benthic community appear to have recovered and all stakeholders agree that monitoring may cease.

4.2. BOTTOM PROFILING

Per the Nantucket Order of Conditions (Nantucket Conservation Commission 2019), prior to cable installation in Town of Nantucket waters, Vineyard Wind shall provide updated bottom profiling detailing pre-construction bottom composition, sediment profiles, species composition, and topography of the area to be disturbed during cable installation, and shall include at a minimum high-resolution video monitoring.

4.3. POST-CONSTRUCTION CABLE MONITORING

In Federal waters, inter-array and export cable inspections will occur within 6 months following commissioning. Subsequent inspections will occur on years 1, 2, and every 3 years afterward. Additionally, cable inspection will occur after a major storm event as defined in Appendix D of the FEIS. The inspection is expected to include high resolution geophysical (HRG) methods to identify seabed features, man-made and natural hazards, and site conditions along Federal sections of the cable routing. The HRG surveys would use only electromechanical sources such as boomer, sparker, and chirp sub-bottom profilers, side-scan sonar, and multibeam depth sounders.

4.4. UNDERWATER DEBRIS SURVEYS

Periodic surveys using remotely operated vehicles, divers, or other means will be conducted to monitor indirect associated lost recreational fishing gear around WTG foundations. Surveys will inform frequency and locations of debris removal to decrease ingestion by and entanglement of marine species.

4.5. BENTHIC INVERTEBRATE OPTICAL SAMPLING

In collaboration with the University of Massachusetts Dartmouth School for Marine Science and Technology (SMAST), Vineyard Wind will conduct up to 3 years pre/during construction and 3 years post-construction drop camera surveys to examine the macroinvertebrate community and substrate habitat in the Vineyard Wind 1 WDA. The surveys will identify the distribution and abundance of the dominant benthic megafauna classify the substrate, and compare the benthic communities and substrate types between the WDA, a control area, and the broader region of the US Continental Shelf (SMAST 2020a). Surveys will be conducted in and near the Vineyard Wind WDA, with survey stations placed in a systematic grid design. A drop camera pyramid will be deployed four times at each pre-determined sampling station. The pyramid will be equipped with two downward-looking cameras, providing 2.3 m^2 and 2.5 m^2 quadrat samples of the seafloor for all stations. Following image collection, the pyramid will be raised, and the

vessel allowed to drift 50 meters and the pyramid will be lowered to the seafloor again (SMAST 2020a). This will be repeated for a total of four camera images at each station. Images will be reviewed within each quadrat for 50 taxa of epibenthic invertebrates (see Stokesbury and Harris 2006 for a complete list) will be counted or noted as present and the substrate will be identified. Survey methods were developed collaboratively with scallop fisherman and apply quadrat sampling methods based upon diving studies (Stokesbury and Himmelman 1993, 1995). A percent similarity index will be used to measure the similarity of benthic communities and substrates between the Vineyard Wind 1 WDA, control area, and the broader regions of the US Continental Shelf.

4.6. SCOUR PROTECTION MONITORING

In addition to post-construction monitoring of benthic habitat as described under the Benthic Monitoring Plan, Vineyard Wind must also inspect scour protection performance at 20 percent of WTG foundations every 3 years, starting in year 3 post-construction.

4.7. PAM

Moored Passive Acoustic Monitoring (PAM) systems or autonomous PAM platforms such as gliders or autonomous surface vehicles will be used periodically over the lifetime of the project. PAM will be used to record ambient noise and marine mammal vocalizations in the lease area before, during, and after (up to three years of operations) to monitor project impacts relating to vessel noise, pile driving noise, WTG operational noise, and to document whale detections in the WDA. In addition to specific requirements for Before After Control Impact Study (BACI) monitoring surrounding the construction period, periodic PAM deployments may occur periodically over the life of the project for other scientific monitoring needs.

4.8. FINFISH AND SQUID TRAWL SURVEYS

In collaboration with the University of Massachusetts Dartmouth SMAST, Vineyard Wind will conduct up to six years of post-ROD trawl surveys (3 years pre/during construction and three years post-construction) to assess the finfish community in the Vineyard Wind WDA and adjacent control area. The surveys will be adapted to Northeast Area Monitoring and Assessment Program (NEAMAP) protocols. A minimum of 20 tows will be conducted in the Vineyard Wind 1 WDA and an additional 20 tows will occur in the control area (SMAST 2020b). The 20 tows in the WDA will yield a sampling density of 1 station per 18.5 km^2. A systematic random sampling design will be used to ensure adequate spatial coverage of the WDA and control area. Tows will be conducted four times per year (spring, summer, fall, and winter) during daylight hours (after sunrise and before sunset) for 20 minutes each with a target speed of 3 knots (SMAST 2020b). Tows will be completed using a 400 x 12 centimeters (cm), three-bridle four-seam bottom trawl with a 12 cm cod end with a 2.54 cm knotless liner that is identical to those used in NEAMAP surveys. The net will also be paired with a three inch cookie-sweep and a set of Thyboron Type IV 66 inch doors (SMAST 2020b).

