ATLANTIC SHORES offshore wind

Atlantic Shores Offshore Wind LLC

Request for an Incidental Harassment Authorization to Allow the Non-Lethal Take of Marine Mammals Incidental to Site Characterization Surveys of the Atlantic Shores Lease Area (OCS-A 0499, OCS-A 0541, OCS-A 0549)

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Acronyms and Abbreviations

Atlantic Shores	Atlantic Shores Offshore Wind, LLC
BOEM	Bureau of Ocean Energy Management
CeTAP	Cetacean and Turtles Assessment Program
C.F.R.	Code of Federal Regulations
CPT	cone penetration test
dB	decibel
DMA	Dynamic Management Area
ECR	Export Cable Route
ESA	Endangered Species Act
EEZ	Exclusive Economic Zone
HFC	high-frequency cetaceans
HRG	high-resolution geophysical
Hz	hertz
IHA	Incidental Harassment Authorization
km	kilometer
km^2	square kilometer
km/h	kilometer per hour
kHz	kilohertz
knot	nautical mile per hour
LFC	low-frequency cetaceans
MFC	mid-frequency cetaceans
mi	mile
µPa	microPascal
MMPA	Marine Mammal Protection Act
nm	nautical mile
NARW	North Atlantic Right Whale
NEFSC	Northeast Fisheries Science Center
NJDEP	New Jersey Department of Environmental Protection
NOAA (Fisheries)	National Oceanic and Atmospheric Administration, (National Marine Fisheries Service)
OCS	Outer Continental Shelf
OPW	Otariid pinnipeds in water
PBR	potential biological removal
PPW	Phocid pinnipeds in water
Project	Atlantic Shores Offshore Wind Projects
PSO	Protected Species Observer
PTS	permanent threshold shift
r	maximum radial distance
RMS	root mean square
SEFSC	Southeast Fisheries Science Center
SEL	sound exposure level
SEL_{cum}	cumulative SEL
SL	sound level
SMA	Seasonal Management Area
ZOI	zone of influence

1. Description of Specified Activity

Atlantic Shores Offshore Wind, LLC (Atlantic Shores), a 50/50 joint venture between EDF-RE Offshore Development, LLC and Shell New Energies US LLC, is seeking an Incidental Harassment Authorization (IHA) for future offshore wind development projects (Project) pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA) (16 U.S. Code § 1371(a)(5)(D)) and 50 Code of Federal Regulations (C.F.R.) § 216.107. The IHA requests the incidental take of marine mammals by Level B harassment resulting from site characterization surveys, including high-resolution geophysical (HRG) sources operating at frequencies less than 180 kilohertz (kHz), off the coasts of New Jersey, New York, Delaware, and Maryland including Commercial Leases of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf OCS-A 0499, OCS-A 0541, and OCS-A 0549 (Lease Areas).

Figure 1-1 contains a map of the proposed survey area, which has been delineated for operational purposes into two sub-areas along the 10-meter bathymetric contour. The Nearshore Survey Area is defined by waters less than 33 feet (10 meters) deep. The Offshore Survey Area is defined by waters more than 10 meters deep. Atlantic Shores proposes to conduct HRG and geotechnical surveys within this approximately 7,819 square miles (5,004,120 acres) of the Nearshore Survey Area and Offshore Survey Area (collectively referred to as the Survey Area) that extends from the shoreline out to a maximum distance of approximately 40 nautical miles (74 kilometers).[1] The survey area division along the 10-meter bathymetric contour was determined by the specific vessel capabilities of Atlantic Shores contracted vessels and the preference for use of the offshore survey vessel for HRG surveys by the Atlantic Shores geophysical and geotechnical team. Site characterization surveys will be performed over a period of up to 12 months beginning no earlier than April 2024.

The regulations set forth in Section 101(a)(5) of the MMPA and 50 C.F.R. § 216 Subpart I allow for the incidental taking of marine mammals by a specific activity if the take by such activity is found to have a negligible impact on the species or stock(s) of marine mammals and will not result in an unmitigable adverse impact on the availability of the marine mammal species or stock(s) for certain subsistence uses. In order for the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) to consider authorizing the taking by U.S. citizens of small numbers of marine mammals incidental to a specified activity (other than commercial fishing), or to make a finding that incidental take is unlikely to occur, a written request must be submitted to NOAA Fisheries' Office of Protected Resources. Such a request is detailed in the following sections.

[1] 1 nautical mile = 1.852 kilometers

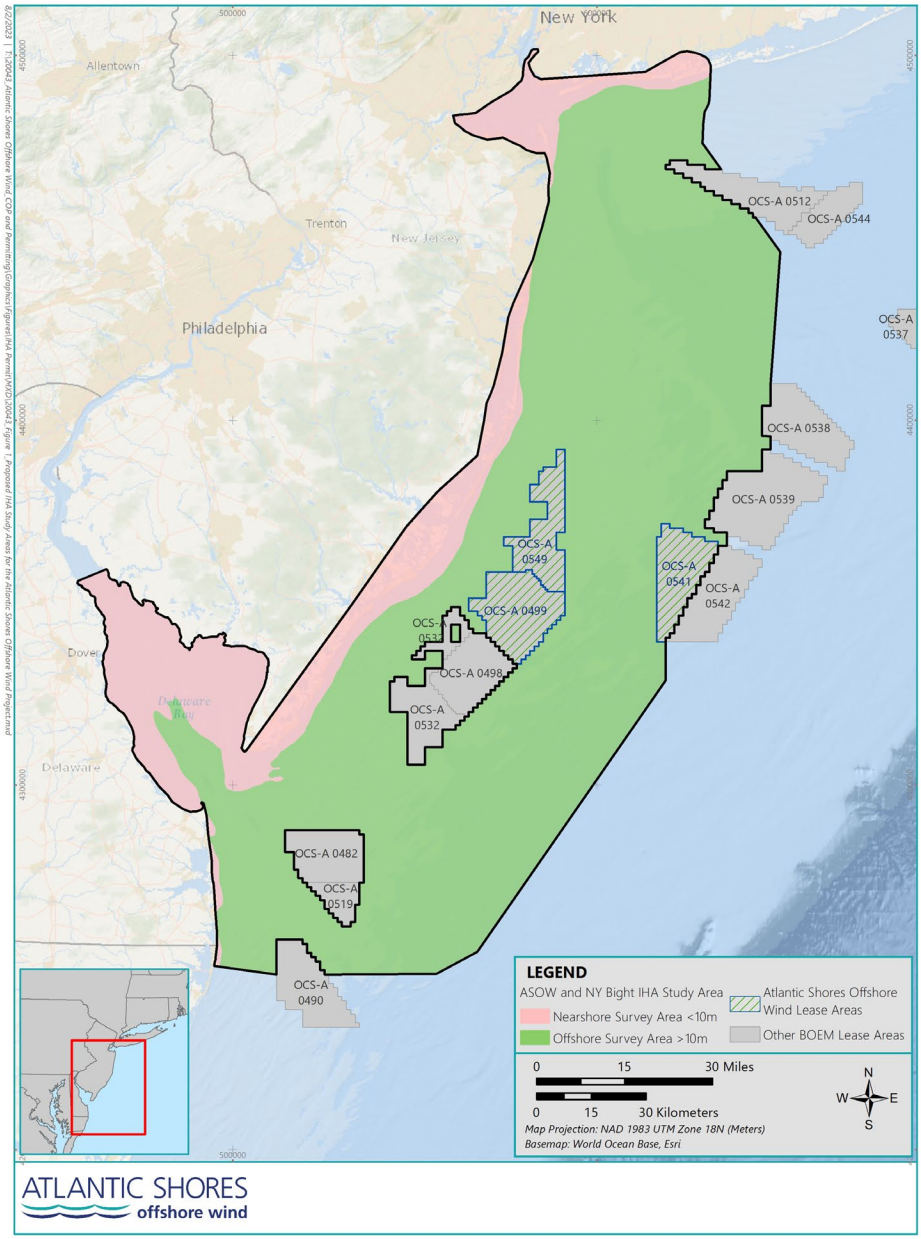

Figure 1-1 Atlantic Shores Offshore Wind Project Portfolio Site Characterization Survey Area

The purposes of the HRG and geotechnical surveys are as follows:

- Support the site characterization, siting, and engineering design of offshore wind energy project facilities including wind turbine generators, offshore substation(s), and submarine cables within the Survey Area; and
- Collect the data necessary to support Project review requirements associated with 30 C.F.R. § 585 and the National Environmental Policy Act.

NOAA Fisheries has indicated, through past IHA decisions, that geotechnical surveys do not result in acoustic impacts to marine mammals. Based on these decisions, it is unlikely that the geotechnical surveys to be conducted by Atlantic Shores (e.g., sample boreholes, deep cone penetration tests [CPTs], and shallow CPTs) will result in Level A or B harassment. Therefore, geotechnical survey activities are not discussed in further detail in this application request.

1.1 Acoustic Thresholds and Regulatory Criteria

NOAA Fisheries has advised that sound-producing survey equipment operating below 180 kHz has the potential to cause both Level A and/or Level B acoustic harassment to marine mammals (pers comm. Benjamin Laws, NOAA Fisheries 2021). Under the MMPA, Level A Harassment is statutorily defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild. Level B harassment refers to acts that have the potential to disturb, but not injure, a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering. The actionable sound pressure levels are not identified in the statute.

Under recent NOAA Fisheries (2018) guidance, Level A harassment is said to occur as a result of exposure to high noise levels and the onset of permanent hearing sensitivity loss, known as a permanent threshold shift (PTS). NOAA Fisheries has defined PTS for five distinct marine mammal hearing groups: Low-frequency cetaceans (LFC) (i.e., baleen whales), Mid-frequency cetaceans (MFC) (i.e., dolphins, toothed whales, beaked whales, bottlenose whales), High-frequency cetaceans (HFC) (i.e., true porpoises, Kogia spp., river dolphins, *Cephalorhynchus*, *Lagenorhynchus cruciger* and *L. australis*), Phocid pinnipeds in water (PPW) (i.e., true seals), and Otariid pinnipeds in water (OPW) (i.e., sea lions and fur seals). PTS levels for each of these hearing groups for both impulsive and non-impulsive noise are defined in Table 1-1.

Table 1-1 M-Weighted PTS Criteria and Functional Hearing Range for Marine Mammals (NOAA Fisheries 2016, 2018)

Functional Hearing Group	PTS Onset Impulsive	PTS Onset Non-Impulsive	Functional Hearing Range
LFC	219 dB_{peak} and 183 dB SEL_{cum}	199 dB SEL_{cum}	7 Hz to 35 kHz
MFC	230 dB_{peak} and 185 dB SEL_{cum}	198 dB SEL_{cum}	150 Hz to 160 kHz
HFC	202 dB_{peak} and 155 dB SEL_{cum}	173 dB SEL_{cum}	275 Hz to 160 kHz
PPW	218 dB_{peak} and 185 dB SEL_{cum}	201 dB SEL_{cum}	50 Hz to 86 kHz
OPW	232 dB_{peak} and 203 dB SEL_{cum}	219 dB SEL_{cum}	60 Hz to 39 kHz

Notes:
dB – decibel
dB_{peak} – peak decibel
Hz – hertz
kHz – kilohertz
SEL – sound exposure level
SEL_{cum} – cumulative SEL

NOAA Fisheries has defined the threshold level for Level B harassment at 120 dB_{RMS} re 1 microPascal (µPa) for continuous noise and 160 dB_{RMS} re 1 µPa for non-explosive, impulsive, and intermittent noise.

The following section provides specific information regarding the HRG survey activities proposed by Atlantic Shores and includes information on the types of activities and associated equipment to be deployed, how the equipment will interact with the surrounding physical and biological environment, and which activity may result in the potential taking of marine mammals per NOAA Fisheries' established thresholds for Level A and B harassment.

1.2 HRG Survey Activities

The HRG survey equipment to be used in the Survey Area will be familiar to both NOAA Fisheries and BOEM because this equipment has been operated for previous Atlantic Shores surveys and other offshore wind development projects on the Atlantic Outer Continental Shelf. The HRG survey activities will be supported by vessels of sufficient size to accomplish the survey goals in the Survey Area. Survey equipment will be deployed from multiple vessels during site characterization surveys. Up to two geophysical vessels could be operating at any one time across the Survey Area, with one vessel operating in the Nearshore Survey Area and one vessel operating in the Offshore Survey Area.

HRG survey activities within the Survey Area will utilize the following categories of equipment:

- Depth sounding (multibeam depth sounder and single beam echosounder) to determine water depths and general bottom topography (currently estimated to range from approximately 16 feet [5 meters] to 197 feet [60 meters] in depth)
- Magnetic intensity measurements (gradiometer) for detecting local variations in regional magnetic field from geological strata and potential ferrous objects on and below the bottom
- Seafloor imaging (side scan sonar survey) for seabed sediment classification purposes, to identify natural and man-made acoustic targets resting on the bottom as well as any anomalous features
- Shallow penetration sub-bottom profiler (parametric) to map the near surface stratigraphy (top 0 to 16 feet [0 to 5 meters] soils below seabed)
- Medium penetration sub-bottom profiler (parametric profilers/sparkers) to map deeper subsurface stratigraphy as needed (soils down to 246 to 328 feet. [75 to 100 meters] below seabed). Based upon five years of previous survey experience (i.e., 2019 – 2023 surveys), Atlantic Shores anticipates that it will operate the GeoMarine Geo-Source to map deeper stratigraphy in the Survey Area.

Atlantic Shores has evaluated a range of possible HRG survey equipment that would be necessary to support seabed assessments across the Survey Area during the specified timeframe associated with the proposed activities. The categories of representative HRG survey equipment with operating frequencies <180 kHz that are anticipated for use are presented in Table 1-2. This equipment will either be mounted to or towed behind the survey vessel at a typical survey speed of approximately 3.5 knots (6.5 kilometers) per hour.

Operational parameters presented in Table 1-2 were obtained from the following sources: Crocker and Fratantonio (2016); manufacturer specifications; personal communication with manufacturers; agency correspondence; and Atlantic Shores. The operational source level, frequency, and beamwidth were used in the NOAA Fisheries Level B spreadsheet tool for calculating the distance to the Level B threshold (see Section 6.0, Table 6-1). Manufacturer specifications are included in Appendix A.

Table 1-2 Representative Equipment Specifications with Operating Frequencies Below 180 kHz

HRG Survey Equipment (Sub-Bottom Profiler)	Representative Equipment Type	Operating Frequencies Ranges (kHz)	Operational Source Level (dB_{RMS})	Beamwidth Ranges (degree)	Typical Pulse Durations RMS_{90} (millisec)	Pulse Repetition Rate (Hz)
Sparker	Geo Marine Geo-Source 2D SUHRS	0.2 to 5[a]	195[a]	180[a]	7.2[a]	0.41[a]
Parametric (sub-bottom profiler)	INNOMAR SES-2000 Medium-100 Parametric [c]	85 to 115[b]	241[d]	2[b]	2[b]	40[b]
	INNOMAR deep -36 Parametric [c]	30 to 42[b]	245	1.5[b]	0.15 to 5[b]	40[b]

Notes:

[a] Operational information from Crocker Fratantonio (2016) selecting SIG ELC 820 operating at 400J with 100 electrode tips as a proxy for the GeoMarine GeoSource operating at 400J with 400 electrode tips. The specification sheet provided by Crocker Fratantonio 2016 indicates an operational source level of 195 dB_{RMS} for the SIG ELC 820 while operating at 400J using 100 electrode tips, it has been determined that an increase in the number of electrode tips decreases the overall peak source pressure translating to a lower operational source level (dB_{RMS}).

[b] Manufacturer specifications and/or correspondence with manufacturer.

[c] Based on personal communication with Benjamin Laws, NOAA GARFO (2021), NOAA Fisheries does not expect take from these parametric sub-bottom profilers due to their lower frequencies and extremely narrow beamwidth. Therefore, these sources were not considered in calculating the maximum r value for the ZOI calculation.

[d] The specification sheet indicates a peak source level of 247 dB re 1 µPa m (Jens Wunderlich, Innomar, personal communication, 7-18-2019). The average difference between the peak SPL source levels for sub-bottom profilers measured by Crocker and Fratantonio (2016) was 6 dB. We therefore estimate the SPL source level is 241 dB re 1 µPa m.

Some of the equipment expected to be operated during certain survey activities are not considered impactful to marine mammals and were not included in Table 1-2. These include single beam depth echosounders which are not believed to result in take of marine mammals; gradiometers which generate no acoustic output and do not pose risk of take to marine mammals; and side scan sonar and multibeam echosounders operated at frequencies above 180 kHz which are outside the general hearing range of most marine mammals (pers comm. Benjamin Laws; NOAA GARFO 2021; CSA Ocean Sciences Inc. 2021; NOAA Fisheries 2018). Of the HRG survey equipment expected to be operated during the survey campaign, only the sparkers generate the sound with characteristics that have the potential to result in the non-lethal take of exposed marine mammals.

Benthic sampling activities such as bottom grab sampling may result in bottom disturbance; however, seafloor disturbances of this nature would be very localized, temporary, and considered to have negligible effects to benthic habitat and water quality given the small scale of the activity. These negligible effects are unlikely to impact marine mammal species, their habitat, or prey (see Sections 9 and 10).

Implementation of the avoidance, minimization, and monitoring measures detailed in Section 11 effectively mitigates the potential effect of HRG survey equipment operation. In combination with the behavior of marine mammal species (i.e., mobile and transient behavior and the ability to avoid or move away from disturbances or sources of potential harassment), it is unlikely that these pieces of equipment will result in the Level A harassment of marine mammals. This conclusion has been supported by both BOEM and NOAA Fisheries through published literature and agency communications from past Atlantic Shores IHA applications. Given the discrete frequency bands and small area of sound propagation emitted from HRG equipment, BOEM has concluded that injury to marine mammals (i.e., Level A harassment) is not expected as sound diminishes rapidly from the equipment (BOEM 2018). NOAA Fisheries has also confirmed that Level A harassment is not expected with the use of mitigation measures and advised Atlantic Shores not to calculate Level A take in IHA applications for HRG surveys (pers comm. Benjamin Laws, NOAA GARFO

2021). Therefore, Level A take calculations have not been performed, and Level A take has not been requested for any marine mammal species. Atlantic Shores is only requesting authorization for the incidental take of small numbers of marine mammals within each of the Survey Area by Level B harassment. Estimates of Level B take are further detailed in Section 6.

2. Dates, Duration, and Specified Geographic Region

Atlantic Shores will conduct HRG surveys within the Survey Area beginning April 1, 2024. Survey activities may include up to two geophysical vessels operating simultaneously in different areas.[2] The estimated duration of survey activities is provided in Table 2-1. This estimate accounts for weather downtime and assumes activities could occur at any time in a 24-hour day for up to 12 months.

Table 2-1 Estimated Duration of Survey Activities in Proposed HRG Survey Segments[3]

Survey Segment	Total Duration (Vessel Days)
Nearshore Survey Area	120
Offshore Survey Area	180

3. Species and Numbers of Marine Mammals Expected Within the Survey Area

The *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York Revised Environmental Assessment* (BOEM 2016) reports 31 species of marine mammals (whales, dolphins, porpoise, and seals) in the New York Bight and Mid-Atlantic Bight that are protected by the MMPA, five of which are listed under the Endangered Species Act (ESA) and may be present, at least seasonally, in the Survey Area (see Table 3-1). The status and distribution of these species are discussed in detail in Section 4.