4.9. VENTLESS TRAP SURVEYS

In collaboration with the University of Massachusetts Dartmouth SMAST, Vineyard Wind will conduct ventless trap surveys to assess the American lobster (*Homarus americanus*), Jonah crab (*Cancer borealis*), and black sea bass (*Centropristis striata)* resources in the Vineyard Wind 1 WDA and control sites adjacent to the WDA and to evaluate the differences between pre (2 years)-, during (1 year), and post-construction (3 years) survey results (SMAST 2020c). A total of 30 sampling stations will be selected and split evenly between the Vineyard Wind WDA and the control area. The strings in each area will use standardized protocols demonstrated in previous SMAST, Massachusetts Division of Marine Fisheries (MADMF), and coast wide ventless trap surveys (ASFMC 2015, Courchene and Stokesburry 2011). Each station will consist of a total of 6 pots, alternating between vented and ventless. The surveys will use standardized 40" x 21" x 16" traps and contain a single kitchen, parlor, and a rectangular $1^{15}/_{16}$" x $5^{3}/_{4}$" vent in the parlor of vented traps (SMAST 2020c). Each sampling station/string will use two vertical lines marking each end of the string for a total 60 marking buoys. Trap deployment, maintenance, and hauling will be conducted between May 15 and October 31 by commercial lobstermen under the guidance of a SMAST researcher. To the greatest extent possible, gear will be hauled on a three-day soak time to standardize catchability among trips (SMAST 2020c). To assess the black sea bass population, one un-baited fish pot will be deployed adjacent to each lobster string and allowed to naturally saturate over the soaking period. All gear used will be consistent with Federal rigging regulations and use a 600 lb breakaway swivel and 1,700 lb breakaway sinking ropes. As new technologies advance, Vineyard Wind will explore options for incorporation into future survey protocols.

4.10. PLANKTON SURVEYS

Plankton sampling will occur concurrent with the ventless trap surveys. The plankton surveys will determine the relative abundance and distribution of the larvae of commercially fished crustaceans. Results from this monitoring will provide data for a BACI study in the Vineyard Wind 1 WDA. The surveys will use a towed neuston net and sample the top 0.5 meters of the water column (SMAST 2020c). At each ventless trap survey station, one ten-minute tow will be conducted at a target of four knots to assess pre-settlement and abundance of plankton resources in the Vineyard Wind WDA and the adjacent control area. The 2.4 x 0.6 x 6 meter sampling net made with 1320 microfiber mesh will be deployed off the stern of commercial fishing vessels from May to October on days set aside for baiting and setting gear for the ventless trap surveys described above (SMAST 2020c).

5. EFFECTS OF THE PROPOSED ACTION ON ESA-LISTED SPECIES

5.1. MARINE MAMMALS

Much of the potential impacts to ESA-listed marine mammal species arising from the above described post-ROD surveys are related to increased vessel traffic, and the associated underwater vessel noise and potential for vessel strikes, required to conduct the above described monitoring. Additional impacts to marine mammals may occur as a result of fishing gear associated with

ventless trap surveys and the use of PAM technologies. No impacts are expected to occur from bottom trawl survey gears.