Table 3-1 Marine Mammals Known to Occur in the Mid-Atlantic

Common Name	Scientific Name	ESA and MMPA Status	Relative Occurrence in the Region	Estimated Population	Stock	Hearing Range
Toothed Whales (Odontoceti)						
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	N/A	Uncommon	93,233	W. North Atlantic	Mid
Atlantic spotted dolphin	*Stenella frontalis*	N/A	Uncommon	39,921	W. North Atlantic	Mid
Bottlenose dolphin	*Tursiops truncatus*	N/A	Uncommon	62,851	W. North Atlantic, Offshore	Mid
		Strategic [a]	Common	6,639	W. North Atlantic, Northern Migratory Coastal	Mid
Pan-tropical spotted dolphin	*Stenella attenuata*	N/A	Rare	6,593	W. North Atlantic	Mid

[2] Atlantic Shores will be utilizing two vessels for HRG Surveys, the Fugro Enterprise: length – 170 ft (51.8 m), tonnage – 99 gross registered tons and the M/V Bella Marie; length – 40 ft (12.2 m), tonnage - 8 gross registered tons.
[3] See Table 6-2 for further information on the number of survey days and trackline distances.

Common Name	Scientific Name	ESA and MMPA Status	Relative Occurrence in the Region	Estimated Population	Stock	Hearing Range
Risso's dolphin	*Grampus griseus*	N/A	Common	35,215	W. North Atlantic	Mid
Short beaked common dolphin	*Delphinus delphis*	N/A	Common	172,974	W. North Atlantic	Mid
Striped dolphin	*Stenella coeruleoalba*	N/A	Rare[b]	67,036	W. North Atlantic	Mid
White-beaked dolphin	*Lagenorhynchus albirostris*	N/A	Rare	536,016	W. North Atlantic	Mid
Harbor porpoise	*Phocoena phocoena*	N/A	Uncommon	95,543	Gulf of Maine/Bay of Fundy	High
Killer whale	*Orcinus orca*	N/A	Rare	Unknown	W. North Atlantic	Mid
False killer whale	*Pseudorca crassidens*	N/A	Rare	1,791	W. North Atlantic	Mid
Long-finned pilot whale	*Globicephala melas*	N/A	Common	39,215	W. North Atlantic	Mid
Short-finned pilot whale	*Globicephala macrorhynchus*	N/A	Rare[c]	28,924	W. North Atlantic	Mid
Sperm whale	*Physeter macrocephalus*	Endangered[a]	Uncommon[d]	4,349	North Atlantic	Mid
Pygmy sperm whale	*Kogia breviceps*	N/A	Rare[b]	7,750 [e]	W. North Atlantic	High
Dwarf sperm whale	*Kogia sima*	N/A	Rare	7,750 [e]	W. North Atlantic	High
Cuvier's beaked whale	*Ziphius cavirostris*	N/A	Rare	5,744	W. North Atlantic	Mid
Blainville's beaked whale	*Mesoplodon densirostris*	N/A	Rare	10,107 [f]	W. North Atlantic	Mid
Gervais' beaked whale	*Mesoplodon europaeus*	N/A	Rare	10,107 [f]	W. North Atlantic	Mid
True's beaked whale	*Mesoplodon mirus*	N/A	Rare	10,107 [f]	W. North Atlantic	Mid
Sowerby's beaked whale	*Mesoplodon bidens*	N/A	Rare	10,107 [f]	W. North Atlantic	Mid
Baleen Whales (Mysticeti)						
Minke whale	*Balaenoptera acutorostrata*	N/A	Regular	21,968	Canadian East Coast	Low
Blue whale[d]	*Balaenoptera musculus*	Endangered[a]	Uncommon	Unknown	W. North Atlantic	Low
Fin whale	*Balaenoptera physalus*	Endangered[a]	Regular	6,802	W. North Atlantic	Low
Humpback whale	*Megaptera novaeangliae*	N/A	Common	1,396	Gulf of Maine	Low
North Atlantic right whale	*Eubalaena glacialis*	Endangered[a]	Regular	338	W. North Atlantic	Low
Sei whale	*Balaenoptera borealis*	Endangered[a]	Uncommon[d]	6,292	Nova Scotia	Low

Common Name	Scientific Name	ESA and MMPA Status	Relative Occurrence in the Region	Estimated Population	Stock	Hearing Range
Earless Seals (Phocidae)						
Gray seals	*Halichoerus grypus*	N/A	Regular	27,300	W. North Atlantic	-
Harbor seals	*Phoca vitulina*	N/A	Regular	61,336	W. North Atlantic	-
Hooded seals	*Cystophora cristata*	N/A	Rare	Unknown	W. North Atlantic	-
Harp seal	*Phoca groenlandica*	N/A	Rare	7.6 million	W. North Atlantic	-

Notes:

a. Strategic stock is defined as any marine mammal stock: 1) for which the level of direct human-caused mortality exceeds the potential biological removal level; 2) which is declining and likely to be listed as threatened under the ESA; or 3) which is listed as threatened or endangered under the ESA or as depleted under the MMPA (http://www.ncseonline.org/nle/crsreports/biodiversity/biodv-11.cfm).

b. The 2016 Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York, describes striped dolphin and pygmy sperm whale as common and uncommon, respectively, in the NY Bight. However, based on more recent marine mammal density modeling published by Roberts et al. (2020, 2023), these species are not expected to occur in the Survey Area.

c. Short-finned pilot whale was identified as occurring year-round on the shelf break according to the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York. Given that the Survey Area is not located on the shelf break, their occurrence in the area of the Survey Area is expected to be rare.

d. Based on the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York Revised Environmental Assessment, sperm and sei whales presence was identified as rare off the coast of New York. However, based on density modeling published by Roberts et al. (2023), their presence is possible.

e. This estimate may include both the dwarf and pygmy sperm whales.

f. This estimate includes Gervais' and Blainville's beaked whales and undifferentiated Mesoplodon spp. beaked whales. Sources: Hayes et al. 2023; Hayes et al. 2021; Hayes et al. 2018a, 2018b; Hayes et al. 2017; Waring et al. 2010, 2011, 2013, 2015; RI Ocean SAMP 2011; Kenney and Vigness-Raposa 2009; NOAA Fisheries 2016, 2018; Pace 2021; BOEM 2016, Roberts et.al 2020.

4. Affected Species Status and Distribution

The 31 marine mammal species identified in Table 3-1 are protected by the MMPA, and some are also listed under the ESA. The five ESA-listed marine mammal species that could occur in waters of the New York Bight and Mid-Atlantic Bight are the sperm whale, North Atlantic right whale (NARW), fin whale, blue whale, and sei whale. The humpback whale, which may occur year-round, was delisted as an endangered species. These large whale species are generally migratory and typically do not spend extended periods of time in a localized area. The waters within the New York Bight and Mid-Atlantic Bight are primarily used as areas where animals occur seasonally to feed, or as habitat during seasonal movements between the more northward feeding areas and southern hemisphere breeding grounds typically used by some of the large whale species (though some winter breeding areas exist further offshore vs. in the southerly latitudes) (NOAA 2023, BOEM 2016). Presence of mid-sized whale species and other large baleen whales in the Survey Area will vary with prey availability and other habitat factors. The humpback whale has the greatest potential to occur within the Survey Area; however, sperm whales, fin whales, and North Atlantic right whales (NARW) can also occur.

The following subsections provide additional information on the distribution, habitat use, abundance, and the existing threats to marine mammals with regular, common, and uncommon presence around the Survey

Area. Species with regular, common, and uncommon presence around the Survey Area include the sperm whale, long-finned pilot whale, harbor porpoise, bottlenose dolphin, short-beaked common dolphin, Atlantic white-sided dolphin, Atlantic spotted dolphin, Risso's dolphin, NARW, fin whale, sei whale, humpback whale, minke whale, harbor seal, and gray seal. Of the 31 species included in Table 3-1, 15 species with the greatest potential of occurrence in the Survey Area were selected for further analysis and evaluated for potential take in this Application. The 15 species included in the take analysis are described in sections 4.1 through 4.3.

4.1 Toothed Whales (Odontonceti)

4.1.1 Sperm Whale (Physeter macrocephalus) – Endangered

Sperm whales are the largest of the toothed whales and characterized by their large, bulbous heads. Adults can achieve 15 tons (females) to 45 tons (males). They mainly reside in deep-water habitats on the OCS, along the shelf edge, and in mid-ocean regions (NOAA Fisheries 2010). However, this species has also been observed in relatively high numbers in shallow continental shelf areas off the coast of southern New England (Scott and Sadove 1997). Sperm whale vocalizations include directional clicks, from less than 100 Hz to 30 kHz with most of the clicks in the 5 to 25 kHz range. Sperm whales use echolocation and produce repeated patterns of clicks or codas, which are used to attract females, compete for mates, display aggression, and maintain group cohesion (Wahlberg 2002). Foraging sperm whales make regularly spaced clicks interrupted by "creaks" and very rapid clicking for locating and capturing prey (Wahlberg 2002; Richardson et al. 1995).

Distribution

Sperm whale migratory patterns are not well-defined, and no obvious migration patterns have been observed in certain tropical and temperate areas. However, general trends suggest that most populations move poleward during summer (Waring et al. 2015). Within U.S. Atlantic Exclusive Economic Zone (EEZ) waters, sperm whales appear to exhibit seasonal movement patterns (CeTAP 1982, Scott and Sadove 1997). During winter, sperm whales are concentrated to the east and northeast of Cape Hatteras (NOAA Fisheries 2023a). This center of distribution shifts northward in spring and spreads out across the central portion of the Mid-Atlantic Bight between Virgina and Delaware, to the southern region of Georges Bank (NOAA Fisheries 2023a). In summer, this distribution remains similar to that of spring, but expands northward to include the area east and north of Georges Bank (NOAA Fisheries 2023a). In fall, sperm whales are most abundant on the continental shelf to the south of New England. Additionally in the fall sperm whales can be found along the continental shelf edge within the Mid-Atlantic Bight (NOAA Fisheries 2023a).

Sperm whale habitat offshore is typically classified by deep waters, with their presence being uncommon in waters less than 300 meters deep. According to data compiled from the U.S. Navy's Marine Resource Assessment, which utilized NOAA Fisheries survey data, sperm whale sightings on the continental shelf of the Mid-Atlantic Bight, particularly around designated Wind Energy Areas, were rare (BOEM 2012a). Modeling studies suggest that sperm whales between North Carolina and Nova Scotia predominately inhabit waters near or on the continental shelf break (Palka 2017).

Abundance

Although there is currently no reliable estimate of total sperm whale abundance in the entire western North Atlantic, the most recent and best available population estimate for the U.S. Atlantic EEZ is 4,349 (Hayes et al. 2023).

Status

Sperm whales are listed as endangered under the ESA, and the North Atlantic stock is considered strategic by NOAA Fisheries under the MMPA.

4.1.2 Long-Finned Pilot Whale (*Globicephala melas*) – Non-Strategic

Long-finned pilot whales have bulbous heads, are dark gray, brown, or black in color, and can reach approximately 24 feet (7.3 meters) in length (NOAA Fisheries 2022a). These whales form large, relatively stable aggregations that appear to be maternally determined (American Cetacean Society 2022). Long-finned pilot whales feed primarily on squid but also eat small to medium-sized fish and octopus when available (NOAA Fisheries 2022a). Occurrence of the long-finned pilot whale is considered common in the Survey Area.

Pilot whales are acoustic mid-frequency specialists with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al. 2007). Pilot whales echolocate and produce tonal calls. The primary tonal calls of the long-finned pilot whale range from 1 to 8 kHz with a mean duration of about one second. The calls can be varied with seven categories identified (level, falling, rising, up-down, down-up, waver, and multi-hump) and are likely associated with specific social activities (Vester et al. 2014).

Distribution

In U.S. Atlantic waters, long-finned pilot whales are distributed principally along the continental shelf edge off the northeastern U.S. coast in winter and early spring (CETAP 1982, Payne and Heinemann 1993, Abend and Smith 1999, Hamazaki 2002). In late spring, long-finned pilot whales move onto Georges Bank, into the Gulf of Maine, and into more northern waters, where they remain through late fall (CeTAP 1982, Payne and Heinemann 1993). Long-finned pilot whales have occasionally been observed stranded as far south as Florida (Hayes et al. 2022). The latitudinal range of the species therefore remains uncertain; however, are largely expected to occur north of Cape Hatteras (i.e., approximately 42° N) (Hayes et al. 2022).

Long-finned pilot whales can be found along the shelf break between Delaware and Georges Bank. Given the species preference for deeper waters around the shelf break, which is located farther offshore than the Survey Area, it is unlikely that long-finned pilot whales would be present in the Survey Area. This is further supported by aerial and shipboard observation studies conducted along the east coast of the United States which show long-finned pilot whales preference for deeper waters and their lack of presence nearshore (Hayes et al. 2022; Geo-Marine 2010, BOEM 2012a, NEFSC and SEFSC 2022).

Abundance

The best available estimate for long-finned pilot whale abundance is 39,215 whales as of surveys conducted through 2016 (Garrison 2020, Lawson and Gosselin 2018, Hayes et al. 2023). Estimates of population trend or net productivity rates have not been calculated for long-finned pilot whales as abundance estimates remain highly uncertain due to long survey intervals. From 2016 to 2020, total annual observed fishery-related mortality or serious injury was 9 whales (Hayes et al. 2023). In addition, to direct

human-induced mortality, mass strandings of long-finned whales have occurred throughout their range. Between 2015 and 2019, 9 long-finned pilot whales were found stranded between Maine and Florida (Hayes et al. 2022).

Status

The long-finned pilot whale species is not listed as threatened or endangered under the ESA, and the Western North Atlantic stock is not considered strategic under the MMPA.

4.1.3 Harbor Porpoise (*Phocoena phocoena*) – Non-Strategic

The harbor porpoise is abundant throughout the coastal waters of the Northern hemisphere and the only porpoise species found in the Atlantic Ocean. This species is the smallest cetacean, with a blunt, short-beaked head, dark gray back, and white underside (NOAA Fisheries 2022a). Harbor porpoises reach a maximum length of 6 feet (1.8 meters) and feed on a wide variety of schooling fish and occasionally cephalopods (NOAA Fisheries 2022a). Most harbor porpoise groups are small, usually between five and six individuals, although they aggregate into large groups for feeding or migration (Jefferson et al. 2008). Harbor porpoises are considered high-frequency cetaceans. The dominant component of harbor porpoise echolocation signals are narrowband, high-frequency clicks within 130 to 142 kHz (Villadsgaard et al. 2007).

Distribution

The harbor porpoise occupies both coastal and deep waters from off the coast of North Carolina to Greenland. They are commonly found in bays, estuaries, harbors, and fjords less than 656 feet (200 meters) deep (NOAA Fisheries 2022a). Hayes et al. (2022) report that harbor porpoises are generally concentrated along the continental shelf within the northern Gulf of Maine and southern Bay of Fundy region during summer (July to September). During fall (October to December) and spring (April to June), they are more widely dispersed from New Jersey to Maine. In winter (January to March), intermediate densities of harbor porpoises can be found in waters off New Jersey to North Carolina with lower densities found in waters off New York to New Brunswick, Canada (Hayes et al. 2022). Four distinct populations of harbor porpoise occur in the western North Atlantic: Gulf of Maine/Bay of Fundy, Gulf of St. Lawrence, Newfoundland, and Greenland (NOAA Fisheries 2022b). Harbor porpoises observed within the U.S. Atlantic EEZ are considered part of the Gulf of Maine/Bay of Fundy stock.

Harbor porpoises are a frequently sighted cetacean offshore of New Jersey (Geo-Marine 2010). During the Geo-Marine (2010) study, 51 harbor porpoise sightings were documented approximately 0.8 to 19.8 nautical miles (1.5 to 36.6 kilometers) from shore (mean = 10.5 nautical miles/19.5 kilometers) primarily in the winter months (February to March). This species is also commonly sighted in the Mid-Atlantic, off the coast of Maryland and Delaware during the winter months, compared to other seasons (BOEM 2012a). Therefore, harbor porpoise presence is likely within the Survey Area.

Abundance

According to data collected in 2016 by Northeast Fisheries Science Center (NEFSC) and Department of Fisheries and Oceans Canada, the best abundance estimate for harbor porpoises is 95,543 individuals (Hayes et al. 2023). The total annual estimated human-caused mortality and serious injury is 164 harbor porpoises per year based on fisheries observer data (Hayes et al. 2023).

Status

Harbor porpoises are not listed as threatened or endangered under the ESA or designated as a strategic stock under the MMPA.

4.1.4 Bottlenose Dolphin (*Tursiops truncatus*) – Western North Atlantic Offshore Stock – Non-Strategic/Western North Atlantic Migratory Stock – Strategic

Bottlenose dolphins are one of the most well-known and widely distributed species of marine mammals. There are multiple genetically distinct bottlenose dolphin stocks present in the Mid-Atlantic including the Western North Atlantic Offshore stock and Northern Migratory Coastal stock (Mead and Potter 1995). Given the location of the Survey Area, both the Western North Atlantic Offshore Stock and the Western North Atlantic Migratory stock are expected to potentially occur in the Survey Area.

These dolphins reach 7 to 13 feet (2 to 4 meters) in length and are light gray to black in color (NOAA Fisheries 2022a). Bottlenose dolphins are commonly found in groups of two to 15 individuals, though aggregations in the hundreds are occasionally observed (NOAA Fisheries 2022a). They are considered generalist feeders and consume a wide variety of organisms, including fish, squid, shrimp, and other crustaceans (Jefferson et al. 2008). Bottlenose dolphins are in the mid-frequency functional hearing group, with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al. 2007). Bottlenose dolphin vocalization frequencies range from 3.4 to 130 kHz (DoN 2008).

Distribution

The Western North Atlantic Offshore stock (offshore stock) inhabits the OCS and shelf edge regions from Georges Bank to the Florida Keys (Hayes et al. 2020). Sightings of this stock of bottlenose dolphin occur from Cape Hatteras to the eastern end of Georges Bank (Kenney 1990). The Northern Migratory Coastal stock (coastal stock) migrates seasonally within coastal waters of the western North Atlantic. The coastal migratory stock typically inhabits nearshore waters with depths less than 82 feet (25 meters) north of Cape Hatteras (CETAP 1982; Kenney 1990). Sampling and genetic analysis demonstrated that common bottlenose dolphins concentrated close to shore were of the coastal morphotype, while those in waters greater than 25 m depth were from the offshore morphotype (Garrison *et al.* 2003). During late summer, fall, and during cooler months (January to February), the Migratory Coastal stock occupies coastal waters from Cape Lookout, North Carolina to North Carolina/Virginia border (Garrison and Stokes 2017).

Within the Mid-Atlantic Bight bottlenose dolphins can occur throughout the year and were the most frequently detected species in an ecological baseline survey conducted in coastal New Jersey waters (Geo-Marine 2010, BOEM 2012b). Seasonal movements north along the coast occur during the warmer months, are likely directed by the presence of prey (Hayes et al. 2018b). Targeted prey species vary by area, season, and stock; however, sciaenid fishes, such as Atlantic croaker, weakfish, and squid, are common (NOAA 2022a). The NEFSC and Southeast Fisheries Science Center (SEFSC) observed bottlenose dolphins along the Atlantic coast during the AMAPPS surveys (NEFSC and SEFSC 2011a, 2011b, 2012, 2014a, 2014b, 2015, 2016, 2018, 2019, 2022).

Bottlenose dolphins were the most frequently observed species during the Geo-Marine (2010) study period. A total of 319 bottlenose dolphins with group sizes averaging 15.3 animals were detected offshore of New Jersey (Geo-Marine 2010). Several other monitoring efforts recorded sightings of this species during geophysical surveys in the potential windfarm sites (including the Survey Area) off the coast of Delaware and southeast of Atlantic City (Geo-Marine 2009a, 2009b; BOEM 2012a). Bottlenose dolphins have been present annually near and offshore of New Jersey; with greater sightings during spring and summer months

(Geo-Marine 2010). The coastal stock is more likely to be present northward in the summer and fall as opposed to the offshore stock which has a higher propensity to be seen within the New York Bight year-round (BOEM 2012a).