5.1.1. Vessel Noise

As discussed in the Opinion, the frequency for vessel noise overlaps with the hearing range of fin, NARW, sei, and sperm whales and would be audible to these species (NMFS 2020). As discussed in the Opinion, vessel noise associated with project vessels is below the thresholds that could cause injury, and as such, no injury is expected to occur. While vessel noise may have some effect on marine mammal behavior, it would be expected to be limited to temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes (Erbe et al. 2018; Erbe et al. 2019; Nowacek et al. 2007). Studies indicate noise from shipping increases stress hormone levels in NARWs (Rolland et al. 2012), and modeling suggests that their communication space has been reduced substantially by anthropogenic noise (Hatch et al. 2012). The authors also suggest that physiological stress may contribute to suppressed immunity and reduced reproductive rates and fecundity in NARWs (Hatch et al. 2012; Rolland et al. 2012). Similar impacts could occur for other marine mammal species. Other behavioral responses to vessel noise could include animals avoiding the ensonified area, which may have been used as a forage, migratory, or socializing area. Results from studies on acoustic impacts from vessel noise on odontocetes indicate that small vessels at a speed of 5 knots in shallow coastal water can reduce the communication range for common bottlenose dolphins within 164 feet (50 m) of the vessel by 26 percent (Jensen et al. 2009). Pilot whales in a quieter, deep-water habitat could experience a 50 percent reduction in communication range from a similar size boat and speed (Jensen et al. 2009). Since lower frequencies propagate farther away from the sound source compared to higher frequencies, low-frequency cetaceans are at a greater risk of exposure to noise from vessel traffic due to the frequencies associated with vessel traffic. This increased vessel traffic during post-ROD monitoring, and associated noise impacts, could result in repeated localized, intermittent, short-term, impacts on marine mammals and result in brief behavioral responses that would be expected to dissipate once the vessel or the individual has left the area. These short-term and temporary responses are unlikely to be significant (Navy 2018). BOEM expects that these brief responses of individuals to passing vessels would be infrequent given the patchy distribution of marine mammals and the limited number of vessel trips that would occur as a result of the proposed monitoring efforts. Additionally, as discussed in the NMFS Opinion, ESA-listed marine mammals are expected to either not respond to vessel noise, or not likely to measurable respond in a way that would disrupt normal breeding, feeding, or sheltering behaviors. Thus, effects from vessel noise, if any, would be insignificant (NMFS 2020).

5.1.2. HRG Survey Noise

In addition to vessel noise, underwater noise associated with HRG bathymetric survey equipment has some potential to result in impacts to marine mammals during post-installation cable inspections and surveys prescribed in the Benthic Monitoring Plan. BOEM and NMFS believe that Level A Harassment from HRG surveys is unlikely given the PTS distances (26 meters for right, fin and sei whales and 1 meter for sperm whales) and the brief duration of the acoustic

impacts (NMFS 2020). While Level B harassment may potentially occur as a result of HRG surveys, implementation of mitigation and monitoring measures, as described Appendix D of the FEIS, would be expected to reduce the likely impacts, if any, to negligible levels. If a whale is sighted within the 500 meter exclusion zone, HRG sound sources would be powered down, and as such no whales would be expected to be exposed to disturbing levels of sound during surveys. If a whale did get closer than 500 meters, exposure is expected to be short (no more than a few seconds to a few minutes), and the response is expected to be limited to course changes and the individual swimming away from the sound (NMFS 2020). Additionally, no animals would be exposed to the noise source more than once and individuals are expected to fully recover following the brief exposure to sounds associated with HRG surveys. As such, behavior responses, if any, would be so small that they would not be meaningfully detected, measured, or evaluated, and therefore, would be insignificant (NMFS 2020).

5.1.3. Vessel Strike

Vessel strike is relatively common with cetaceans (Kraus et al. 2005) and one of the primary causes of death to NARWs with as many as 75 percent of known anthropogenic mortalities of NARWs likely resulting from collisions with large ships along the U.S. and Canadian eastern seaboard (Kite-Powell et al. 2007). Further, recent evidence suggests that the proportion of NARW mortality attributed to fishing gear entanglement and overall mortality is likely higher than previously estimated (Pace et al. 2021). Marine mammals are more vulnerable to vessel strike when they are within the draft of the vessel and when they are beneath the surface and not detectable by visual observers. Some conditions that make marine mammals less detectable include weather conditions with poor visibility (e.g., fog, rain, and wave height) or nighttime operations. Vessels operating at speeds exceeding 10 knots have been associated with the highest risk for vessel strikes of NARWs (Vanderlaan and Taggart 2007). Reported vessel collisions with whales show that serious injury rarely occurs at speeds below 10 knots (Laist et al. 2001). Data show that the probability of a vessel strike increases with the velocity of a vessel (Pace and Silber 2005; Vanderlaan and Taggart 2007). As discussed in the Opinion, NMFS expects that despite the increase in vessel traffic associated with Project activities, required mitigation measures discussed in Appendix D of the FEIS, including PSOs and vessel speed restrictions, make it extremely unlikely that a Project vessel will strike a marine mammal. Given that the increase in vessel traffic associated with the above described monitoring would be very small compared with the baseline and vessel traffic associated with project construction no vessel strikes would be expected as a result of the above described monitoring.