Abundance

The best available population estimate for the offshore stock is at 62,851 individuals and 6,639 for the coastal stock. Abundance estimates for the migratory stock is estimated via surveys occurring north of Assateague Island, Virgina and south of Sandy Hook, New Jersey (Hayes et al. 2023). Current population estimates indicate there is no significant trend in abundance for either stock. Total annual human-caused and fisheries mortality and serious injury is estimated as 28 individuals for the offshore stock and 21.5 at the top end of the range for the migratory stock (from 2016-2020) (Hayes et al. 2023).

Status

The offshore stock of bottlenose dolphin is not listed as threatened or endangered under the ESA or designated as a strategic stock under the MMPA (Hayes et al. 2018b). The coastal stock is not listed as threatened or endangered under the ESA but is designated as strategic under the MMPA due to its designation as depleted.

4.1.5 Short-Beaked Common Dolphin (*Delphinus delphis*) – Non-Strategic

Short-beaked common dolphins (*Delphinus delphis*) are one of the most widely distributed cetaceans and occur in temperate, tropical, and subtropical regions (Jefferson et al. 2008). Short-beaked common dolphins typically measure 6 feet (2 meters) in length and have a dark gray dorsal “cape” that extends along the back of the head. Forward of the dorsal fin, a yellow/tan panel contrasts the dark cape. (NOAA Fisheries 2022a). This species feeds on schooling fish and squid found near the surface at night (NOAA Fisheries 2022a). Short-beaked common dolphins are in the mid-frequency functional hearing group. Their vocalizations range from 300 Hz to 44 kHz (Southall et al. 2007).

Distribution

Short-beaked common dolphins within the U.S. Atlantic EEZ belong to the Western North Atlantic stock, generally occurring from Cape Hatteras to the Scotian Shelf (Hayes et al. 2020). Short-beaked common dolphins are a highly seasonal, migratory species. Within the U.S. Atlantic EEZ, this species is distributed along the continental shelf and is associated with Gulf Stream features (CeTAP 1982, Selzer and Payne 1988, Hamazaki 2002, Hayes et al. 2019). Short-beaked common dolphins occur from Cape Hatteras northeast to Georges Bank (35° to 42°N) during mid-January to May and move as far north as the Scotian Shelf from mid-summer to fall (Selzer and Payne 1988). Migration onto the Scotian Shelf and continental shelf off Newfoundland occurs when water temperatures exceed 51.8° Fahrenheit (11° Celsius) (Sergeant et al. 1970, Gowans and Whitehead 1995). Breeding usually takes place between June and September, with females estimated to have a calving interval of two to three years (Hayes et al. 2019).

There have been numerous sightings of short-beaked common dolphins throughout the New York and Mid-Atlantic Bights (Hamazaki 2002, BOEM 2012a, BOEM 2016). Generally, this species has been documented out to 20 nautical miles (>37 kilometers), near the shelf break within the months of February, May, and July; however, they have been sighted throughout the year (Geo-Marine 2010). Short-beaked common dolphins are most common at the surface and are regularly observed in large groups consisting of hundreds of animals (NOAA Fisheries 2022a). Evidence of their presence in the Mid-Atlantic Bight and New York Bight

has been documented during New Jersey's Baseline Ecological Studies, which recorded a total of 32 short-beaked common dolphins between January 2008 and December 2009 (Geo-Marine 2010). Additionally, documented strandings along the eastern cost of the United States indicate the species presence. Strandings of short-beaked common dolphin from 2015 to 2019 occurred as far north as New Hampshire and as far south as North Carolina; however, the states with the highest number of strandings include Massachusetts (429 strandings), New York (41 strandings), and Rhode Island (25 strandings) (Hayes et al. 2022).

Abundance

The best abundance estimate for the western North Atlantic stock of common dolphins is 172,974 individuals (Hayes et al. 2023). The average annual estimated human-caused mortality and serious injury between 2016 to 2020 was 390 animals (Hayes et al. 2023).

Status

Short-beaked common dolphins are not listed as threatened or endangered under the ESA or designated as a strategic stock under the MMPA.

4.1.6 Atlantic White-Sided Dolphin (*Lagenorhynchus acutus*) – Non-Strategic

Atlantic white-sided dolphins are common in temperate waters of the western North Atlantic. They have a distinctive yellowish-tan patch near their fluke and white patches below the dorsal fin and ventral sides, on both sides of their long, slender bodies. These dolphins grow up to 9 feet (2.7 meters) in length and weigh between 400 and 500 pounds as adults. Like other dolphins, Atlantic white-sided dolphins communicate vocally and non-vocally through signals. They produce burst-pulse sounds and echolocation clicks and whistles (Popper 1980).

Distribution

Atlantic white-sided dolphins observed off the U.S. Atlantic coast are part of the Western North Atlantic Stock (Hayes et al. 2019). This stock inhabits waters from central West Greenland to North Carolina (about 35°N), primarily in continental shelf waters to the 328 feet (100 meters) depth contour (Doksæter et al. 2008). Sighting data indicate seasonal shifts in distribution (Northridge et al. 1997). From January to May, low numbers of Atlantic white-sided dolphins are found from Georges Bank to Jeffreys Ledge (off New Hampshire). From June through September, large numbers of Atlantic white-sided dolphins are found from Georges Bank to the lower Bay of Fundy. From October to December, they occur at intermediate densities from southern Georges Bank to the southern Gulf of Maine (Payne and Heinemann 1990). No critical habitat areas are designated for the Atlantic white-sided dolphin.

Atlantic white-sided dolphin sightings are not commonly sighted in the New York or Mid-Atlantic Bights. Within the New York Bight, occasional sightings have been documented during fall months (BOEM 2016). Sightings of white-sided dolphins in the Mid Atlantic Bight are also rare. Data suggests that the few documented sightings of the species that have occurred in the region are likely the result of wandering individuals (BOEM 2012a). Additionally, during the New Jersey Department of Environmental Protection's (NJDEP's) Ecological Baseline Studies (Geo-Marine 2010), no Atlantic white-sided dolphins were observed. Given this data the Atlantic white-sided dolphin is unlikely to be present in the Survey Area.

Abundance

The best available abundance estimate for the Western North Atlantic stock of Atlantic white-sided dolphins is 93,233 individuals, resulting from surveys conducted in 2016 (Hayes et al. 2022) covering nearly entire North Atlantic stock: all of the Gulf of Maine and Gulf of St. Lawrence populations and part of the Labrador population (Hayes et al. 2022).

Status

The Atlantic white-sided dolphin is not listed as threatened or endangered under the ESA, and the Western North Atlantic stock of Atlantic white-sided dolphins is not classified as strategic under the MMPA.

4.1.7 Atlantic Spotted Dolphin (*Stenella frontalis*) – Non-Strategic

Atlantic spotted dolphins have a robust body with a curved, tall dorsal fin and moderately long beaks (NOAA Fisheries 2022a). This species can range in length from 5 to 7.5 feet (1.5 to 2.3 meters) long and weigh between 220 and 315 pounds (NOAA Fisheries 2022a). There are two species of spotted dolphin in the Atlantic Ocean, the Atlantic spotted dolphin (*Stenella frontalis*) and the pantropical spotted dolphin (*S. attenuata*) (Perrin et al. 1987). In addition, two forms of the Atlantic spotted dolphin exist: one that is large and heavily spotted and usually inhabits the continental shelf, and one that is smaller in size with less spots (Fulling et al. 2003; Mullin and Fulling 2003, 2004; Viricel and Rosel 2014). The Atlantic spotted dolphin diet consists of a wide variety of fish and squid, as well as benthic invertebrates (Herzing 1997). Its hearing is in the mid-frequency range (Southall et al. 2007).

Distribution

The western North Atlantic stock of the Atlantic spotted dolphin can be found from southern New England to the Gulf of Mexico and Venezuela; however, they typically prefer tropical, sub-tropical and warm temperate waters along the continental shelf (NOAA 2022a). In the northern portion of their range, they may be found in deeper waters (NOAA 2022a). Based on shipboard and aerial surveys conducted by the NEFSC and SEFSC, Atlantic spotted dolphin presence in the New York and Mid Atlantic Bights is generally concentrated in deeper waters of the continental shelf and continental slope waters (NOAA Fisheries 2020); however, presence of this species in shallower waters increases in southern latitudes (NOAA Fisheries 2020). Therefore, presence of the Atlantic spotted dolphin is most likely to occur in the southern portion of the Survey Area, if present at all (BOEM 2016, NEFSC and SEFSC 2022).

Abundance

The best population estimate for the Atlantic spotted dolphin is approximately 39,921 individuals and potential biological removal (PBR) of 320 for the combined offshore and coastal forms. (Hayes et al. 2023). From 2013 to 2017, no fishery-related mortality or serious injury was reported, however 21 strandings were reported along the coastline from North Carolina to Florida (NOAA Fisheries 2023b).

Status

Atlantic spotted dolphin is not listed as threatened or endangered under the ESA or designated as a strategic stock under the MMPA.

4.1.8 Risso's Dolphin (*Grampus griseus*) – Non-Strategic

Risso's dolphins occur worldwide in both tropical and temperate waters (Jefferson et al. 2008, Jefferson et al. 2014). This species of dolphin attains a body length of approximately 9 to 13 feet (2.6 to 4 meters) (NOAA Fisheries 2022a), a narrow tailstock, and a whitish or gray body. Risso's dolphins form groups ranging from 10 to 30 individuals (NOAA Fisheries 2022a). They feed primarily on squid as well as fish, such as anchovies, krill, and other cephalopods (NOAA Fisheries 2022a). Risso's dolphins are in the mid-

frequency functional hearing group, with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al. 2007). Vocalizations range from 400 Hz to 65 kHz (DoN 2008).

Distribution

Risso's dolphins within the U.S. Atlantic EEZ are part of the Western North Atlantic stock. The Western North Atlantic stock of Risso's dolphins inhabits waters from Florida to eastern Newfoundland (Leatherwood et al. 1976; Baird and Stacey 1991). During spring, summer, and fall, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank (CeTAP 1982; Payne et al. 1984). In winter, the distribution extends farther offshore (Payne et al. 1984) within the Mid-Atlantic Bight; however, little is known about movement and migration patterns, and they are infrequently observed in shelf waters.

Based on NEFSC and SEFSC shipboard and aerial surveys, Risso's dolphins have been observed in the waters of the New York and Mid Atlantic Bight (Hayes et al. 2022). Many of these observations occur in deep waters of the continental shelf, rather than nearshore waters (Hayes et al. 2022). Sightings of this species have been primarily documented on the shelf break off of New Jersey (DiGiovanni et al. 2005) and New York (BOEM 2016). This species is generally expected to occur in waters deeper than the Survey Area; however, one Risso's dolphin observation was recorded during Atlantic Shores 2020 geophysical campaign in the vicinity of the Survey Area.

Abundance

The best abundance estimate for Risso's dolphins is 35,215 individuals, calculated from surveys conducted by the NEFSC and Department of Fisheries and Oceans Canada (Hayes et al. 2022). Estimates of population trend or net productivity rates have not been calculated for Risso's dolphins. Annual average estimated human-caused mortality or serious injury from 2015 to 2019 was 35 dolphins, most of which was likely due to interactions with fisheries (Hayes et al. 2022).

Status

Risso's dolphins are not listed as threatened or endangered under the ESA or designated as a strategic stock under the MMPA.

4.2 Baleen Whales (Mysticeti)

4.2.1 North Atlantic Right Whale (*Eubalaena glacialis*) – Endangered

North Atlantic right whales (NARW) are among the most endangered of all marine mammal species in the Atlantic Ocean. The average adult NARW can grow to approximately 50 feet (15 meters) in length, while calves are typically 14 feet (4 meters) at birth (NOAA Fisheries 2023c). Members of this species have stocky, black bodies with no dorsal fin, and bumpy, coarse patches of skin on their heads called callosities. NARWs feed mostly on zooplankton and copepods belonging to the *Calanus* and *Pseudocalanus* genera (Hayes et al. 2022). They are slow-moving grazers that feed on dense concentrations of prey at or below the water's surface, as well as at depth (NOAA Fisheries 2023c). Female whales become sexually mature at about age ten and carry a single calf during a year-long gestation period every six to ten years. The life span of NARW is estimated at 70 years, based on the estimated age of found deceased right whales and other closely related species (NOAA Fisheries 2023c).

NARWs are low-frequency cetaceans that vocalize using several distinctive call types, most of which have peak acoustic energy below 500 Hz. Most vocalizations do not go above 4 kHz (Matthews et al. 2014). One typical right whale vocalization is the “up call”: a short sweep that rises from roughly 50 to 440 Hz over a period of two seconds. These up calls are characteristic of the NARW and are used by research and monitoring programs to determine species presence. A characteristic “gunshot” call is believed to be produced by male NARWs. These pulses can have sound levels of 174 to 192 dB re 1 µPa with frequency range from 50 to 2,000 Hz (Parks et al. 2005, Parks and Tyack 2005). Other tonal calls range from 20 to 1,000 Hz and have sound levels between 137 and 162 dB re 1 µPa.

Distribution

NARWs in U.S. waters belong to the Western stock. This stock ranges primarily from calving grounds in coastal waters of the southeastern U.S. to feeding grounds in New England waters and the Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence (Hayes et al. 2022). Surveys indicate that there are seven areas where NARWs congregate seasonally: the coastal waters of the southeastern United States, the Great South Channel, Jordan Basin, Georges Basin along the northeastern edge of Georges Bank, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Roseway Basin on the Scotian Shelf (Hayes et al. 2018b). NOAA Fisheries has designated two critical habitat areas for the NARW under the ESA: off the coast of New England (foraging area) and off the southeast U.S. from North Carolina to Florida (calving area). These areas of critical habitat extend northward into the maritime provinces of Canada. Two additional critical habitat areas in Canadian waters, Grand Manan Basin and Roseway Basin, were identified in Canada’s final recovery strategy for the NARW (Brown et al. 2009). A study by Davis et al. (2017) compiled detections from a large number of passive acoustic devices and results indicated that NARW likely utilize much more of the Atlantic Seaboard than previously believed. Further, there has been an apparent shift in habitat use patterns (Davis et al. 2017), which includes an increased use of Cape Cod Bay (Mayo et al. 2018) and decreased use of the Great South Channel. Movements within and between habitats are extensive (Hayes et al. 2023), and there is a high interannual variability in NARW use of some habitats (Pendleton et al. 2009).

A shift in habitat-use patterns was highlighted in 2010 during an analysis of right whale acoustic presence in the western North Atlantic from 2004 to 2014 (Davis et al. 2017) and confirmed via visual survey data in the greater Gulf of Maine region. Between 2012 and 2016, visual surveys detected fewer individuals in the Great South Channel (NMFS unpublished data) and the Bay of Fundy (Davies et al. 2019), while the number of individuals using Cape Cod Bay in spring increased (Mayo et al. 2018; Ganley et al. 2019). In addition, NARW apparently abandoned the central Gulf of Maine in winter (see Cole et al. 2013), but have since been seen in large numbers, and both feeding and socializing observed, in a region south of Martha’s Vineyard and Nantucket Islands (Leiter et al. 2017; Stone et al. 2017; Quintana-Rizzo et al. 2021), an area outside of the 2016 Northeastern U.S. Foraging Area Critical Habitat. Right whale presence in this area is nearly year-round, including in summer months. The highest sighting rates are from winter through early spring; close to a quarter of the population may be present at any given time between December and May.

The NARW is a migratory species that travels from high-latitude feeding waters to low-latitude calving and breeding grounds, though this species has been observed feeding in winter in the Mid-Atlantic region and has been recorded off the coast of the Mid-Atlantic in all months of the year (Whitt et al. 2013) and Virginia (Salisbury et al. 2016). Figure 4-1 illustrates the NARW migration corridor with respect to the Survey Area. NARWs are expected to be present in the Survey Area during winter, with another smaller peak in spring, ranging elsewhere for their main feeding and breeding/calving activities (Geo-Marine 2010). NARWs

typically occupy coastal and shelf waters within 48 nautical miles (90 kilometers) of the shoreline; however, they have been observed as far as 76 nautical miles (140 kilometers) offshore. These whales undertake a seasonal migration from their northeast feeding grounds (generally spring, summer, and fall habitats) south along the eastern U.S. coast to their calving grounds in the waters of the southeastern U.S. (Kenney and Vigness-Raposa 2010). The Survey Area is located within the NARW migration Biologically Important Area (BIA). NARWs are usually observed in groups of fewer than 12 individuals, and most often as single individuals or pairs. Larger groups may be observed in feeding or breeding areas (Jefferson et al. 2008). Migrating NARWs have been detected acoustically in the New York Bight from February to May and then again in August through December (Biedron et al. 2009).

Historically, there have been several documented sightings of NARW off the coast of New Jersey and surrounding waters (CETAP 1982l Knowlton and Kraus 2001; Biedron et al. 2009). These waters are important migratory routes for NARW as this species travels between feeding areas and breeding/calving grounds off the southeastern U.S. (NOAA Fisheries 2023c). Satellite-monitored radio tags on a NARW cow and calf documented the migratory route of this pair from the Bay of Fundy to New Jersey and back during a six-week period (Knowlton et al. 2002). A few NARW sightings were documented in the southern portion of the Survey Area near the Delaware Bay in October, December, May, and July (Knowlton et al. 2002). Other visual recordings of NARW were found in New Jersey waters during the spring and fall seasons (CETAP 1982). It has been noted, however, that NARW sightings in several traditional feeding habitats have been declining, causing speculation that a shift in NARW habitat usage may be occurring (Pettis et al. 2021).

The NEFSC and SEFSC AMAPPS III abundance surveys conducted in 2021 documented two single NARW in the northeast study area, with one sighting occurring south of Long Island near Hudson Canyon in nearly 200 meters of water significantly further east of the Survey Area and the other occurring southeast of Nantucket. Geo-Marine (2010) observed NARWs offshore of New Jersey during all seasons; except for summer. NARWs detected in the Geo-Marine (2010) study area off the coast of New Jersey were seen as single animals or pairs. These sightings occurred within water depths from 56 to 85 feet (17 to 26 meters) with distances from shore ranging from 10.7 to 17.2 nautical miles (19.9 to 31.9 kilometers). A January 2009 sighting documented two adult males offshore of Barnegat Light in the northernmost portion of the Geo-Marine (2010) study area. In May 2008, a cow-calf pair were documented in waters (56 feet [17 meters] isobath) southeast of Atlantic City (Geo-Marine 2010; M. Zani, New England Aquarium, pers. comm. 6 January 2020). North Atlantic right whales are likely to occur within the Survey Area specifically in late fall, winter and spring months (BOEM 2012a).

Abundance

The population of the western Atlantic NARW stock has been in decline since 2011, with a current population estimate of 338 individuals (Hayes et al. 2023). The current population growth rate is currently unknown. The population growth rate between 1986 and 1992 was 2.5%, as average calves born per year between 1990 to 2017 was 16 and ranged from one to thirty-nine per year. In more recent years, female production has fallen, likely a result of lower female survival rate. According to Hayes et.al. (2023) there were 17 right whale mortalities reported in 2017 (Daoust et al. 2017). This number exceeds the largest estimated annual mortality rate during the past 25 years. Further, despite high survey effort, only 5 and 0 calves were detected in 2017 and 2018, respectively. In 2019, 7 calves were identified, and in 2020 10 calves were documented (Pettis et al. 2021). For the period 2016 through 2020, the annual detected (i.e., observed) human-caused mortality and serious injury to right whales averaged 8.1 individuals per year.

This is derived from incidental fishery entanglement records at 5.7 per year, and vessel strike records averaging 2.4 per year (Hayes et.al. 2023). To address potential for ship strike, NOAA Fisheries designated the nearshore waters of the Mid-Atlantic Bight as the Mid-Atlantic U.S. Seasonal Management Area (SMA) for NARW (see Figure 4-1).

Status

The NARW was listed as a federally endangered species in 1970 and remains critically endangered throughout its range. In addition to its endangered status, the high rate of annual human-related mortality classifies NARW as a strategic stock under the MMPA. An unusual mortality event (UME) was established for NARWs in June 2017. Since the UME declaration in 2017, there have been 36 documented deaths, 34 documented seriously injured free-swimming whales and 45 documented whales with morbidity (sublethal injury or illness) as of 2023 (NOAA Fisheries 2023e).

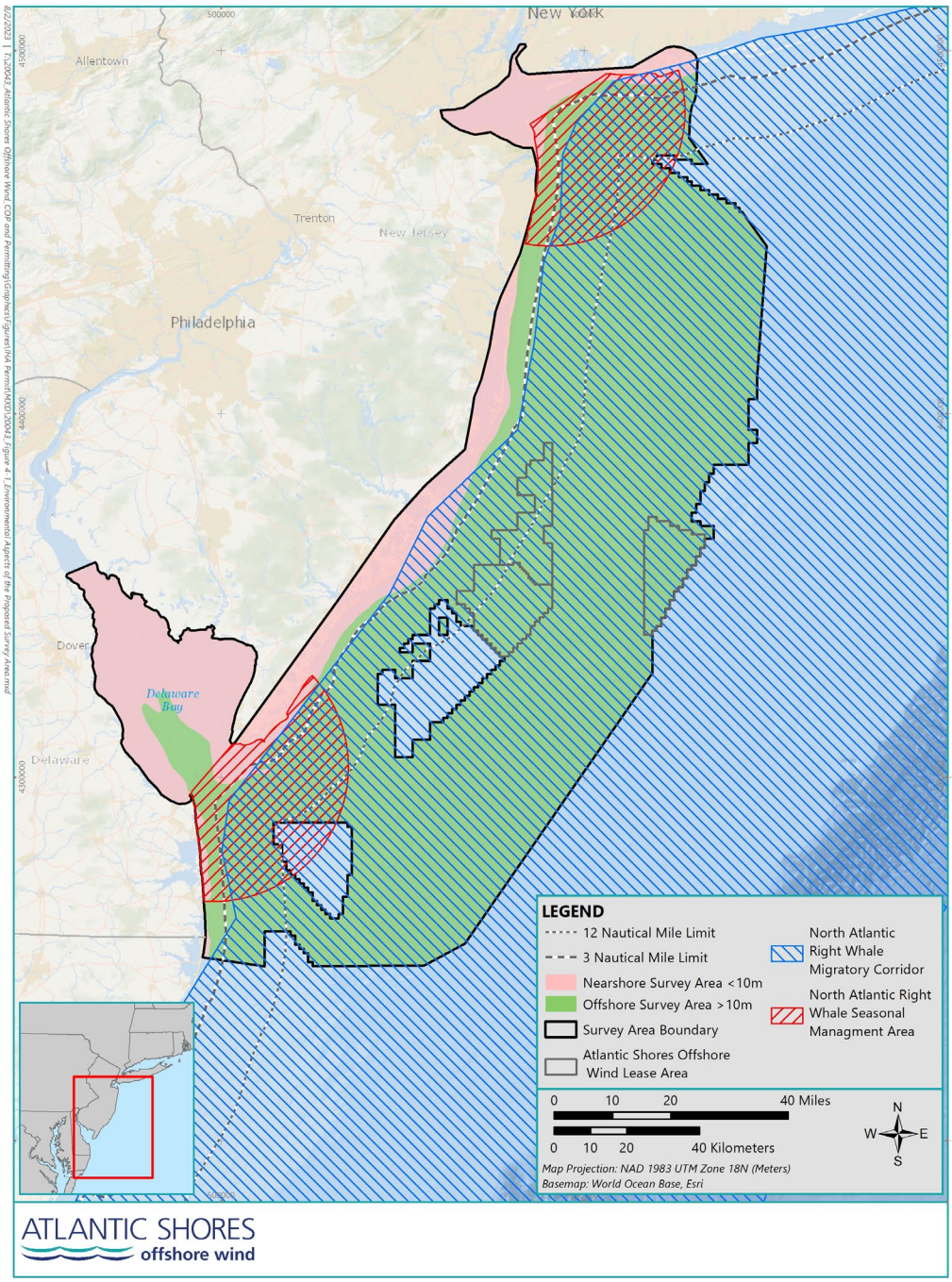

Figure 4-1 NARW Migration Corridor and Management Areas Near the Future Offshore Wind Development of Lease Areas OCS-A-0499, OCS-A 0541, OCS-A 0549

4.2.2 Fin Whale (*Balaenoptera physalus*) – Endangered

Fin whales are the second largest species of baleen whale that occur in the northern hemisphere, with a maximum length of 85 feet (25.9 meters) (NOAA Fisheries 2022a). These whales have a sleek, streamlined

body with a V-shaped head that makes them fast swimmers. Fin whales have a distinctive coloration pattern: the dorsal and lateral sides of their bodies are black or dark brownish-gray while the ventral surface is white. The lower jaw is dark on the left side and white on the right side. Fin whales feed on krill (*Euphausiacea*), small schooling fish (e.g., herring [*Clupea harengus*], capelin [*Mallotus villosus*], sand lance [*Ammodytidae* spp.]), and squid (*Teuthida* spp.) by lunging into schools of prey with their mouths open (Kenney and Vigness-Raposa 2010). Fin whales are low-frequency cetaceans producing short duration down sweep calls between 15 and 30 Hz, typically termed "20-Hz pulses," as well as other signals up to 1 kilohertz (kHz) (Southall et al. 2019). The sound level (SL) of fin whale vocalizations can reach 186 dB re 1 µPa, making them one of the most powerful biological sounds in the ocean (Charif et al. 2002).

Distribution

Fin whales found offshore of the U.S. Atlantic, Nova Scotia, and southeastern coast of Newfoundland are believed to constitute a single stock under the present International Whaling Commission (IWC) management scheme (Donovan 1991), which has been named the western North Atlantic stock. The current understanding of stock boundaries, however, remains uncertain (Hayes et al. 2022). The range of fin whales in the western North Atlantic extends from the Gulf of Mexico and Caribbean Sea to the southeastern coast of Newfoundland. Fin whales are common in waters of the U.S. Atlantic EEZ, principally from Cape Hatteras northward. There is evidence that fin whales are present year-round throughout much of the U.S. EEZ north of 30° N, but the density of individuals in any one area changes seasonally (NOAA Fisheries 2022a; Hayes et al. 2022). Fin whales are the most commonly observed large whales in continental shelf waters from the Mid-Atlantic coast of the U.S. to Nova Scotia (Sergeant 1977; Sutcliffe and Brodie 1977; CeTAP 1982; Hain et al. 1992), and were the most common baleen whale species detected in an ecological baseline survey conducted in coastal New Jersey waters, which surveyed an area that encompassed 97% of the New Jersey Wind Energy Area (Geo-Marine 2010; BOEM 2012b). Fin whales are the dominant large cetacean species during all seasons from Cape Hatteras to Nova Scotia, having the largest standing stock, the largest food requirements; therefore, the largest influence on ecosystem processes of any baleen whale species (Hain et al. 1992; Kenney et al. 1997).

Fin whales have a high multi-seasonal relative abundance in Mid-Atlantic Bight, and surrounding areas (CETAP 1982). During the Geo-Marine (2010) survey, conducted off the coast of New Jersey, the highest number of sightings were documented during winter and summer. Within the study area, group size ranged from one to four animals with a mean distance from shore of 20 kilometers and a mean water depth of 21.5 meters (Geo-Marine 2010). One calf was observed with an adult fin whale in the area (Geo-Marine 2010). There were mixed aggregations of feeding humpbacks during fin whale sightings, and with the presence of known prey species, it is possible that fin whales use this area to feed (Geo-Marine 2010). Fin whales were the second most common baleen whale species detected during 2021 NEFSC and SEFSC surveys including surveys of other animals' groups such as birds. Detections generally occurred further north and east of the Survey Area towards Georges Bank and the shelf break (NEFSC and SEFSC 2022).

While fin whales typically feed in the Gulf of Maine and the waters surrounding New England, their mating and calving (and general wintering) areas are largely unknown (Hain et al. 1992; Hayes et al. 2022). Acoustic detections of fin whale singers augment and confirm these visual sighting conclusions for males. Recordings from Massachusetts Bay, New York Bight, and deep-ocean areas have detected some level of fin whale singing from September through June (Watkins et al. 1987; Clark and Gagnon 2002; Morano et al. 2012). These acoustic observations from both coastal and deep-ocean regions support the conclusion that male fin whales are broadly distributed throughout the western North Atlantic for most of the year

(Hayes et al. 2022). It is likely that fin whales occurring within the U.S. Atlantic EEZ undergo migrations into Canadian waters, open-ocean areas, and perhaps even subtropical or tropical regions; however, the popular notion that entire fin whale populations make distinct annual migrations like some other mysticetes has questionable support (Hayes et al. 2022). Based on an analysis of neonate stranding data, Hain et al. (1992) suggest that calving occurs during October to January in latitudes of the U.S. Mid-Atlantic region.

Low-frequency vocalizing fin whale pulses were detected in the northern and eastern range of the NJDEP Ecological Baseline Studies study area (i.e., off the coast of New Jersey) where shelf waters are typically deeper (Geo-Marine 2010). Fin whales were acoustically detected on 281 days from March 2008 to October 2009 and documented in every month of acoustic recording indicating a lack of seasonal trends (Geo-Marine 2010). As the detection range for fin whale vocalizations is more than 108 nautical miles (200 kilometers), detected signals may have originated from areas far outside of the study area; however, the acoustic presence suggest that this species can be found regularly along the New Jersey outer continental shelf (Geo-Marine 2010). Additionally, acoustic data from 2015- 2019 showed detections of fin whales at all sites along the U.S. Atlantic coast including: Nantucket Canyon, Babylon Canyon, and Wilmington Canyon, all of which occur along the shelf break further indicating the presence of fin whales is higher east of the Survey Area (NEFSC and SEFSC 2022). Therefore, fin whale presence could occur in the Survey Area; however, based on known habitat preferences and acoustic data, it is likely that they inhabit waters deeper than those of the Survey Area.

Abundance

The best available abundance estimate for the western North Atlantic fin whale stock in U.S. waters from NOAA Fisheries stock assessments is 6,802 individuals (Hayes et al. 2022). Current and maximum net productivity rates and population trends are unknown for this stock due to relatively imprecise abundance estimates and variable survey design (Hayes et al. 2022). From 2013 to 2017, the minimum human-caused mortality rate was approximately two whales per year, caused by incidental fishery interactions and vessel collisions; however, this estimate is biased low due to haphazard detections of carcasses (Hayes et al. 2022). PBR for fin whales was calculated based on the most recent SAR (Hayes et al. 2022), while the most recent density data from Roberts et al. (2018) were used to calculate the number of animals potentially exposed to threshold levels of sound.

Status

The fin whale is federally listed under the ESA as an endangered marine mammal and are designated as a strategic stock under the MMPA due to their endangered status under the ESA, uncertain human-caused mortality, and incomplete survey coverage of the stock's defined range.

4.2.3 Sei Whale (*Balaenoptera borealis*) – Nova Scotia Stock – Endangered

Sei whales can reach lengths of approximately 39 to 59 feet (12 to 18 meters) (NOAA Fisheries 2023c). This species has a long, sleek body that is dark bluish gray to black in color and pale underneath (NOAA Fisheries 2023c). Their diet is comprised primarily of plankton including krill and copepods, schooling fish, and cephalopods. Sei whales generally travel in small groups (two to five individuals), but larger groups are observed on feeding grounds (NOAA Fisheries 2023c).

Sei whales, like all baleen whales, are categorized as low-frequency cetaceans. There are limited confirmed sei whale vocalizations; however, studies indicate that this species produces several, mainly low-frequency

(less than 1,000 Hz) vocalizations. Calls attributed to sei whales include pulse trains up to 3 kHz, broadband "growl" and "whoosh" sounds between 100 and 600 Hz, tonal calls, and upsweeps between 200 and 600 Hz, and down sweeps between 34 and 100 Hz (McDonald et al. 2005; Rankin and Barlow 2007; Baumgartner et al. 2008).

Distribution

The stock that occurs within the U.S. Atlantic EEZ is the Nova Scotia stock, which ranges along the continental shelf waters of the northeastern United States to Newfoundland (Hayes et al. 2022). Sei whales are relatively widespread. Sighting data suggest sei whale distribution is largely centered in the waters of New England and eastern Canada (Roberts et al. 2016a; Hayes et al. 2022). There appears to be a strong seasonal component to sei whale distribution, and they are most abundant in adjacent waters near the continental shelf from winter to spring (Roberts et al. 2016a). This general offshore pattern of sei whale distribution is disrupted during episodic incursions into more shallow and inshore waters (Hayes et al. 2017). In years of reduced predation on copepods by other predators, and thus greater abundance of this prey source, sei whales are reported in more inshore locations, such as the Great South Channel (1987 and 1989) and Stellwagen Bank (1986) areas (Payne and Heinemann 1990, Waring et al. 2016). An influx of sei whales into the southern Gulf of Maine occurred in summer 1986 (Schilling et al. 1992). Such episodes, often punctuated by years or even decades of absence from an area, have been reported for sei whales from various places worldwide.

There has been little detection of sei whales within the Mid-Atlantic and surrounding waters (Kenney et al. 1985, Geo-Marine 2010, BOEM 2012a). Sightings within the Mid-Atlantic and New York Bights indicate a higher presence of individuals further east of the Survey Area, on, or near the shelf edge (BOEM 2012a, 2016). Recent acoustic data within or near the Survey Area is limited; however, acoustic data from 2018-2019 showed frequent detections at sites such as: Nantucket Canyon, Babylon Canyon, and Wilmington Canyon, all of which occur along the shelf break, further suggesting that the presence of sei whales primarily occurs in deeper waters east of the Survey Area (NEFSC and SEFSC 2022).

Abundance

The best available abundance estimate for the Nova Scotia stock of sei whales from NOAA Fisheries stock assessments is 6,292 individuals (Hayes et al. 2022). This estimate is considered uncertain because the full known range of the stock was not surveyed, the estimate did not include availability-bias correction for submerged animals, and there was uncertainty regarding population structure (Hayes et al. 2022).

Status

Sei whales are listed as endangered under the ESA and the Nova Scotia stock is considered strategic by NOAA Fisheries under the MMPA. No critical habitat areas are designated for the sei whale under the ESA. A BIA for feeding for sei whales occurs north of Survey Area in the Gulf of Maine from May through November (LaBrecque et al. 2015).

4.2.4 Humpback Whale (*Megaptera novaeangliae*) – Non-Strategic for Gulf of Maine Stock/West Indies Distinct Population Segment

Humpback whale body coloration is primarily dark gray, but individuals have a variable amount of white on their pectoral fins, belly, and flukes. These distinct coloration patterns are used by scientists to identify individuals. This baleen whale species feeds on small prey often found in large concentrations, including

krill and fish such as herring and sand lance (Kenney and Vigness-Raposa 2010). Humpback whales use unique behaviors, including lunge feeding, bubble nets, bubble clouds, and flicking of their flukes and fins, to herd and capture prey (NOAA Fisheries 2023c). Humpback whale females are larger than males and can reach lengths of up to 59 feet (18 meters) (NOAA Fisheries 2023c) and reach sexual maturity between the ages four and ten with females producing a single calf every two to three years.

Humpback whales are low-frequency cetaceans but have one of the most varied vocal repertoires of the baleen whales. Male humpbacks will arrange vocalizations into a complex, repetitive sequence to produce a characteristic "song". Songs are variable but typically occupy frequency bands between 300 and 3,000 Hz and last upwards of 10 minutes. Songs are predominately produced while on breeding grounds; however, they have been recorded on feeding grounds throughout the year (Clark and Clapham 2004, Vu et al. 2012). Typical feeding calls are centered at 500 Hz with some other calls and songs reaching 20 kHz. Common humpback calls also contain series of grunts between 25 and 1,900 Hz as well as strong, low-frequency pulses (with sound levels up to 176 dB re 1 µPa) between 25 and 90 Hz (Clark and Clapham 2004, Vu et al. 2012).

Distribution

Humpback whales are a cosmopolitan species and widely distributed in the Western Atlantic. Most humpback whales that inhabit the waters within the U.S. Atlantic EEZ belong to the Gulf of Maine stock, formerly called the western North Atlantic stock. Humpback whales in the Gulf of Maine stock typically feed in the waters between the Gulf of Maine and Newfoundland during spring, summer, and fall, but they have been observed feeding in other areas, such as off the coast of New York (Sieswerda et al. 2015). Humpback whales from most feeding areas, including the Gulf of Maine, migrate to the West Indies (including the Antilles, Dominican Republic, Virgin Islands, and Puerto Rico) in winter, where they mate and calve their young (Katona and Beard 1990, Palsbøll et al. 1997). There have been several wintertime humpback sightings in coastal waters of the eastern U.S., including 46 sightings of humpbacks in the New York-New Jersey Harbor Estuary documented between 2011 and 2016 (Brown et al. 2017). However, not all humpback whales from the Gulf of Maine stock migrate to the West Indies every winter because significant numbers of animals are observed in mid- and high-latitude regions at this time (Swingle et al. 1993).

Humpback whales are known to occur regularly throughout the Mid-Atlantic Bight waters (Geo-Marine 2010, BOEM 2016). The occurrence of this population is strongly seasonal with most observations occurring during the spring and fall, with a peak from April to June (Geo-Marine 2010, Curtice et al. 2019). Sightings of humpback whales during the NJDEP Ecological Baseline Study surveys, which occurred off the coast of New Jesey, resulted in observed group sizes of single animals or pairs with a mean distance from shore of 9.9 nautical miles (18.4 kilometers) and a mean depth of 67 feet (20.5 meters) (Geo-Marine 2010). Acoustic data gathered east of Long Island indicate that this species may be present within the surrounding areas year-round, with the highest rates of acoustic detections in adjacent waters in winter and spring (Kraus et al. 2016). Acoustic data gathered all along the Atlantic east coast from June 2018 - June 2019 showed detections at all study sites along the U.S. Atlantic Coast including sites such as Nantucket Canyon, Babylon Canyon, and Wilmington Canyon, all of which occur along the shelf break in the northeast Atlantic, farther east of the Survey Area (NEFSC and SEFSC 2022). Additional studies from the NEFSC and SEFSC between 1995 and 2016 showed humpback whales concentrations to primarily occur north of Virginia, with many sightings occurring in deep waters of the continental shelf (Hayes 2020). However, humpback whales have also been observed feeding off the coast of New Jersey with juveniles exhibiting feeding behavior just south of New Jersey near the mouth of the Chesapeake Bay (Swingle et al. 1993). Additionally, sightings

of a cow-calf pair nearshore in northern New Jersey suggest that the nearshore waters off New Jersey may provide important feeding and nursery habitats for humpback whales (Geo-Marine 2010). Humpback whales are likely to be present within the Survey Area (BOEM 2012a, 2016).

Abundance

The Gulf of Maine humpback whale stock consists of approximately 1,396 whales and is characterized by a positive trend in abundance with a maximum annual production rate estimate of 6.5% (Barlow and Clapham 1997, Hayes et al. 2021). The most significant anthropogenic causes of mortality to humpback whales remain incidental fishery entanglements, responsible for roughly eight whale mortalities, and vessel collisions, responsible for four mortalities both on average annually from 2013 to 2017 (Hayes et al. 2020).