5.1.4. Trawl Surveys

The NMFS opinion on the Continued Prosecution of Fisheries and Ecosystem Research Conducted and Funded by the Northeast Fisheries Science Center and associated Issuance of a Letter of Authorization under the MMPA for the Incidental Take of Marine Mammals pursuant to those Research Activities (dated June 23, 2016), concluded that impacts to North Atlantic right, humpback, fin, sei, and blue whales if any, as a result of trawl gear use would be expected to be discountable. These large whale species have the speed and maneuverability to avoid

oncoming mobile gear (NMFS 2016). The slow speed of mobile gear and the short tow times further reduce the potential for entanglements or other interactions. Observations during mobile gear use has shown that entanglement or capture of large whale species is extremely rare and unlikely (NMFS 2016). Although the trawl methods analyzed in commercial fisheries are comparable to the fishery monitoring methods proposed, the proposed trawl effort and tow times (20 minutes) for the proposed post-ROD surveys are less than that previously considered by NMFS for commercial trawling activities. Consequently, the likelihood of interactions with listed species of marine mammals is lower than commercial fishing activities. Based on the above analysis, there is a discountable likelihood of any potential impacts to occur, and the trawl surveys may affect, but are not likely to adversely affect listed species of marine mammals.

5.1.5. Ventless trap surveys

Of all the above described surveys, ventless trap surveys have the greatest potential to result in adverse impacts to marine mammals. The Draft Environmental Impact Statement, Regulatory Impact Review, and initial Regulatory Flexibility Analysis for Amending the Atlantic Large Whale Take Reduction Plan: Risk Reduction Rule (ALWTRP DEIS; NOAA 2020), provides an analysis of data that shows entanglement in commercial fisheries gear represents the highest proportion of all documented serious and non-serious incidents reported for humpback, North Atlantic right, fin, and minke whales. Entanglement was the leading cause of serious injury and mortality for North Atlantic right, humpback, fin, and minke whale from 2010 to 2018 for cases where the cause of death could be identified (NOAA 2020). ALWTRP was last amended in 2015 and includes a combination of seasonal area closures and fishing gear modifications that are intended to reduce the risk of serious injury or mortality as a result of entanglement in commercial fishing gear. One required component of the ALWTRP have been the use of weak links for trap/pot fisheries in some areas (NOAA 2020). The requirements have been modified over time to include more areas and to lower breaking strengths (see Borggaard et al. 2017). As discussed in the ALWTRP, it is believed that the weak links allow the buoy to break away and the rope to pull though the baleen if an entanglement occurs, though it is difficult to assess how well the weak link reduces serious injury and mortality (NOAA 2020). Another recommended risk reduction measure proposed is the use of weak rope or weak insertions. Based upon Knowlton et al. 2016, it is assumed that weak rope (engineered to break at 1,700 lb or less) would allow whales to break free from the ropes and avoid a life-threatening entanglement (NOAA 2020). As discussed above, post-ROD ventless trap surveys would employ the use of both weak link and weak rope technologies that are consistent with the proposed changes in the ALWTRP. As such, impacts to marine mammals are expected to be insignificant and discountable based upon the limited number of associated buoy lines and the implementation of NOAA required risk reduction measures.

5.1.6. PAM

The use of PAM buoys or autonomous PAM devices to monitor noise and marine mammals, and the use of sound attenuation devices placed on the seafloor for mitigation during pile driving have been the subject of previous consultation. The use of sound attenuation devices and PAM

for mitigation and monitoring were considered as part of the proposed action for the proposed issuance of a NMFS IHA for the Vineyard Wind 1 Project (see 84 FR 18346 2019) under the MMPA. NMFS expects the proposed mitigation and monitoring measures to use PAM and sound attenuation devices, which will minimize the severity of anticipated harassment. According to NMFS, no mortality is anticipated or proposed to be authorized for this activity. Additionally, no take by harassment was expected for the sound attenuation or PAM devices to be used as mitigation practices during pile driving activities. Although the additional post-construction monitoring with PAM, as outlined in Appendix D of the FEIS, will fall outside of the IHA period and wasn't explicitly identified in the Opinion as part of the proposed action, the PAM monitoring technologies are similar to those proposed for mitigation purposes during construction and are not expected to adversely affect any listed species.

Moored and autonomous PAM systems that may be used for monitoring will either be stationary (e.g., moored) or mobile (e.g., gliders or autonomous surface vehicles). Moored PAM systems will use the best available technology to reduce any potential risks of entanglement. As detailed in BOEM's BA on data collection activities (BOEM 2021), the Lessee must ensure that any buoys attached to the seafloor use buoys, lines (chains, cables, or coated rope systems), swivels, shackles, and anchor designs that prevent any potential entanglement of listed species while ensuring the safety and integrity of the structure or device. All mooring lines and ancillary attachment lines must use one or more of the following measures to reduce entanglement risk: shortest practicable line length, rubber sleeves, weak-links, chains, cables or similar equipment types that prevent lines from looping, wrapping, or entrapping protected species. Any equipment must be attached by a line within a rubber sleeve for rigidity. The length of the line must be as short as necessary to meet its intended purpose. All buoys must be properly labeled with Lessee and contact information. The use of buoys for moored PAM systems, or any other intended purposes, will pose a discountable risk of entanglement to listed marine mammals.