Status

The humpback whale was listed under the ESA as endangered throughout its range until 2016 when NOAA Fisheries revised the listing and defined 14 distinct population segments (DPS) based on breeding populations. Under the final determination, the three DPSs that occur in U.S. waters are listed as threatened or endangered (81 FR 62259, September 8, 2016).

The Gulf of Maine stock is not considered depleted because it does not coincide with any ESA-listed DPS. The detected level of U.S. fishery-caused mortality and serious injury, derived from the available records, which is surely biased low, does not exceed the calculated PBR and, therefore, this is not a strategic stock (if the recovery factor is set at 0.5) (Hayes et al. 2019) under the MMPA. Humpback whales in the western North Atlantic have been experiencing a UME since January 2016 that appears to be related to a larger than usual number of vessel collisions (NOAA Fisheries 2023d). In total, 204 strandings were documented through August 11, 2023, as part of this event (NOAA Fisheries 2023d). A biologically important area (BIA) for humpback whales for feeding from March to December has been designated in the Gulf of Maine, Stellwagen Bank, and the Great South Channel; all of which are north of the Survey Area (LaBrecque et al. 2015).

4.2.5 Minke Whale (*Balaenoptera acutorostrata*) – Non-Strategic

Minke whales are a small baleen whale species reaching up to 35 feet (10.6 meters) in length (NOAA Fisheries 2022a). This species has a dark gray-to-black back and a white ventral surface (NOAA Fisheries 2022a). Its diet is comprised primarily of crustaceans, schooling fish, and copepods. Minke whales generally travel in small groups (one to three individuals), but larger groups have been observed on feeding grounds (NOAA Fisheries 2022a). Like other baleen whales, minke whales use low-frequency sounds to communicate with one another and to locate prey. They are believed to make mechanical sound calls and a variety of grunts, moans, and belches (Gedamke 2004).

Distribution

This species has a cosmopolitan distribution in temperate, tropical, and high latitude waters (Hayes et al. 2023). Common and widely distributed within the U.S. Atlantic EEZ, these whales are the third most abundant great whale (any of the larger marine mammals of the order Cetacea) within the U.S. Atlantic EEZ (CeTAP 1982). Minke whales within the U.S. Atlantic EEZ are considered part of the Canadian East Coast stock, which inhabits the area from the western half of the Davis Strait (45°W) to the Gulf of Mexico. It is uncertain if separate sub-stocks exist within the Canadian East Coast stock. Like many of the other pelagic baleen whales, minke whales conduct seasonal migrations between high latitude summer feeding

waters and low latitude winter breeding and calving grounds. Acoustic monitoring surveys indicate minke whales leave wintering grounds for their northern migrations from March through April and move south once again in mid-October through November (Risch et al. 2014).

Minke whales are most common in coastal Mid-Atlantic waters in the spring and early summer as they move north to feeding ground in New England and fall as they migrate south (Geo-Marine 2010). The NEFSC and SEFSC AMAPPS III Survey during the summer of 2021 documented 50 sightings of Minke whales, most concentrated in Georges Bank, east/southeast of Cape Cod with only individual documented within/near the Survey Area further confirming the migration patterns highlighted in Geo-Marine 2010. Minke whale sightings off the coast of New Jersey were within water depths of 36 to 79 feet (11 to 24 meters) and temperatures ranging from 5.4 to 11.5°C (47°F) (Geo-Marine 2010, BOEM 2012a) and therefore could be sighted within nearshore areas. Minke whales are likely to be present in the vicinity of the Survey Area as they move northward in the spring and southward in the fall with the potential for some individuals to be present in the Survey Area during the summer and spring months (BOEM 2012a, 2016).

Acoustic recordings of minke whales have been detected in northern portions of the Survey Area within the New York Bight during the fall (August to December) and winter (February to May) (Biedron et al. 2009). The expected occurrence of minke whales near the Survey Area is likely due to the availability of prey species, such as capelin, herring, mackerel, and sand lance in this region (Kenney et al. 1985, Horwood 1989). Based on habitat information and predictive habitat models, Hamazaki (2002) determined that minke whales are likely to occur in nearshore waters of the Mid-Atlantic.

Abundance

The best available abundance estimate for the Canadian East Coast minke whale stock is 21,968 individuals (Hayes et al. 2022). Current population trends and net productivity rates of minke whales in this region are currently unknown. The average annual minimum human-caused mortality is estimated to be an average of 10.35 whales per year between 2015-2019, with 9.5 caused by entanglement in fishing gear and 0.8 deaths caused by vessel strikes (Hayes et al. 2022).

Status

Minke whales are not listed as threatened or endangered under the ESA or designated as a strategic stock under the MMPA.

4.3 Earless Seals (Phocidae)

4.3.1 Harbor Seal (*Phoca vitulina*) – Non-Strategic

Adult harbor seals are not sexually dimorphic and both males and females are light gray to dark brown in color and typically reach 4.9 feet (1.5 meters) and 220 pounds in size with a 35-year lifespan (NOAA Fisheries 2022a). Harbor seals forage in both shallow coastal waters and deeper offshore waters, diving to target prey within the water column or on the seafloor (Tollit et al. 1997). Primary food sources vary with seasonal abundances of fish and crustaceans in the North and Mid-Atlantic coastal region, with the most numerous prey species including sand lance, silver hake, Atlantic Herring, and redfish (NOAA Fisheries 2022a).

Male harbor seals produce underwater vocalizations during mating season to attract females and defend territories. These calls are comprised of “growls” or “roars” with peak energy at 200 Hz (Sabinsky et al.

2017). Captive studies have shown that harbor seals have good (greater than 50%) sound detection thresholds between 0.1 and 80 kHz, with primary sound detection between 0.5 and 40 kHz (Kastelein et al. 2009).

Distribution

Harbor seals are found throughout coastal waters of the Atlantic Ocean and adjoining seas above 30° N and is the most abundant pinniped within the U.S. Atlantic EEZ (Hayes et al. 2019). Harbor seals are year-round inhabitants of the coastal waters of eastern Canada and Maine (Richardson and Rough 1993, Katona et.al. 1993) and occur seasonally from southern New England to Virginia coasts between September and late May (Schneider and Payne 1983, Barlas 1999, Schroeder 2000); however, they have been observed as far south as the Carolinas (Payne and Selzer 1989). The Western North Atlantic Stock may occupy waters of the New York and Mid-Atlantic Bights during seasonal migrations southward from the Bay of Fundy in the late autumn and winter (Rosenfeld et al. 1988, Whitman and Payne 1990, Jacobs and Terhune 2000, NOAA Fisheries 2022b; Palka et al. 2017). A northward movement from southern New England to Maine and eastern Canada takes place prior to the pupping season, which occurs from mid-May through June along the Maine coast (Richardson 1976, Wilson 1978, Whitman and Payne 1990, Kenney 1994). In addition to coastal waters, harbor seals utilize terrestrial habitat as haul-out sites throughout the year, but primarily during the pupping and molting periods, which occur from late spring to late summer in the northern portion of their range.

Though the species has been observed as far south as Virginia and the Carolinas, the majority of harbor seals are expected to be observed as south as New Jersey (BOEM 2012a). During NJDEP's Ecological Baseline Studies (Geo-Marine 2010), only one harbor seal was observed between January 2008 and December 2009. In addition to sighting data, known harbor and gray seal haul-outs are present along the New York coastline (Atlantic Marine Conservation Society 2023). Therefore, harbor seal presence could occur in the Survey Area and is most likely to occur within the coastal waters of New Jersey and New York.

Abundance

The best current abundance estimate for harbor seals is 61,336 individuals (CV = 0.08), estimated using both aerial photographs from haul-out sites along the coast of Maine in 2018 and was adjusted using correction factors from previous years. (Sigourney *et. al.* 2021, Hayes et al. 2021). Annual average estimated human-caused mortality and serious injury to harbor seals (from 2015 to 2019) is estimated to be 339 seals per year (Hayes et al. 2021), with death due to fisheries interactions accounting for most of the mortality events. Harbor seal mortality through bycatch is highest in the Northeast Sink Gillnet fishery between Boston, Massachusetts, and Maine. Death due to fisheries interactions in the Mid-Atlantic is significantly lower at 22 individuals for average annual mortality compared to 304 in the northeast. Increased abundance of seals in the northeast region has also been documented during aerial and boat surveys of overwintering haul-out sites from the Maine/New Hampshire border to eastern Long Island and New Jersey (Payne and Selzer 1989, Rough 1995, Barlas 1999, Hoover et al. 1999, Slocum et al. 1999, deHart 2002).

Status

The Western North Atlantic Stock of harbor seals is not considered strategic under the MMPA (Hayes et al. 2022).

4.3.2 Gray Seal (*Halichoerus grypus*) – Non-Strategic

Gray seals are large, reaching 7 to 10 feet (2 to 3 meters) in length, and have a silver-gray coat with scattered dark spots (NOAA Fisheries 2022a). These seals are generally gregarious and live in loose colonies while breeding (Jefferson et al. 2008). Though they spend most of their time in coastal waters, gray seals can dive to depths of 984 feet (300 meters) and frequently forage on the OCS (Lesage and Hammill 2001, Jefferson et al. 2008). These opportunistic feeders primarily consume fish, crustaceans, squid, and octopus (Bonner 1971; Reeves 1992; Jefferson et al. 2008). They often co-occur with harbor seals because their habitat and feeding preferences overlap (NOAA Fisheries 2022a). Gray seals, as with all pinnipeds, are assigned to functional hearing groups based on the medium (air or water) through which they are detecting the sounds, for an estimated auditory bandwidth of 75 Hz to 75 kHz (Southall et al. 2007). Vocalizations range from 100 Hz to 3 kHz (DoN 2008).

Distribution

Gray seals are the second most common pinniped along the U.S. Atlantic coast (Jefferson et al. 2008). This species inhabits temperate and sub-arctic waters and lives on remote, exposed islands, shoals, and unstable sandbars (Jefferson et al. 2008). Gray seals most commonly range from Canada to New Jersey; however, strandings as far south as Cape Hatteras (Gilbert et al. 2005) have been recorded. The gray seal is primarily found in coastal waters and forages in OCS regions (Lesage and Hammill 2001). In U.S. waters, gray seals primarily pup at four established colonies: Muskeget and Monomoy islands in Massachusetts, and Green and Seal Islands in Maine. Since 2010, pupping has also been observed at Noman's Island in Massachusetts and Wooden Ball and Matinicus Rock in Maine (Hayes et al. 2019). Although white-coated pups have been stranded on eastern Long Island beaches in New York, no pupping colonies have been detected in that region. In addition to pupping areas, haul-out sites have been identified along the northeastern coastline, including the shorelines of New York and New Jersey. Gray seals can be found utilizing shoreline habitat as haul-out areas, which typically serve as areas for seals to rest, molt, and can even use these areas to birth and nurse pups (NJ Sea Grant 2014). Following the breeding season, gray seals may spend several weeks ashore in late spring and early summer while undergoing a yearly molt.

Given that gray seal haul-out sites are located along the coast of New York and New Jersey, the presence of gray seals in the Survey Area is possible; however, such presence is expected to be in nearshore waters and along coastlines.

Abundance

The gray seal is found on both sides of the North Atlantic, with three major populations: Northeast Atlantic, Northwest Atlantic, and Baltic Sea (Haug et al. 2013). The Western North Atlantic stock is equivalent to the Northwest Atlantic population, and ranges from New Jersey to Labrador (Mansfield 1966; Scott et al. 1990; Katona et al. 1993; Lesage and Hammill 2001). In U.S. waters alone, Hayes et al. (2023) estimated an abundance of 27,300. PBR (1,458) for gray seals was calculated based on the most recent SAR (Hayes et al. 2023).

Status

Gray seals are not listed as threatened or endangered under the ESA and they are not considered strategic under the MMPA.

5. Type of Incidental Take Authorization Requested

Atlantic Shores is seeking an IHA for HRG survey activities to support future offshore wind development project (Project) pursuant to section 101(a)(5)(D) of the MMPA (16 U.S. Code § 1371(a)(5)(D)) and 50 C.F.R. § 216.107. Atlantic Shores is requesting authorization for incidental take by Level B harassment of small numbers of marine mammals resulting from the operation of specific HRG equipment within each of the Survey Area. The request is based on the following:

- The projected HRG survey activities as described in Section 1.
- The projected survey schedule as described in Section 2.
- The evaluation of the "maximum" acoustic footprint associated with the range of potential sound-producing equipment available on the market that could be deployed within the Survey Area.
- The mitigation and monitoring measures proposed in Section 11.

6. Take Estimates for Marine Mammals

To determine the type of take that could result from the operation of the HRG survey equipment operating below 180 kHz throughout the survey period, Atlantic Shores followed the interim recommendations provided by NOAA Fisheries (2020) and the NOAA Fisheries HRG Level B Impact Distance Calculation spreadsheet (pers comm. Benjamin Laws, NOAA GARFO 2021) to estimate the maximum horizontal distance to the Level B marine mammal acoustic harassment threshold for impulsive noise (160 $dB_{RMS90\%}$ re 1 µPa) based on equipment source specifications. Results of this assessment are provided in Table 6-1 and Appendix B.

Table 6-1 Maximum Distances to Level B 160 $dB_{RMS90\%}$ Threshold by Equipment Type Operating Below 180 kHz[4]

HRG Survey Equipment (Sub-Bottom Profiler)	Representative Equipment Type	Operating Frequencies Ranges (kHz)	Operational Source Level Ranges (dB_{RMS})	Beamwidth Ranges (degree)	Distance to Level B Threshold (meters)
Sparker	Geo Marine Survey System 2D SUHRS	0.2 to 5	195	180	56

As evidenced in Table 6-1, the maximum distance to the Level B harassment threshold is 183.7 feet (56 meters) and results from use of the Geo Marine Survey System sparker equipment. This distance was used as the "r" input in calculating the zone of influence (ZOI), which in turn is used to calculate estimated takes of marine mammals (see Section 6). It is unlikely that the sound source (sparker) resulting in the maximum possible impact as presented in Table 6-1 will be used over the entire duration of the 12-month survey period in the Survey Area. As such, the assessment included herein is based on conservative assumptions and provides a cautious approach to predicting active survey operations and their potential impact on marine mammal species.

Atlantic Shores seeks authorization for potential take of small numbers of marine mammals by Level B harassment in the specified areas where the proposed activities will occur (Figure 1-1). Anticipated impacts to marine mammals from the proposed survey activities will be associated with noise propagation from the

[4] See Table 1-2 for further information on the determination of operational values for HRG survey equipment.

use of specific HRG survey equipment deployed to meet the goals of the survey campaigns conducted over the 12-month period. The following sections present Atlantic Shores' basis for estimating take and associated request for take related to planned HRG surveys.

6.1 Basis for Estimating Numbers of Marine Mammals that Might be Taken by Harassment

As stated in Section 1, Atlantic Shores proposes to conduct HRG surveys over a 12-month period in the Survey Area (Figure 1-1). To provide flexibility in the design, selection, and execution of the survey campaign (including choice of equipment) and to maximize protection of marine mammals from survey activities, Atlantic Shores used the following conservative (i.e., maximum or upper-end) parameters to estimate the potential for take:

- Maximum number of days of survey that could occur over a 12-month period in each of the identified survey areas.
- Maximum distance each vessel could travel per 24-hour period in each of the identified survey areas.
- Maximum ensonified area (ZOI) from the equipment listed in Table 6-1.
- Maximum average marine mammal densities for any given season that a survey could occur.

The following sections provide additional details on how each of these parameters have been applied to calculate the maximum ZOI associated with the planned survey activities in each survey area, along with estimates and associated requests for take.

6.2 Calculation of Maximum ZOI

The ZOI is the maximum ensonified area around the sound source over a 24-hour period. The following formula for a mobile source was used to calculate the ZOI:

$$\textit{Mobile Source ZOI} = (\textit{Distance/day} \times 2r) + \pi r^2$$

Where:

Distance/day = the maximum distance a survey vessel could travel in a 24-hour period;

r = the maximum radial distance from a given sound source to the NOAA Level A or Level B harassment thresholds.

For the purpose of the Atlantic Shores HRG surveys, the total *distance/day* has been estimated to be approximately 16.2 nautical miles (30 kilometers) in the Nearshore Survey Area and 76 nautical miles (140km) in the Offshore Survey Area (Table 6-2). This estimated distance per day has taken into consideration the line-kilometers per day achieved during the four years of Atlantic Shores' surveys to date.

To calculate a conservative ZOI, Atlantic Shores applied the maximum radial distance (*"r")* for any category and type of HRG survey equipment considered in its assessment to the mobile source ZOI calculation. Following the methods in the interim recommendations provided by NOAA Fisheries (2020) and the results from the NOAA Fisheries HRG Level B Impact Distance Calculation spreadsheet, the maximum calculated distance to the Level B harassment threshold for any category and type of HRG survey equipment that could be operated is the sparker at 183.7 feet (56 meters; Table 6-2 and Appendix B). As such, the ZOI for the sparker was applied as the maximum assumption.

Results of the maximum mobile source ZOI calculations are provided in Table 6-2.

Table 6-2 HRG Survey Area Distances and Maximum ZOIs

Survey Area	Number of Active Survey Days[a]	Survey distances per day (km)[a]	Maximum Radial Distance (r) (meters)	Calculated ZOI per day (km^2)	Total Annual Ensonified Area (km^2)
Offshore Survey Area	180	140	56	15.69	2,824
Nearshore Survey Area	120	30		3.37	404

Notes:
[a] The total 300 active survey days and 170km in daily trackline length are conservative estimates that serve both independent and concurrent vessel usage.

It should be noted that the maximum ZOI calculation for mobile sources results in a conservative ZOI because:

- it uses the sparker, which produces the largest Level B ZOI, as the basis for the take estimates and assumes it is operational for 100% of the survey effort[5],
- and, that this ZOI is a representation of the maximum extent of the ensonified area around a sound source over a 24-hour period.

6.3 Estimate of Numbers of Marine Mammals that Might be Taken by Harassment

Estimates of take are computed according to the following formula:

$$Estimated\ Take = D \times ZOI \times (d).$$

Where:

D = average highest marine mammal species density (number per km^2)
ZOI = maximum ensonified area (as calculated in Section 6.0 and summarized in Table 6-2)
d = number of survey days (as summarized in Table 6-2)

The data used as the basis for estimating species density "*D*" for the Survey Area were derived from data provided by Duke University's Marine Geospatial Ecology Lab and the Marine-life Data and Analysis Team. This dataset is a compilation of the best available marine mammal data (2015-2023) and was prepared in a collaboration led by the Marine Geospatial Ecology Laboratory at Duke University with collaborators such as the University of North Carolina Wilmington, the Virginia Aquarium and Marine Science Center, NOAA Fisheries and others (Roberts et al. 2023; Roberts et al. 2022; Roberts et al. 2016a; Curtice et al. 2019). To determine seasonal densities of marine mammal species in each of the survey areas, density data from Roberts et al. (2016a, 2023) were mapped within the boundary of each survey area using geographic information systems (GIS). For each survey area, the densities, as reported by Roberts et al. (2016, 2022, 2023), were averaged by season (spring [March–May], summer [June–August], fall [September–November], and winter [December–February]). To support the most conservative estimates of take over a 12-month period, Atlantic Shores applied the maximum average seasonal density values for each marine mammal species to the calculation. The seasonal densities by Survey Area are provided in Appendix C.

[5] Though take estimates account for operation of the sparker during all survey campaigns, Atlantic Shores and their contractor reports that it is more likely that the sparker will only be used during 80% of survey campaigns. Thus, using the sparker to calculate take estimates for the entirety of surveying provides conservative take values.