Autonomous surface vehicles (ASVs) could have hydrophone equipment attached that operate autonomously in a defined area. ASVs in very shallow water can be operated remotely from a vessel or line of sight from shore by an operator and in an unmanned mode. ASVs are typically lightweight, very small vessels and travel at slow speeds (see https://greentownlabs.com/offshore-wind-challenge-cohort-highlights-their-work-with-vineyard-wind-commitment-to-advancing-the-industry/). ASVs produce virtually no self-noise and pose a discountable risk of vessels strike due to their extreme light weight and small size. It is not anticipated that ASVs pose any reasonable risk of entanglement or harm to listed species and any potential impacts are expected to be discountable.

5.2. SEA TURTLES

Much of the potential impacts to ESA-listed sea turtles species arising from the above described post-ROD surveys are related to increased vessel traffic, and the associated underwater vessel noise and potential for vessel strikes, required to conduct the above described monitoring. Additional impacts to sea turtles could result from HRG, trawl, and ventless trap surveys, as well as the use of PAM technologies.

5.2.1. Vessel Noise

The frequency range for vessel noise (10 to 1,000 Hz; MMS 2007) overlaps with sea turtles' most sensitive hearing range (less than 1,000 Hz with maximum sensitivity between 200 to 700 Hz; Bartol 1994) and would, therefore, be audible. However, Hazel et al. (2007) suggest that sea turtles' ability to detect approaching vessels is primarily vision-dependent, not acoustic. Sea turtles may respond to vessel approach and/or noise with a startle response (diving or swimming away) and a temporary stress response (NSF and USGS 2011). Samuel et al. (2005) indicated that vessel noise can have an effect on sea turtle behavior, especially their submergence patterns. BOEM anticipates that the potential effects of noise from survey vessels would elicit brief responses to the passing vessel that would dissipate once the vessel or the turtle left the area. As discussed in the Opinion, sea turtles may habituate to vessel noise and typically only appear to elicit avoidance responses at approximately 10 meters or less (Hazel et al. 2007, NMFS 2020). However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of sea turtles and the use of PSOs and clearance zones for sea turtles on all Project vessels, as describe in Appendix D of the FEIS. For these reasons, vessel noise is expected to cause minimal disturbance to sea turtles, and responses if any, would be temporary and insignificant, with individuals returning to normal behaviors and stress levels once the vessel has passed (NMFS 2020).

5.2.2. HRG Survey Noise

In addition to vessel noise, underwater noise associated with HRG bathymetric survey equipment has some potential to result in impacts to sea turtles during post-installation cable inspections and surveys prescribed in the Benthic Monitoring Plan. The HRG surveys would use only electromechanical sources such as boomer, sparker, and chirp sub-bottom profilers; side-scan sonar; and multi-beam depth sounders. Acoustic signals from electromechanical sources other than the boomer and sparker are not likely to be detectable by sea turtles. Boomers and sparkers used in the offshore wind industry have an operating frequency range of 0.05-6.2 kHz (BOEM 2021) and could be audible to sea turtles; however, but have very short pulse lengths (.0006 to .0095 seconds) and very low source levels (Crocker et al. 2016). Consequently, BOEM assessed the risk to sea turtles from HRG survey equipment and determined there is no risk of PTS impacts to sea turtles (BOEM 2021). As such, BOEM has concluded that injury will not occur to sea turtles as a result of HRG survey equipment. While there is some potential for disturbance and behavioral avoidance up to 90 meters around sparkers, no biologically significant impacts would be expected given the very small ensonified area and the very short duration of exposures (BOEM 2021, NMFS 2020). As such, effects to migrating, foraging, or resting sea turtles, if any, would be expected to be insignificant and discountable.

5.2.3. Vessel Strike

Sea turtles are vulnerable to vessel collisions as they regularly surface to breathe and often rest at or near the ocean surface (NMFS 2020). Sea turtles are likely to be most susceptible to vessel collision in coastal waters, where they forage from May through November. Vessel speed may exceed 10 knots in such waters, and those vessels traveling at greater than 10 knots would pose

the greatest threat to sea turtles (Hazel et al. 2007). As discussed in Hazel et al. (2007) sea turtles may become habituated to vessel noise and respond to the sight of a vessel as opposed to the noise. However, regardless of what stressor (audible or visual), sea turtles appear to only show avoidance behaviors within 10 meters or closer. Vessel strikes can cause permanent injury or death from trauma, paralysis and subsequent drowning, infection, or the inability to feed (NMFS 2020). Foley et al. (2019) found that the cause of death was known or probable vessel strike in 93 percent of stranded sea turtles that exhibited vessel strike injuries.

5.2.4. Trawl Surveys

The capture and mortality of sea turtles in bottom trawl fisheries is well documented (see Henwood and Stuntz 1987; NMFS and USFWS 1991, 1992, 2008; NRC 1990). As discussed in recovery plans and 5-year status reviews for all sea turtle species, reduction of sea turtle interactions with fisheries is a priority where these species occur. Fienkbeiner et al. (2011) compiled sea turtle bycatch in U.S. fisheries and found that in the Atlantic, a mean estimate of 137,700 interactions, of which 4,500 were lethal, occurred annually since the implementation of bycatch mitigation measures. However, a vast majority of the interactions (98%) and mortalities (80%) occurred in the Southeast/Gulf of Mexico shrimp trawl fishery, though sampling inconsistencies and limitation should be considered when interpreting this data (NMFS 2014). While sea turtles are capable of remaining submerged for long periods of time, they appear to rapidly consume oxygen stores when forcibly submerged in fishing gear (Lutcavage and Lutz 1997). However, based upon Sasso and Epperly (2006) and Epperly et al. (2002), as well as additional information from past trawl surveys, tow times less than 30 minutes will likely eliminate the risk of death from forced submergence for captured sea turtles. Given the short (20 minute) tow times, no mortality would be expected. While no mortality is expected, some impacts may occur to captured individuals. However, BOEM does not expect these impacts, if any, to be biologically significant and would expect turtles to resume normal behaviors upon release from the trawl gear.

5.2.5. Ventless trap surveys

Ventless traps or other stationary gear could pose an increased risk of entanglement for listed sea turtle species. Of all the Atlantic sea turtles, the leatherback seems to be the most vulnerable to entanglement in trap/pot fishing gear, possibly due to physical characteristics, diving and foraging behaviors, distributional overlap with the gear, and the potential attraction to prey items that collect on buoys and buoy lines at or near the surface (NMFS 2016). Entangled individuals generally have a reduced ability to forage, dive, surface, breathe or perform other behaviors essential for survival (Balazs 1985). In addition to mortality as a result of forced submersion, entanglement can restrict blood flow and result in tissue necrosis and increase the risk of vessel strike (NMFS 2016). While there is some potential for entanglement of sea turtles, particularly leatherbacks, given the patchy distribution of sea turtles in the Action Area and the small number of vertical lines associated with the ventless trap surveys (60 lines), entanglement as a result of the ventless trap surveys are extremely unlikely. As such, impacts to sea turtles, if any, would be expected to be insignificant and discountable.

5.2.6. PAM

While the use of PAM technologies would not have any direct impacts on sea turtles, impacts arising from vessel noise and the potential for vessel strike, as discussed above could occur. Additionally, mooring lines for moored PAM systems could pose an entanglement risk to sea turtles and autonomous surface vehicles could pose additional strike risk.

Moored PAM systems will use the best available technology to reduce any potential risks of entanglement. As detailed in BOEM's BA on data collection activities (BOEM 2021), the Lessee must ensure that any buoys attached to the seafloor use buoys, lines (chains, cables, or coated rope systems), swivels, shackles, and anchor designs that prevent any potential entanglement of listed species while ensuring the safety and integrity of the structure or device. All mooring lines and ancillary attachment lines must use one or more of the following measures to reduce entanglement risk: shortest practicable line length, rubber sleeves, weak-links, chains, cables or similar equipment types that prevent lines from looping, wrapping, or entrapping protected species. Any equipment must be attached by a line within a rubber sleeve for rigidity. The length of the line must be as short as necessary to meet its intended purpose. All buoys must be properly labeled with Lessee and contact information. The use of buoys for moored PAM systems or any other intended purposes will pose a discountable risk of entanglement to listed sea turtles that may occur in the Action Area.

ASVs could have hydrophone equipment attached that operate autonomously in a defined area. ASVs in very shallow water can be operated remotely from a vessel or line of sight from shore by an operator and in an unmanned mode. ASVs are typically lightweight, very small vessels and travel at slow speeds (see https://greentownlabs.com/offshore-wind-challenge-cohort-highlights-their-work-with-vineyard-wind-commitment-to-advancing-the-industry/). ASVs produce virtually no self-noise and pose a discountable risk of vessels strike due to their extreme light weight and small size. It is not anticipated ASVs pose any reasonable risk of entanglement or harm to listed species and potential impacts, if any, are expected to be insignificant and discountable.

5.3. ATLANTIC STURGEON

Much of the potential impacts to Atlantic sturgeon arising from the above described post-ROD surveys are related to increased vessel traffic, and the associated underwater vessel noise and potential for vessel strikes, required to conduct the above described monitoring. Additional impacts could result from trawl surveys and ventless trap surveys. No impacts to Atlantic sturgeon from the use of PAM devices beyond vessel noise and the potential for vessel strike, arising from vessel traffic to deploy and collect the devices, are expected.