Maximum average densities used to support the calculations of take are presented in bold. Table 6-4 provides a summary of total take inclusive of the entire Survey Area. It should be noted that calculations do not consider whether a single animal is exposed multiple times or whether each exposure is a different animal. Therefore, the numbers summarized in Table 6-4 are the maximum estimates for animals that may be harassed during the HRG surveys (i.e., Atlantic Shores assumes that each exposure event is a different animal).

For bottlenose dolphin densities, Roberts et al. (2016a, 2020, 2023) does not differentiate by individual stock. As stated in Section 4.1.4, there are two stocks of bottlenose dolphin, a coastal migratory stock and an offshore stock. Although Roberts et al. (2016a, 2020, 2023) does not differentiate density values between the two stocks, literature suggests that the approximately boundary between the two stocks, between Assateague, Virginia and Long Island, New York, occurs along the 65-82 feet (20-25 meters) isobath (CETAP 1982, Kenney 1990). Therefore, the 82 feet (25 meters) isobath was used to analyze the density and estimate takes for the two stocks. The 82 feet (25 meters) isobath is located entirely within the Offshore Survey Area; therefore all potential bottlenose dolphin takes within the Nearshore Survey Area are assumed to be of the coastal migratory stock. Potential takes in the Offshore Survey Area was apportioned based on the 82 feet (25 meters) isobath, which separates approximately 40% of the area containing waters less than 82 feet (25 meters) and 60% of the area containing waters greater than 82 feet (25 meters) deep.

Pinnipeds were apportioned evenly between gray and harbor seals for purposes of the take estimations. This adjustment is made because Roberts et al (2016a, 2022, 2023) project pinniped densities for a guild of pinnipeds rather than for species. The take estimates are shown as a percentage of each species' population size.

While Level B harassment take is unlikely due to the required mitigation measures (e.g., shutdown/power-down if an animal enters the Level B harassment isopleths), requested take estimates were adjusted for some species to account for typical group size. Table 6-3 provides the mean group size for sei whale, Long-finned pilot whale, Atlantic spotted dolphin and Risso's dolphin. Increasing takes based on group size provides conservative take estimates by ensuring the number of takes authorized is at least equal to the average group size.

Table 6-3 Average Group Size Used for Adjusting Takes

Species	Average Group Size	Source
Sei whale	2	2021 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS III. (NEFSC and SEFSC 2022)
Long-finned pilot whale	9	
Atlantic spotted dolphin	25	
Risso's dolphin	8	

While Table 6-4 provides estimates of take over the entire survey schedule, not all HRG equipment will be in operation for the entire duration. Yet, to provide maximum operational flexibility, this analysis assumes that the sound source that could result in the largest Level B ZOI (sparker) would be used for the entire duration and in all locations. However, it should be noted that, based on Atlantic Shores' past experience, the sparker is estimated to be used only 80% of the time during the surveys. The remaining 20% of survey time will use other equipment, such as the parametric sub-bottom profiler, that does not result in Level B take. Because the equipment resulting in the maximum-case ZOI would not be used during all survey

campaigns in each survey area, the calculated take represents a conservative number. In addition, as noted in Section 11.7, for delphinoid cetaceans, HRG survey equipment can continue operating if the individuals voluntarily approach the vessel (e.g., to bow ride) when the sound sources are at full operating power. Therefore, the determination of "voluntary" approach will effectively reduce the numbers and percent population affected for delphinoid cetaceans below the estimated values.

Table 6-4. Maximum Average Seasonal Density for Marine Mammals and Total Estimated Level B Harassment Take Numbers

Species		Nearshore Survey Area		Offshore Survey Area		Total Estimated Takes	
		Maximum Seasonal Density[a] (No./100 km²)	Calculated Take (No.)	Maximum Seasonal Density[a] (No./100 km²)	Calculated Take (No.)	Adjusted Take Authorization (No.)	Percentage of Population
North Atlantic right whale		0.058	0	0.075	2	**2**	**0.592**
Humpback whale		0.058	0	0.105	3	**3**	**0.215**
Fin whale		0.004	0	0.135	4	**4**	**0.059**
Sei whale		0.004	0	0.046	1	**2[e]**	**0.032**
Minke whale		0.040	0	0.585	17	**17**	**0.077**
Sperm whale		0.000	0	0.010	0	**0**	**0.000**
Long-finned pilot whale [b]		0.000	0	0.071	2	**9[e]**	**0.023**
Bottlenose dolphin	Offshore stock	---	---	17.155	291[f]	**291**	**0.463**
	N. migratory stock	64.596	261	17.155	194[f]	**455**	**6.853**
Short beaked common dolphin		0.128	0.5[d]	6.517	184	**185[d]**	**0.107**
Atlantic white-sided dolphin		0.009	0	0.731	21	**21**	**0.023**
Atlantic spotted dolphin		0.002	0	0.657	19	**25[e]**	**0.063**
Risso's dolphin		0.000	0	0.078	2	**8[e]**	**0.023**
Harbor porpoise		0.393	2	3.374	95	**97**	**0.102**
Harbor seal [c]		10.022	41	5.886	166	**207**	**0.758**
Gray seal [c]		10.022	41	5.886	166	**207**	**0.337**

Notes:

[a] Cetacean density values from Duke University (Roberts et al. 2016a, 2017, 2018, 2020, 2023).

[b] Pilot whale density models from Duke University (Roberts et al. 2016a, 2022, 2023) represent pilot whales as a 'guild' rather than by species. However, since the Survey Area is only expected to contain long-finned pilot whales, it is assumed that pilot whale densities modeled by Roberts et al. (2016a, 2022, 2023) in the Survey Area only reflect the presence of long-finned pilot whales. Therefore, densities for long-finned pilot whales were not apportioned based on population size.

[c] Pinniped density models from Duke University (Roberts et al. 2016a, 2016b, 2022, 2023) represent 'seals' as a guild rather than by species. In order to calculate density and take of gray and harbor seals, density of each species was apportioned based on total population size of each species.

[d] Where calculated takes for a species in a given survey area were less than 1 individual (e.g., short beaked common dolphin), the number was rounded up to 1 take in each survey area to yield conservative take estimates.

[e] The number of authorized takes (Level B harassment only) for these species has been increased from the calculated take to consider the mean group size. Source for Atlantic spotted dolphin, long-finned pilot whale, risso's dolphin, and sei whale group size estimates is AMAPPS Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean (NEFSC and SEFSC 2022).

[f] Density and take numbers were proportioned per stock as a function of depth. A 25-meter bathymetric line was used to determine individuals from the North Atlantic Offshore Stock versus the Northern Migratory Coastal Stock. More information provided in Section 6.3

7. Anticipated Impact of the Activity

Marine mammals use sound, either by actively producing or passively listening to sounds, for basic life functions such as communication, navigation, foraging, detecting predators, and maintaining social networks. Toothed whales (odontocetes) are known to produce echolocation sounds to image their surroundings and find prey. Additionally, marine mammals passively listen to sounds to learn about their environment by gathering information from other marine mammal species, prey species, and physical phenomena such as wind, waves, rain, and seismic activity (Richardson et al. 1995).

Marine mammals exposed to anthropogenic sound may experience impacts ranging in severity from minor disturbance to non-auditory injury (Southall et al. 2007). The severity of any noise-induced effect on marine mammals depends on the characteristics of received sounds (i.e., received level, frequency band, duration, rise time, duty cycle), the distance the sound travels and the biological context within which it occurs (Ellison et al. 2012, Ellison et al. 2016, Ellison et al. 2018). Impacts most likely to occur from HRG surveys are masking of sound and behavioral disturbance (URI 2021a). Masking effects have the largest impacts on low frequency communicating mammals like baleen whales (NOAA 2021a). NOAA Fisheries has indicated any effects of masking from sub-bottom profiler equipment on ESA-listed whales (e.g., NARW, fin whale, sei whale) will be insignificant given the directionality of signals for most HRG survey equipment and the mobile nature of marine mammals (NOAA GARFO 2021). Therefore, impacts to masking are not expected to cause population-level impacts. Behavioral disturbances are most likely to occur in the form of displacement. The distance to Level B threshold for proposed HRG equipment (otherwise known as the maximum ensonified area), presented in Table 6-1, is relatively small compared to available habitat of 15 marine mammal species expected to occur in the Survey Area (NOAA 2021a). If displacement of one or more individual marine mammals during HRG survey equipment operation occurs, it would likely be limited to the relatively small area exposed to noise from survey equipment. Most marine mammals avoid sound sources, and some species are known for avoiding anthropogenic noise (harbor porpoise). Avoidance or aversion reactions are considered to be of low severity and with no lasting biological consequences (NOAA GARFO 2021; Southall et al. 2007). Since NOAA Fisheries and NOAA Office of Protected Resources have identified impacts from masking and displacement to be insignificant, particularly to sensitive ESA-listed whale species, it can be reasonably assumed that if impacts occur, they would be negligible on a population-level.

Based on the acoustic outputs from surveying work (i.e., non-injurious, Level B harassment), as well as the distribution and density of marine mammals in the Survey Area, impacts to marine mammals are expected to be short term and minimal. For all species, impacts resulting from sound exposure may affect individuals but have only very low to low risk of impact on marine mammal stocks or populations. The potential impact on the population will depend on the effect on the individual, the size of the species' population and the localized activity. Additionally, protective measures such as vessel strike avoidance procedures and visual monitoring of clearance and shutdown zones will be used to further avoid, minimize, or mitigate potential effects. Detailed information regarding protection measures is provided in Section 11 of this Application.

To authorize the incidental take of marine mammals, NOAA Fisheries must determine that harassment resulting from proposed activities will have a negligible impact on marine mammal species or stocks. NOAA Fisheries defines negligible impact as "an impact resulting from a specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stocks [of marine mammals] through effects on annual rates of recruitment or survival" (50 C.F.R. § 216.103).

8. Anticipated Impacts on Subsistence Uses

There are no traditional subsistence hunting areas in the Survey Area.

9. Anticipated Impacts on Habitat

As summarized in Section 1.2, bottom disturbance will be limited to grab samples to support the validation of seabed classifications obtained from the multibeam echosounder/side scan sonar data. This temporary and localized impact is considered negligible given the scale of the activity and is unlikely to affect marine mammal species, their habitat, or prey.

The temporary and localized impact of the ZOI associated with sound emitted from various HRG equipment in relation to the comparatively vast area of surrounding open ocean, would result in negligible effects to marine mammals. Impacts on prey species are expected to be limited to temporary avoidance of the area around HRG survey activities and short-term changes in behavior. Such impacts are not expected to result in population-level effects on prey species (BOEM 2012b). Individuals disturbed by a survey would likely return to normal behavioral patterns after the survey has ceased or after the animal has left the survey area. Because of the limited immediate area of ensonification and duration of individual HRG surveys, few fish may be expected in most cases to be present within the survey areas (BOEM 2012b).

Impacts on marine mammal habitat from survey activities described in this application are considered negligible.

10. Anticipated Effects of Habitat Impacts on Marine Mammals

No long-term impacts to marine mammal habitat are expected. Marine mammals use sound to navigate, communicate, avoid predators, and find food sources (URI 2021a). Alterations to the soundscape from survey activities could result in masking effects which can interfere with an animal's ability to perceive (i.e., detect, interpret, and/or discriminate) sounds (URI, 2021b). Though surveying could result in masking, impacts would be temporary and localized, limited to the vicinity of the survey activities. Such impacts are not expected to permanently degrade or reduce available habitat for marine mammals. Additionally, though the Survey Area is located within the NARW migratory corridor, the Survey Area occupies a relatively small portion (approximately 6%) of the migratory corridor area identified along the western Atlantic coastline. Due to the relatively small area that will be occupied by localized survey activities, it is expected that NARW will be able to avoid vessels and survey activities without disrupting their typical behavior.

11. Mitigation Measures to Protect Marine Mammals and Their Habitat

The mitigation and monitoring measures presented in this section represent Atlantic Shores' baseline commitment to ensure the protection of marine mammals during HRG survey activities. The mitigation procedures outlined in this section aligns with the minimum requirements set forth in Atlantic Shores' Renewable Energy Leases for OCS-A 0499, OCS-A 0541 and OCS-A 0549 and the NOAA Fisheries Greater Atlantic Regional Office (GARFO) programmatic consultation regarding geophysical and geotechnical surveys along the U.S. Atlantic coast in the three Atlantic Renewable Energy Regions (i.e., 2021 NOAA GARFO Biological Assessment).

Atlantic Shores has committed to following monitoring and mitigation procedures described in the following sections including vessel strike avoidance, seasonal operating requirements, visual monitoring of clearance

and shutdown zones, pre-clearance and ramp-up procedures, and shutdown procedures. Atlantic Shores vessels will be operating in different locations, (offshore survey area and nearshore survey area), and will not operate within proximity of one each other unless in transit. Additionally, during transit, Closest Point of Approaches (CPAs) will be honored through vessel-to-vessel communication. Atlantic Shores will provide a Protected Species Mitigation and Monitoring Plan to NOAA Fisheries for review and approval prior to the mobilization of survey activities.

The following table, Table 11-1 provides a summary of the distances and times for clearance, shutdown and vessel separation sones for all species included in this take request.

Table 11-1: Summary of Clearance, Shutdown and Vessel Strike Avoidance Procedures by Species

Species		Clearance Zone (distance [m] & time [mins])	Shutdown Zone (distance [m] & time [mins])	Vessel Strike Avoidance Zone (m)
Common Name	Scientific Name			
ESA Listed Species				
North Atlantic right whale	*Eubalaena glacialis*	500 m & 30 mins	500m & 30 mins	500 m
Sperm whale	*Physeter macrocephalus*	500 m & 30 mins	100 m & 30 mins	500 m
Fin whale	*Balaenoptera physalus*	500 m & 30 mins	100 m & 30 mins	500 m
Sei whale	*Balaenoptera borealis*	500 m & 30 mins	100 m & 30 mins	500 m
Non-ESA Listed Species				
Humpback whale	*Megaptera novaeangliae*	100 m & 30 mins	100 m & 30 mins	100 m
Minke whale	*Balaenoptera acutorostrata*	100 m & 30 mins	100 m & 30 mins	100 m
Long-finned pilot whale	*Globicephala melas*	100 m & 30 mins	100 m & 30 mins	50 m
Risso's dolphin	*Grampus griseus*	100 m & 30 mins	100 m & 30 mins	50 m
Harbor porpoise	*Phocoena phocoena*	100 m & 30 mins	100 m & 15 mins	50 m
Harbor Seal	*Phoca vitulina*	100 m & 30 mins	Not required	50 m
Gray Seal	*Halichoerus grypus*	100 m & 30 mins	Not required	50 m
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	100 m & 30 mins	Not required	50 m
Atlantic spotted dolphin	*Stenella frontalis*	100 m & 30 mins	Not required	50 m
Short beaked common dolphin	*Delphinus delphis*	100 m & 30 mins	Not required	50 m
Bottlenose dolphin	*Tursiops truncatus*	100 m & 30 mins	Not required	50 m

11.1 Vessel Strike Avoidance Procedures

Atlantic Shores will implement vessel strike avoidance measures including, but are not limited to, the following, except under circumstances when complying with these requirements would put the safety of the vessel or crew at risk or when the vessel is restricted in its ability to maneuver:

- A Vessel Strike Avoidance Zone(s) will be maintained, as defined as 1,640 feet (500 meters) or greater from any sighted ESA-listed whale species or other unidentified large marine mammal. However, vessel strike avoidance and shutdown will not be required for pinnipeds or small delphinids of the following genera, if visually detected approaching the vessel (i.e., to bow ride) or towed vehicle: *Delphinus, Lagenorhynchus, Stenella*, and *Tursiops*.

- Any time a vessel is underway (transiting or surveying), the vessel must maintain a 1,640-foot (500-meter) minimum separation distance from any sighted ESA-listed species or other large, unidentified mammal visible at the surface. Protected species observers (PSOs), or crew members if as PSOs are not required, must monitor the Vessel Strike Avoidance Zone to ensure detection of an animal in time to take necessary measures to avoid a strike with the animal. To monitor the Vessel Strike Avoidance Zone, a PSO (or designated crew members) will be posted during all times a vessel is underway (transiting or surveying) to monitor for listed species in all directions. All vessel operators and crew will maintain vigilant watch for all marine mammals, and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any marine mammals. Unless a required PSO is aboard and on duty, then a designated and trained vessel crew member on all vessels associated with survey activities (transiting [i.e., travelling between a port and survey site] or actively surveying) will be assigned as a lookout for marine mammals.
- Maintain Vessel Strike Avoidance Zone(s) around all surface vessels at all times in accordance with the following parameters, at a minimum:
    - If a large whale is identified within 1,640 feet (500 meters) of the forward path of any vessel, the vessel operator must steer a course away from the whale at 10 knots (18.5 kilometers/hour) or less until the 1,640 feet (500 meters) minimum separation distance has been established. Vessels may also shift to idle if feasible.
- If a large whale is sighted within 656 feet (200 meters) of the forward path of a vessel, the vessel operator 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 1,640 feet (500 meters). If stationary, the vessel must not engage engines until the large whale has moved beyond 1,640 feet (500 meters). All survey vessels, regardless of size, will observe a 10 knot (less than 18.5 kilometers per hour) speed restriction in specific areas designated by NOAA Fisheries for the protection of NARWs from vessel strikes, including seasonal management areas (SMAs), Right Whale Slow Zones, and dynamic management areas (DMAs), when in effect.
- All vessels greater than or equal to 65 feet (19.8 meters) in overall length operating from November 1 through April 30 will operate at speeds of 10 knots or less while transiting to and from the Survey Area.
- All vessels, regardless of size, will reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near (within 330 feet [100 meters]) of an underway vessel.
- Vessels underway will not divert their course to approach any ESA-listed species.
- Vessel operators will check for information regarding mandatory or voluntary ship strike avoidance (SMAs, DMAs, Slow Zones) and daily information regarding NARW sighting locations. Such sources for this information include NOAA weather radio, U.S. Coast Guard NAVTEX and channel 16 broadcasts, Notices to Mariners, the Whale Alert application, or the WhaleMap website.

A survey vessel crew training program will be provided to NOAA Fisheries for review and approval prior to the start of surveys. All vessel crew members will be briefed on the identification of protected species that may occur in the survey area, regulations, and best practices for avoiding vessel collisions. Reference materials will be available onboard all vessels to aid in the identification of protected species. Expectations and processes for reporting sightings of protected species will be clearly communicated and posted in highly

visible locations aboard all project vessels so there is an expectation for reporting to the designated vessel contact (such as the lookout or vessel captain), as well as a communication channel and process for crew members to do so. Confirmation of the training and understanding of the requirements will be documented on a training course log sheet. Signing the log sheet will certify that the crew members understand and will comply with the necessary requirements throughout the survey event.

11.2 Seasonal Operating Requirements

Throughout all survey operations, Atlantic Shores will monitor NOAA Fisheries NARW reporting systems for the presence of NARW. If NOAA Fisheries should establish Right Whale Slow Zones or DMA in the Survey Area, survey vessels will abide by established restrictions. The Survey Area overlaps with the Migratory Route and Calving Grounds SMAs located off Raritan Bay (i.e., Ports of New York/New Jersey) and off Delaware Bay. If surveys activities occur within this SMA between November 1 through April 30, Atlantic Shores will ensure compliance with the requisite speed restrictions.

11.3 Maintenance of Shutdown Zones

Atlantic Shores will maintain shutdown zones described below during site characterization survey activities using HRG sources listed in Table 6-1 operating at frequencies below 180 kHz.