5.3.1. Vessel Noise

All fish can detect low-frequency vessel noise. However, as discussed in the Opinion, because of the characteristics of vessel noise, sounds produced by vessels are unlikely to result in direct injury, hearing impairment, or other trauma to Atlantic sturgeon. Responses to vessel noise may include physiological stress responses or avoidance behaviors. Additionally, vessel noise may

result in auditory masking of biologically significant sounds that fish rely upon (NMFS 2020). However, due to the expected brief periods of exposure to vessel noise, short-term behavioral and physiological response, if any, resulting from vessel noise associated with the above described surveys would not be expected to significantly alter normal behavior patterns of Atlantic sturgeon and would be expected to be insignificant (i.e., so minor that the effect could not be measured) (NMFS 2020).

5.3.2. HRG Survey Noise

In addition to vessel noise, underwater noise associated with HRG bathymetric survey equipment has some potential to result in impacts to Atlantic sturgeon during post-installation cable inspections and surveys prescribed in the Benthic Monitoring Plan. The HRG surveys would use only electromechanical sources such as boomer, sparker, and chirp sub-bottom profilers, side-scan sonar, and multibeam depth sounders. Acoustic signals from electromechanical sources other than the boomer, sparker, bubble gun, and chirp sub-bottom profiler are not likely to be detectable by Atlantic Sturgeon. The boomers/bubble guns and sparkers have estimated PTS ranges of 3.2 and 9.0 meters, respectively (BOEM 2021). These short ranges have a discountable risk of (i) exposing any fish on or near the bottom, or (ii) resulting in long enough periods of exposure from moving vessels for any PTS to occur. Conservative estimates of the distance to harassment ranges from 105 feet (32 meters) for chirp sub -bottom profilers to 6,548 feet (1,996 meters) for sparkers and bubble guns (BOEM 2021). Given the dispersed nature of Atlantic sturgeon in the Action Area, it is also extremely unlikely that an individual would be exposed to an injurious level of noise as a result of the HRG surveys (NMFS 2020). Additionally, the narrow beam width of the sound sources would reduce the area where elevated noise levels occur. As such, no physical effects to Atlantic sturgeon, including injury or mortality, is expected to occur. The area of increased noise above the behavioral threshold would be transient and increased noise would be experienced for seconds at a time in any given area. As such, any impacts would be limited to brief disruptions of normal behavior, temporary avoidance of the ensonified area, and minor additional energy expenditure required to swim away from the sound source (NMFS 2020). Impacts, if any, to individual sturgeon would be temporary and localized, and would be expected to be limited to brief startle responses or short displacement. These impacts are expected to be insignificant and discountable.

5.3.3. Vessel Strike

As discussed in the Opinion, the distribution of Atlantic sturgeon does not overlap with the entire Action Area and is largely restricted to a portion of the expected vessel routes from shore to the 50 meters depth contour (NMFS 2020). While Atlantic sturgeon are known to be struck and killed by vessels in rivers and estuaries, there are no reports of vessel strikes in the marine environment, likely due to the space between bottom oriented sturgeon and the propellers and hull of vessels (NMFS 2020). Further, the dispersed nature of vessel traffic and individual sturgeon reduces the potential for co-occurrence of individual sturgeon and individual vessels. As such, risk of vessel strikes is assumed to be extremely low, and impacts, if any, would be insignificant (i.e., so minor that the effect could not be measured).

5.3.4. Trawl Surveys

Capture of Atlantic sturgeon in trawl gear has the potential to result in injury and mortality, reduced fecundity and delayed or aborted spawning migrations (Moser and Ross 1995, Collins et al. 2000, Moser et al. 2000). However, the use of trawl gear has been used as a safe and reliable method to capture sturgeon, provided that the tow time is limited (NMFS 2014). Negative impacts to sturgeon resulting from trawling capture are related to tow speed and duration (Moser et al. 2000). Short tow durations and careful handling of individuals once on deck is likely to result in very low risk of mortality to captured individuals (NMFS 2014, 2016). Historic Northeast Fisheries Science Center (NEFSC) and NEAMAP surveys have captured 110 and 102 Atlantic sturgeon, respectively, with no recorded injury or mortality. Given the dispersed nature of Atlantic sturgeon, the limited number of trawl tows that will be conducted, the short tow times, and the fact that no injuries or mortalities have been recorded during similar surveys, impacts to Atlantic sturgeon from post-ROD trawl surveys, if any, are expected to be insignificant and discountable. Further, given the lack of documented injury or mortality, if captured, Atlantic sturgeon would be released alive and uninjured (NMFS 2016)