- Shutdown Zones - Protected Species Observers (PSOs) will establish and monitor marine mammal Shutdown Zones. Distances to Shutdown Zones will be from acoustic sources operating below 180 kHz, not the distance from the vessel. Shutdown Zones will be as follows:
    - 1,640 feet (500 meters) Shutdown Zone for NARW for use of impulsive acoustic sources (e.g., sparkers) and;
    - 328 feet (100 meters) Shutdown Zone for all other marine mammals for use of impulsive acoustic sources (e.g., sparkers), except for as noted in Section 11.7 for delphinids from the genera *Delphinus*, *Lagenorhynchus*, *Stenella*, or *Tursiops* that are visually detected as voluntarily approaching the vessel or towed equipment.

If a shutdown is required, a PSO will notify the survey crew immediately. Vessel operators and crews will comply immediately with any call for shutdown of active acoustic sources below 180 kHz. A shutdown will remain in effect until the minimum separation distances (detailed above) between the animal and noise source are re-established.

11.4 Visual Monitoring Program

Visual monitoring from HRG survey vessels of the established monitoring zones will be performed by qualified, NOAA Fisheries-approved PSOs. Qualifications for PSOs will include completion of an approved PSO training course (scoring 80% or higher) and/or demonstrated experience in the role of independent PSO during an HRG survey. PSO resumes will be provided to NOAA Fisheries for review and approval prior to the start of survey activities. As they will not be using equipment that generates a sound source with the potential to cause Level B harassment take, geotechnical survey activities and vessels will not require PSOs.

Up to six PSOs will be on board each one of the two survey vessels (i.e., a total of up to 12 PSOs) that will be conducting 24-hour and daylight only survey operations. PSOs will undertake visual and acoustic

watches, implement mitigation and conduct data collection and reporting. PSOs will be assigned to duties as follows:

24-Hour Operations Vessels:

- One PSO will be on watch at all times during transit.
- One PSO will be on watch at all times during daylight source operations.
- Two PSO will be on watch at all times during nighttime operations.

12-Hour/Day-light only Operations Vessels:

- One PSO will be on watch at all times during transit.
- One PSO will be on watch at all times during daylight source operations.

These third-party PSOs will conduct marine mammal visual monitoring when specified acoustic sources (impulsive: sparkers; non-impulsive: non-parametric sub-bottom profilers) are operating below 180 kHz in accordance with the following:

- A minimum of one PSO must be on duty looking for listed species when noise-producing equipment operating below 180 kHz is deployed, or the survey vessel is actively transiting during daylight hours (i.e., from 30 minutes prior to sunrise and through 30 minutes following sunset). If an ESA-listed species is observed within the Clearance or Shutdown Zones, those occurrences will be documented. Two PSOs must be on duty during nighttime operations. A PSO schedule showing that the number of PSOs used is sufficient to effectively monitor the affected area for the project (e.g., surveys) and record the required data will be included.
- PSOs will be employed by a third-party observer provider and will have no tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of marine mammals and mitigation requirements (including brief alerts regarding maritime hazards). At least one PSO aboard each acoustic source vessel will have a minimum of 90 days at-sea experience working as a PSO during a geophysical survey, with no more than 18 months elapsed since the conclusion of the at-sea experience. This lead PSO will coordinate duty schedules and roles for the PSO team and serve as primary point of contact for the vessel operator. The responsibility of coordinating duty schedules and roles may instead be assigned to a shore-based, third-party monitoring coordinator. To the maximum extent practicable, the lead PSO will devise the duty schedule such that experienced PSOs are on duty with those PSOs with appropriate training but who have not yet gained relevant experience.
- Non-third-party observers may be approved by NOAA Fisheries on a case-by-case basis for limited, specific duties in support of approved, independent PSOs on smaller vessels with limited crew capacity operating in nearshore waters.
- PSOs will coordinate to ensure 360-degree visual coverage around the vessel from the most appropriate observation posts or vantage point(s). If 360-degree visual coverage is not possible from a single vantage point, multiple PSOs will be on watch to ensure such coverage.
- PSOs may be on watch for a maximum of four consecutive hours followed by a break of at least two hours between watches and may conduct a maximum of 12 hours of observation per 24-hour

period.

- In cases where multiple vessels are surveying concurrently in proximity to one another, any observations of marine mammals will be communicated to PSOs on all active survey vessels. Additionally, a minimum separation distance, to be determined on a survey specific basis depending on the equipment being used, will be maintained between survey vessels to ensure that sound sources do not overlap.
- Visual observations will be conducted using binoculars and the naked eye, while free from distractions and in a consistent, systematic, and diligent manner. PSOs will be equipped with binoculars and will have the ability to estimate distances to marine mammals located in proximity to the vessel and/or Clearance and Shutdown Zones. Reticulated binoculars will be available to PSOs for use as appropriate based on conditions and visibility to support the siting and monitoring of marine species.
- Digital full frame cameras with telephoto lens that are at least 300 mm or equivalent and equipped with an image stabilization system will be used during visual monitoring efforts.
- Position data will be recorded using hand-held or vessel global positioning system (GPS) units for each sighting.
- Atlantic Shores will consult NOAA Fisheries NARW reporting system and Whale Alert throughout survey operations, when practicable, for notifications about the presence of NARWs, and the establishment of Right Whale Slow Zones and DMA. If NOAA Fisheries should establish a DMA in the Survey Area during the survey, the vessels will abide by speed restrictions in the DMA per the lease conditions.
- Visual PSOs will conduct observations in the following circumstances:
    - During good conditions (e.g., daylight hours; Beaufort sea state 3 or less), and no acoustic sources are operating below 180 kHz, for comparison of sighting rates and behavior with and without use of the specified acoustic sources and between acquisition periods (to the maximum extent practicable). Any observed ESA-listed species will be recorded regardless of any mitigation actions required; and
    - During all daylight hours, when any acoustic sources are active.
- Night-vision equipment (i.e., night-vision goggles and/or infrared technology) will be available for use during nighttime monitoring. Two PSOs will always be on watch during nighttime operations. The PSOs on duty will monitor for marine protected species using infrared LED pistol grip spotlight; and Morovision PVS-7 Gen 3 PINNACLE night vision goggles with a thermal acquisition clip-on system, so PSOs can focus observations in any direction.
- Any observations of marine mammals by crew members aboard any vessel associated with the survey will be relayed to the PSO team.
- Prior to the start of geophysical surveys at night or during low-visibility conditions, the PSOs must be able to effectively monitor the Clearance and Shutdown Zone(s). Such activities will not occur if the Clearance and Shutdown Zones cannot be reliably monitored for the presence of ESA-listed species to ensure avoidance of injury to those species.
- To account for surveying efforts that will occur either at night or during low visibility conditions, an Alternative Monitoring Plan will be provided to BOEM detailing monitoring methodologies that will

be employed during these times and how it will be effective at ensuring that the Shutdown Zone(s) can be maintained. The plan will be submitted 60 days before survey operations are set to begin. The plan will include technologies that have the technical feasibility to detect all ESA-listed whales out to 500 meters, and detail how calibration will be performed (e.g., including observations of known objects at set distances and under various lighting conditions). PSOs will be trained and experienced with any proposed alternative monitoring technology.

- PSOs will make nighttime observations from a platform with no visual barriers in order to reduce the interference of reflectivity from bridge windows or other structures.
- In cases when clearance has begun in conditions with good visibility, including via the use of night-vision equipment, and the lead PSO has determined that the pre-start clearance zones (as described in Section 11.5 of this IHA) are clear of marine mammals, survey operations may commence (i.e., no delay is required) despite brief periods of inclement weather and/or loss of daylight. In cases where Shutdown Zones cannot be adequately monitored for ESA-listed species (e.g., low visibility conditions), no equipment operating <180 kHz will be deployed until the Shutdown Zone can be reliably monitored.
- Data on all PSO observations will be recorded based on standard PSO collection requirements. PSOs will use standardized data forms, whether hard copy or electronic, with the final copy of data being recorded electronically. Data will be collected in accordance with standard data reporting, software tools, and electronic data submission standards approved by BOEM and NMFS for the particular activity.

As part of the monitoring program, PSOs will record all sightings beyond the established Clearance and Shutdown Zones, as far as they can see. This will include dates and locations of survey efforts; time of observation, location and weather; details of the sightings (e.g., species, age classification [if known], numbers, behavior); and details of any observed behavioral disturbances or injury/mortality. In addition, prior to initiation of survey work, all crew members will undergo environmental training, a component of which will focus on the procedures for sighting and protection of marine mammals and sea turtles. A briefing will also be conducted between the survey supervisors and crews, the PSOs, and Atlantic Shores. The purpose of the briefing will be to establish responsibilities of each party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures.

11.5 Clearance Zones

PSOs will conduct 30 minutes of clearance observation prior to the initiation of HRG survey operations using impulsive sources operating below 180 kHz. Clearance observations are not required during HRG survey operations using only non-impulsive sources (e.g., USBL and parametric sub-bottom profilers). Before initiating HRG surveys using impulsive sources below 180 kHz, a Clearance Zone of 1,640 feet (500 meters) will be monitored for 30 minutes for all ESA-listed species. If any ESA-listed species is observed within the Clearance Zone during the 30-minute pre-clearance period, the presence of that animal will be recorded, and the 30-minute clock must be paused. If the PSO confirms the animal has exited the zone and headed away from the survey vessel, the 30-minute clock that was paused may resume. The pre-clearance clock will reset to 30 minutes if the animal dives or visual contact is otherwise lost. PSOs will also conduct 30 minutes of post-activity visual monitoring following the usage of impulsive sources,

11.6 Ramp-Up Procedures

When technically feasible, acoustic sources operating below 180 kHz will 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. When technically feasible, the power will then be gradually turned up and other acoustic sources added in a way such that the source level would increase gradually. Ramp-up procedures are not required during HRG survey operations using only non-impulsive sources (e.g., USBL and parametric sub-bottom profilers). Following a shutdown for any reason, ramp up of equipment will begin immediately if the following occur:

- The shutdown is less than 30 minutes.
- Visual monitoring of the Shutdown Zone(s) continued throughout the shutdown.
- The animal causing the shutdown was visually followed and confirmed by PSOs to be outside of the Shutdown Zone(s).
- The Shutdown Zone(s) remains clear for all ESA-listed species.

If all of the conditions listed above are not met, the Clearance Zone will be monitored for 30 minutes before the use of noise-producing equipment resumes.

11.7 Shutdown and Power-Down Procedures

If a marine mammal is observed within or entering the relevant Shutdown Zones as described under Section 11.3 of this IHA while acoustic sources operating below 180 kHz are in use, the acoustic sources will be immediately shut down (except for delphinids from the genera *Delphinus*, *Lagenorhynchus*, *Stenella*, or *Tursiops* as described in more detail below).

Any PSO on duty has the authority to call for shutdown of acoustic sources. When there is certainty regarding the need for mitigation action on the basis of visual detection, the relevant PSO(s) will call for such action immediately. When a shutdown is called for by a PSO, the shutdown will occur, and any dispute resolved only following shutdown. Vessel operators will establish and maintain clear lines of communication directly between PSOs on duty and crew controlling the acoustic source(s) to ensure that shutdown commands are conveyed swiftly, while allowing PSOs to maintain watch.

Upon implementation of a shutdown, survey equipment will be reactivated when all marine mammals that triggered the shutdown have been confirmed by visual observation to have exited the relevant Shutdown Zone or an additional time period of 30 minutes has elapsed with no further sighting of the animal that triggered the shutdown (see Section 11.6 for additional information).

If acoustic sources operating below 180 kHz are shut down for less than 30 minutes for reasons other than marine mammal mitigation (e.g., due to mechanical or electronic failure), the equipment may be re-activated as soon as is practicable at full operational level if PSOs have maintained constant visual observation during the shutdown and no visual detections of marine mammals occurred within the applicable Shutdown Zone during that time. For a shutdown of 30 minutes or longer, or if visual observation was not continued diligently during the pause, pre-start clearance observation will be conducted, as previously described, unless visual observation was continued diligently during the entire pause with no further detections of any marine mammals.

If delphinids from the genera *Delphinus*, *Lagenorhynchus*, *Stenella* (*frontalis* only), or *Tursiops* are visually detected approaching the vessel or towed acoustic sources, shutdown is not required. If there is uncertainty regarding identification of a marine mammal species (i.e., whether the observed marine mammal(s) belongs to one of the delphinid genera for which shutdown is waived), PSOs will use best professional judgment in making the decision to call for a shutdown.

Shutdown of acoustic sources is required upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the zone defined for Level B harassment (i.e., within approximately 184 feet (56 meters) of HRG survey equipment operating below 180 kHz listed in Table 6-1).

Shutdown is not required during HRG survey operations using only non-impulsive sources (e.g., USBL and parametric sub-bottom profilers)

12. Mitigation Measures to Protect Subsistence Uses – Arctic Plan of Cooperation

Potential impacts to species or stocks of marine mammals will be limited to individuals of marine mammal species located in the Mid-Atlantic Bight of the United States and will not affect Arctic marine mammals. Given that the Project is not located in Arctic waters, the activities associated with Atlantic Shores' marine characterization surveys will not have an adverse effect on the availability of marine mammals for subsistence uses allowable under the MMPA.

13. Monitoring and Reporting

13.1 Monitoring

Visual monitoring protocols are described in Section 11.4.

13.2 Reporting

Atlantic Shores will provide the following communications or reports as necessary during survey activities:

- Within 90 days after survey demobilization, or 60 days prior to a requested date or issuance of any future IHAs for projects at the same location, whichever comes first, a final technical monitoring report will be submitted to BOEM and NOAA Fisheries (to renewable_reporting@boem.gov and PR.ITP.MonitoringReports@noaa.gov). This report will fully document the methods and monitoring protocols, summarize the survey activities and data recorded during monitoring, estimate the number of listed species that may have been taken during survey activities, and describe, assess, and compare the effectiveness of monitoring and mitigation measures. Any recommendations made by NOAA Fisheries will be addressed in the final report prior to acceptance by NOAA Fisheries. PSO effort datasheets, sightings data, and track line data in Excel spreadsheet format will also be provided with the draft and final monitoring report.
- Data from all PSO observations must be recorded based on standard PSO collection and reporting requirements. PSOs must use standardized electronic data forms to record data. The following information must be reported electronically in a format approved by BOEM and NOAA Fisheries:

  Visual Effort:
  a. Vessel name;

b. Dates of departures and returns to port with port name;
c. Lease number;
d. PSO names and affiliations;
e. PSO ID (if applicable);
f. PSO location on vessel;
g. Height of observation deck above water surface (in meters);
h. Visual monitoring equipment used;
i. Dates and times (Greenwich Mean Time) of survey on/off effort and times corresponding with PSO on/off effort;
j. Vessel location (latitude/longitude, decimal degrees) when survey effort begins and ends; vessel location at beginning and end of visual PSO duty shifts; recorded at 30 second intervals if obtainable from data collection software, otherwise at practical regular interval;
k. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any change;
l. Water depth (if obtainable from data collection software) (in meters);
m. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions change significantly), including wind speed and direction, Beaufort scale, Beaufort wind force, swell height (in meters), swell angle, precipitation, cloud cover, sun glare, and overall visibility to the horizon;
n. Factors that may be contributing to impaired observations during each PSO shift change or as needed as environmental conditions change (e.g., vessel traffic, equipment malfunctions);
o. Survey activity information, such as type of survey equipment in operation, acoustic source power output while in operation, and any other notes of significance (i.e., pre-clearance survey, ramp-up, shutdown, end of operations, etc.);

Visual Sighting (all Visual Effort fields plus):

a. Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
b. Vessel/survey activity at time of sighting;
c. PSO/PSO ID who sighted the animal;
d. Time of sighting;
e. Initial detection method;
f. Sightings cue;
g. Vessel location at time of sighting (decimal degrees);
h. Direction of vessel's travel (compass direction);
i. Direction of animal's travel relative to the vessel;
j. Identification of the animal (e.g., genus/species, lowest possible taxonomic level, or unidentified); also note the composition of the group if there is a mix of species;
k. Species reliability;
l. Radial distance;
m. Distance method;
n. Group size; Estimated number of animals (high/low/best);
o. Estimated number of animals by cohort (adults, yearlings, juveniles, calves, group composition, etc.);

p. Description (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);

q. Detailed behavior observations (e.g., number of blows, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior);

r. Mitigation Action; Description of any actions implemented in response to the sighting (e.g., delays, shutdown, ramp-up, speed or course alteration, etc.) and time and location of the action.

s. Behavioral observation to mitigation;

t. Equipment operating during sighting;

u. Source depth (in meters);

v. Source frequency;

w. Animal's closest point of approach and/or closest distance from the center point of the acoustic source;

x. Time entered shutdown zone;

y. Time exited shutdown zone;

z. Time in shutdown zone;

aa. Photos/Video.

- If a NARW is observed at any time by PSOs or personnel on any project vessels, during surveys or during vessel transit, the sighting will be reported within two hours of occurrence when practicable and no later than 24 hours after occurrence to the NOAA Fisheries NARW Sighting Advisory System (866-755-6622) or the U.S. Coast Guard via channel 16. If an injured or dead NARW is discovered, Atlantic Shores will report the incident as quickly as possible to the NOAA stranding hotline (866-755-6622).
- Sightings of any injured or dead listed species must be immediately reported, regardless of whether the injury or death is related to survey operations, to BOEM (renewable_reporting@boem.gov), NOAA Fisheries (nmfs.gar.incidental.take@noaa.gov), and the appropriate regional NOAA stranding hotline (866-755-6622). When reporting sightings of injured or dead listed species, the following information must be included:

    a. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

    b. Species identification (if known) or description of the animal(s) involved;

    c. Condition of the animal(s) (including carcass condition if the animal is dead);

    d. Observed behaviors of the animal(s), if alive;

    e. If available, photographs or video footage of the animal(s); and

    f. General circumstances under which the animal was discovered.

- If the surveying activity is responsible for the injury or death, the vessel will assist in any salvage effort, as requested by NMFS.
- In the event of a vessel strike of a protected species by any survey vessel, the project proponent must immediately report the incident to BOEM (renewable_reporting@boem.gov) and NOAA Fisheries (nmfs.gar.incidental.take@noaa.gov) and for marine mammals to the NOAA stranding hotline 866-755-6622. The report must include the following information:
    a. Name, telephone, and email or the person providing the report;
    b. The vessel name;
    c. The Lease Number;
    d. Time, date, and location (latitude/longitude) of the incident;
    e. Species identification (if known) or description of the animal(s) involved;
    f. Vessel's speed during and leading up to the incident;
    g. Vessel's course/heading and what operations were being conducted (if applicable);
    h. Status of all sound sources in use;
    i. 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;
    j. Environmental conditions (wave height, wind speed, light, cloud cover, weather, water depth);
    k. Estimated size and length of animal that was struck;
    l. Description of the behavior of the species immediately preceding and following the strike;
    m. If available, description of the presence and behavior of any other protected species immediately preceding the strike;
    n. Disposition of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, last sighted direction of travel, status unknown, disappeared); and
    o. To the extent practicable, photographs or video footage of the animal(s).

14. Suggested Means of Coordination

All marine mammal data collected by Atlantic Shores during marine characterization survey activities will be provided to NOAA Fisheries, BOEM, and other interested government agencies, and be made available upon request to educational institutions and environmental groups. These organizations could use the data collected during this period to study ways to reduce incidental taking and evaluate its effects.

All hydroacoustic data and resulting transmission loss rates collected during field verification of the safety and/or Shutdown Zones by Atlantic Shores during HRG surveys will be provided to NOAA Fisheries, BOEM, and other interested government agencies, and be made available upon request to educational institutions and environmental groups. These organizations could use the data collected during this period to study ways to reduce incidental taking from survey activities and evaluate its effects.