5.3.5. Ventless trap surveys

Incidental capture of Atlantic sturgeon can occur in most fisheries gear, including crab pots, fish pots, fish traps, fyke nets, gill nets, hook and line, hoop nets, pound nets, and trawls, though the highest potential for mortality exists from gill net and trawl gears (ASMFC 2017). Consistent with this, Dunton et al. (2015) assessed the marine distribution of Atlantic sturgeon via various methods including stratified random sampling, targeted research tows, and a review of fisheries bycatch data from 1989 to 2013. No Atlantic sturgeon were observed in anchored floating gill nets, bottom longlines, fish traps or pots, hydraulic clam dredges, lobster pots or traps, midwater otter trawls, midwater paired otter trawls, sea scallop dredges, scallop bottom trawls, or troll lines (Dunton et al. 2015). In marine habitats, adult Atlantic sturgeon have been documented using relatively shallow nearshore habitats (10 to 50 meters in depth) (Laney et al. 2007, Stein et al. 2004), but have been captured at depths up to 75 meters (ASMFC 2017). Given the dispersed distribution of Atlantic sturgeon in marine habitats and the limited number of post-ROD ventless trap surveys, it is extremely unlikely that an Atlantic sturgeon would encounter the strings associated with the ventless trap surveys, and impacts, if any, would be expected to be insignificant and discountable.

6. CONCLUSIONS

Based on the analysis in this supplemental BA regarding the effects of the above described post-ROD surveys on listed species and critical habitat occurring in the Vineyard Wind 1 Action Area, BOEM has concluded:

- Vessel noise **may affect, but is not likely to adversely affect** NARWs, fin, sei, and sperm whales; loggerhead, Kemp's ridley, leatherback, and green sea turtles because short-term and temporary responses, if any, are expected to be insignificant and discountable.

- Vessel noise generated by survey vessels **may affect, but is not likely to adversely affect** Atlantic sturgeon; noise generated by vessel engines and thrusters would have **no effect** on Atlantic sturgeon.
- Vessel traffic **may affect, but is not likely to adversely affect** NARWs, fin, sei, and sperm whales; and loggerhead, Kemp's ridley, leatherback, and green sea turtles by increased potential for injury or mortality from strike.

Table 3 summarizes the impact determinations for the listed marine mammals, sea turtles, and fish present within the Project Action Area as described in the 2019 BA (BOEM 2019) and the subsequent Opinion (NMFS 2020). There are three conclusions that an action agency may make based on the analyses of direct and indirect effects when determining whether formal consultation is necessary, based on the Endangered Species Consultation Handbook (USDOI, USFWS, USDOC, and NMFS 1998):

- **No Effect**—This is the appropriate determination when the action agency determines its proposed action is not expected to affect listed/proposed species or designated/proposed critical habitat.
- **May Affect, but Not Likely to Adversely Affect**—This is the appropriate determination when effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are positive effects without any adverse effects. Insignificant effects relate to the size of the impact; the impact cannot be meaningfully detected, measured, or evaluated, and should never reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur.
- **May Affect, Likely to Adversely Affect**—This is the appropriate determination when adverse effects that are not beneficial, insignificant, or discountable are likely to occur to listed species/critical habitat.

Table 3. Summary of Impact Determinations for Post-ROD monitoring surveys.

Impact Producing Factor	Impact Type	Potential Effect	Listed Whales [a]	Listed Sea Turtles [b]	Atlantic Sturgeon
Vessel Traffic	Noise	Disturbance, TTS, PTS	NLAA	NLAA	NE
	Strike	Injury / Mortality	NLAA	NLAA	NE
HRG Surveys	Noise	Disturbance	NLAA	NLAA	NLAA
Trawl/Plankton Surveys	Entanglement	Injury / Mortality	NLAA	NLAA	NLAA
Ventless Trap Surveys	Entanglement	Injury / Mortality	NLAA	NLAA	NLAA
PAM	Entanglement	Injury / Mortality	NLAA	NLAA	NLAA
	Strike	Injury / Mortality	NLAA	NLAA	NLAA

HRG = high-resolution geophysical; NARW = North Atlantic right whale; NE = "No effect" and means ESA-listed species or critical habitat will not be affected, directly or indirectly; NLAA = "may affect, but not likely to adversely affect" and means that all effects are

beneficial, insignificant, or discountable; PAM = Passive Acoustic Monitoring; PTS = Permanent Threshold Shift; TTS = Temporary threshold shift.

[a] NARWs, fin whales, sei whales, and sperm whales

[b] Northwest Atlantic DPS of loggerhead sea turtles, green North Atlantic DPS, Kemp's ridley, and leatherback sea turtles

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