15. List of Preparers

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Request for an Incidental Harassment Authorization to Allow the Non-Lethal Take of Marine Mammals Incidental to Site Characterization Surveys of the Atlantic Shores Lease Area (OCS-A 0499, OCS-A 0541, OCS-A 0549)

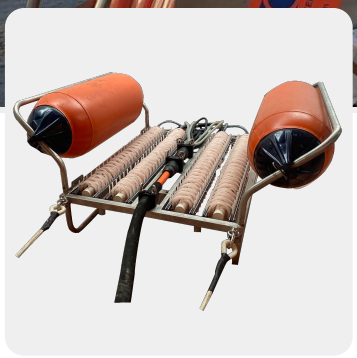
Appendix A

Manufacturer Specifications

MARINE SURVEY SYSTEMS

Geo-Source 400

MARINE MULTI-TIP SPARKER SYSTEM



Versatile maintenance free negative discharge sparker designed for small and larger operations.

Description

INNOVATIVE PRESERVING ELECTRODE MODE
The Geo-Source 400 is designed to operate with the 2000 X Geo-Spark Pulsed Power Supply or higher. It uses the the “Preserving Electrode Mode”, a patented concept that consists of using a NEGATIVE electric discharge pulse, instead of positive.

Note that working with a negative pulse is NOT the same thing as reversing the polarity of an antique power supply, which is generating a positive pulse.

MAINTENANCE FREE ELECTRODES 5 YEAR GUARANTEE
The Preserving Electrode Mode reduces the tip wear to practically zero. You can shoot day after day, week after week, month after month with practically NO tip maintenance.

OPTIMUM ACOUSTIC REPEATABILITY
Zero tip wear is essential for the repeatability of the acoustic pulse, which depends largely on a constant, unaltered electrode surface.

Operational Features

→ Water depths from 2 to 1500 m.

→ Penetration higher than 400 ms below seabed depending on geology.

→ Vertical resolution of 10 - 30 cm.

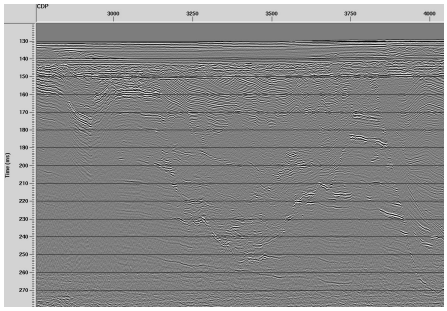
→ You don't need to trim tips during the survey - electrodes do NOT burn off.

→ Successfully employed in wind farm surveying, coastal engineering, sand search, site and route surveys and many others.

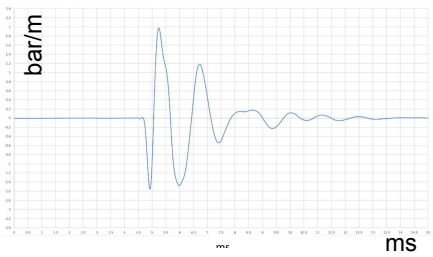
MARINE SURVEY SYSTEMS

Geo-Source 400

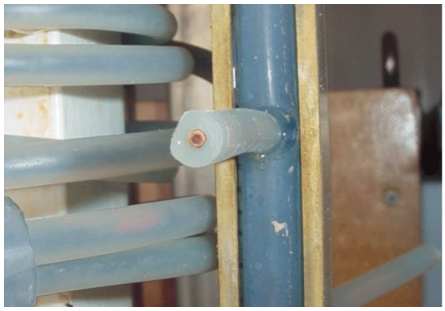
MARINE MULTI-TIP SPARKER SYSTEM



Geo Spark 400 with a 48 ch Multi-channel streamer - see more examples at our gallery.



signal spectrum at 800 J and source 30 cm deep.



No wear of the tips even after 3 years of use.

Additional Features

CONTROL OF ALL SPARKER PARAMETERS
The effective source depth is 15-20 cm. A constant source depth at 1/4 of the wavelength is essential in order to optimize the constructive interference between the primary pulse and surface ghost. But this can be easily customized by the user with the use of extensions, for instance, in situations where penetration should be a priority.

SOURCE GEOMETRY AND CONFIGURATION OF THE TIPS
The electrode modules are evenly spaced in a planar array of 0.50 m x 1.00 m. This geometry not only enhances the downward projection of the acoustic energy, it also reduces the primary pulse length, since all tips are perfectly in phase. Each tip has an exposed surface of 1.4 mm, suitable for maximum 10 Joules per tip and with this configuration it gives an excellent pulse over the 400 - 2000 Joule power range.

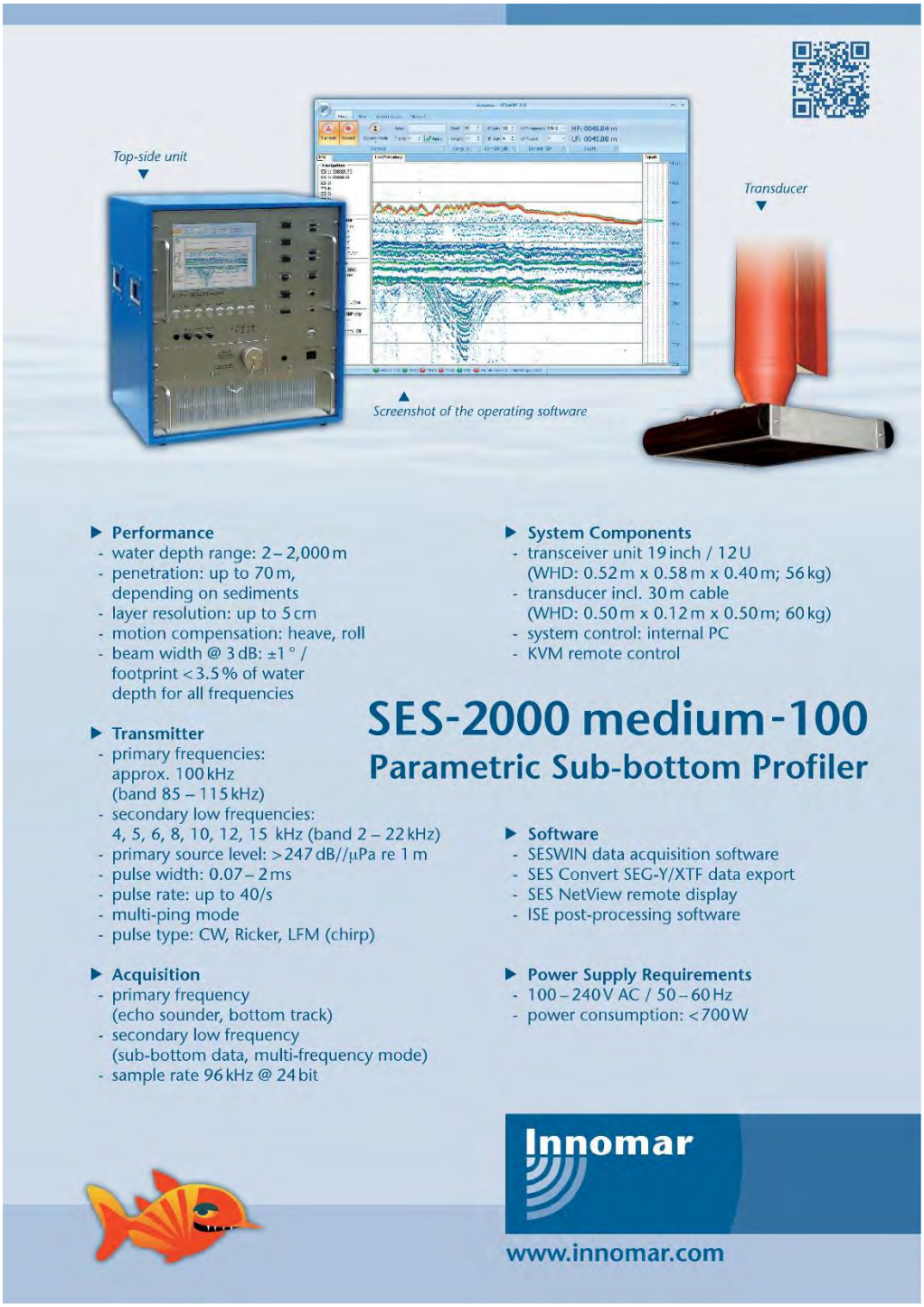
FLEXIBLE AND FLOATING HV TOW CABLE
The Geo-Source 400 is towed by a very high quality, Kevlar reinforced, coaxial power/tow cable with stainless steel kellum grip. This dedicated high voltage (HV) cable contains 4 × 10 mm^2 cores (negative) plus a 40 mm braiding (ground-referenced). It is designed to have a very low self inductance to preserve the high dI/dt pulse output of the Geo-Spark 2000 PPS. The coaxial structure of the HV cable reduces the electromagnetic interference to the absolute minimum.

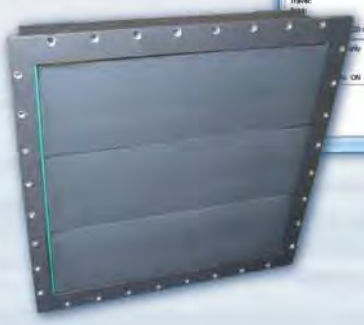
Specification

Dimensions (cm) & Weight	110 (L) x 120 (W) x 60 (H) for 80 kg
Number of Tips	400
Operation Depth (m)	2 - 1500
Dominant Frequencies	1000 - 1500 Hz (at 800 J)
Better if used with	Geo-Spark 2000, 8E single-channel Streamer, multi-channel streamer
Recommended interface system	Mini-Trace II or Multi-Trace Server
Power Requirements	5kVA generator (for the Power Supply)

We are always pushing for improvements, so equipment specifications can change without notice.
Please keep in contact with support to stay in tune with the developments.

Innomar Sub-bottom Profiler





Transducer

Screenshot of the operating software

Top-side unit

INNOMAR deep-36

Parametric Sub-bottom Profiler

Performance
- water depth range: 5 – 6,000 m (option 10,000 m)
- penetration: up to 150 m, depending on sediments
- layer resolution: up to 12 cm
- motion compensation: heave, roll, pitch (option)
- beam width @ 3 dB: ± 1.5° / footprint < 5.5 % of water depth for all frequencies

Transmitter
- primary frequencies: approx. 36 kHz (band 30 – 42 kHz)
- secondary low frequencies: 2, 3, 4, 5, 6, 7 kHz (band 1 – 10 kHz)
- primary source level: > 245 dB//µPa re 1 m
- pulse width: 0.15 – 5 ms
- pulse rate: up to 40/s
- multi-ping mode
- pulse type: CW, Ricker, LFM (chirp)

Acquisition
- primary frequency (echo sounder, bottom track)
- secondary low frequency (sub-bottom data, multi-frequency mode)
- sample rate 48 kHz @ 24 bit

System Components
- transceiver unit 19 inch / 16 U (WHD: 0.52 m x 0.74 m x 0.50 m; 95 kg)
- transducer with frame excl. cable (WHD: 0.90 m x 0.30 m x 0.90 m; 335 kg)
- system control: internal PC
- KVM remote control

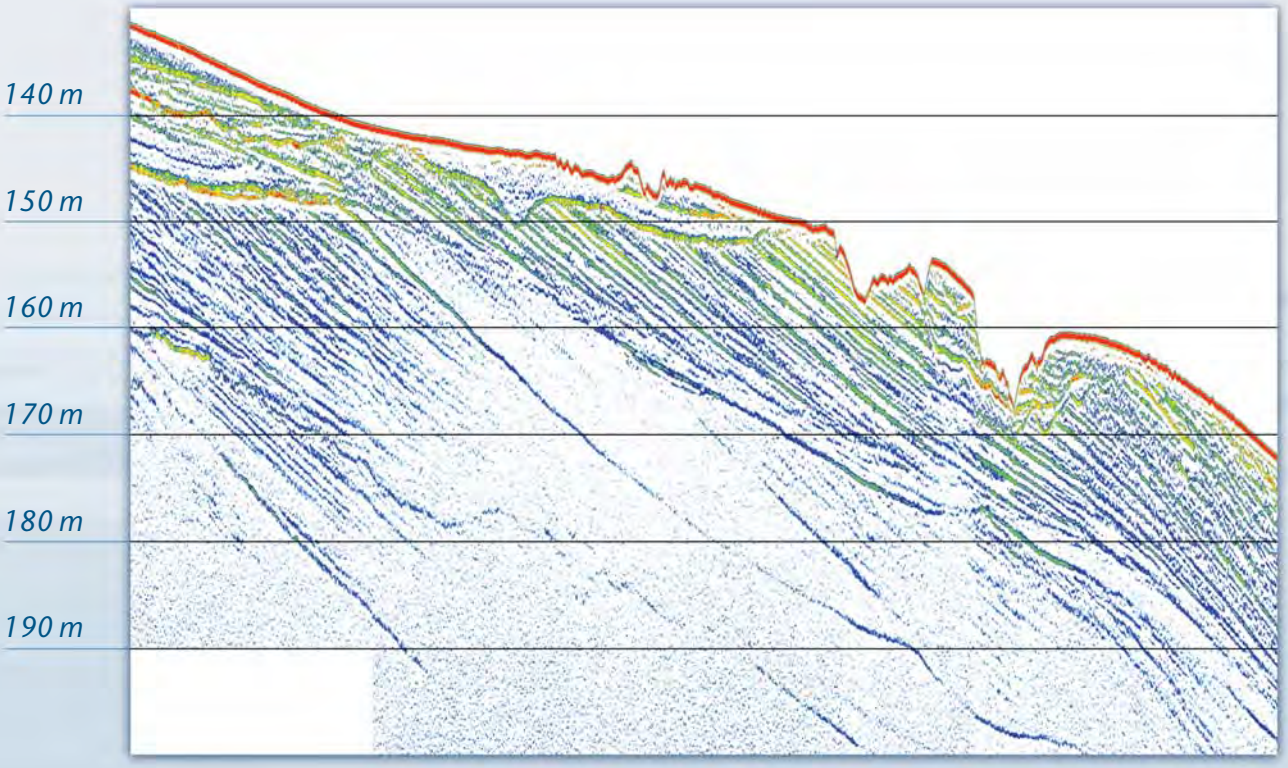
Software
- SESWIN data acquisition software
- SES Convert SEG-Y/XTF data export
- SES NetView remote display
- ISE post-processing software

Power Supply Requirements
- 100 – 240 V AC / 50 – 60 Hz
- power consumption < 900 W

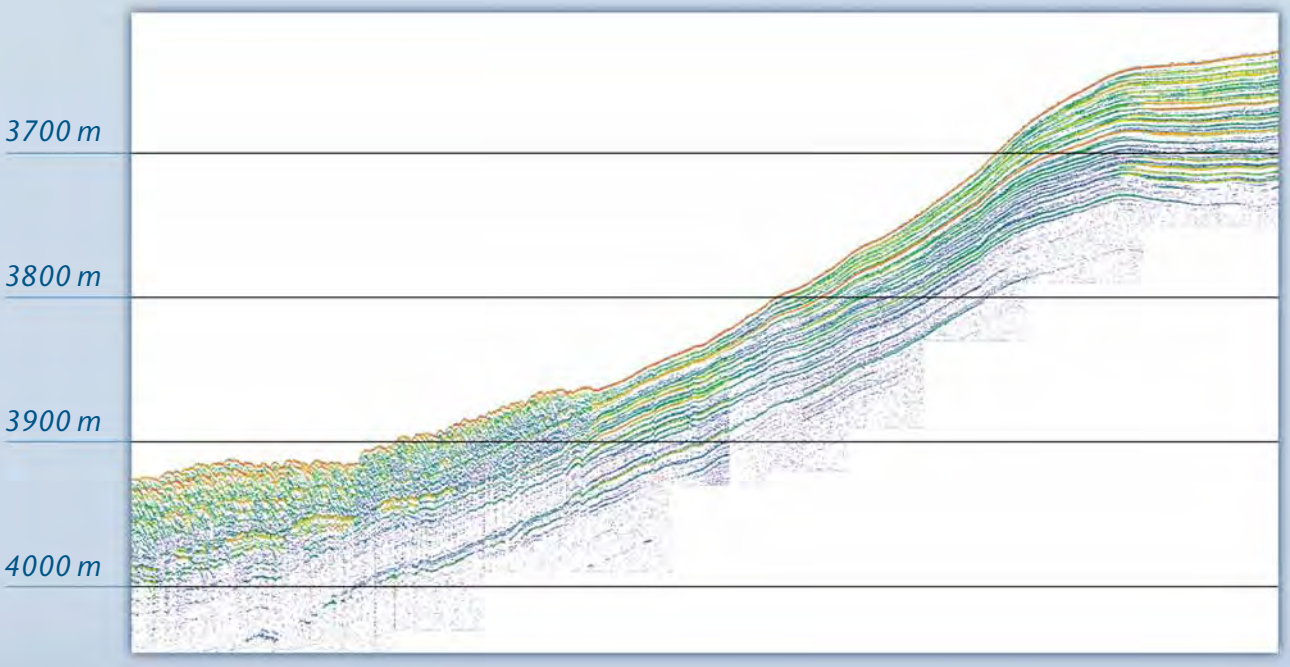
Innomar

www.innomar.com

Survey examples of SES-2000 deep-36



South Korean Coast echo plot example
Frequency 4 kHz, pulse length 750 µs, profile length 11 km, survey speed 13 knots



Atlantic Ocean (Argentina) echo plot example *– Frequency 4 kHz, pulse length 1500 µs, profile length 65 km*

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Appendix B

Distances to Acoustic Thresholds Corresponding to Level B Harassment for High Resolution Geophysical Sources

Source Name: Geo Marine Survey System 2D SUHRS at 400J

INPUT VALUES (LEVEL B)	
Threshold Level	*160*
Source Level (dBrms)	*195*
Frequency (kH)	*0.2*
Beamwidth (degree)	*180*
Water depth (m)	*5*

COMPUTED VALUES (LEVEL B)	DO NOT CHANGE
alpha (dB/km)	0.000352994
TL coefficient	20
Slant distance of threshold (m)	**56**
Vertical depth of threshold (m)	3.43042E-15
Horizontal Threshold Range (m)	**56**

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Appendix C

Marine Mammal Seasonal Densities

Table C-1 Nearshore Survey Area – Marine Mammal Seasonal Densities

Species		Winter Density [a/] (No./100 km²)	Spring Density [a/] (No./100 km²)	Summer Density [a/] (No./100 km²)	Fall Density [a/] (No./100 km²)
North Atlantic right whale		**0.058**	0.021	0.001	0.005
Humpback whale		**0.058**	0.017	0.001	0.004
Fin whale		**0.004**	0.004	0.001	0.001
Sei whale		**0.004**	0.003	0.000	0.001
Minke whale		0.007	**0.040**	0.002	0.005
Sperm whale		**0.000**	0.000	0.000	0.000
Long-finned pilot whale		**0.000**			
Bottlenose dolphin	N. migratory stock	11.891	27.572	64.098	**64.596**
	Offshore stock	---	---	---	**---**
Short beaked common dolphin		0.088	0.068	0.003	**0.128**
Atlantic white-sided dolphin		**0.009**	0.008	0.000	0.002
Atlantic spotted dolphin		0.000	0.000	**0.002**	0.002
Risso's Dolphin		0.000	0.000	0.000	**0.000**
Harbor porpoise		**0.393**	0.336	0.002	0.004
Harbor seal		6.747	7.660	4.431	**10.022**
Gray Seal		6.747	7.660	4.431	**10.022**

Table C-2 Offshore Survey Area – Marine Mammal Seasonal Densities

Species		Winter Density [a/] (No./100 km²)	Spring Density [a/] (No./100 km²)	Summer Density [a/] (No./100 km²)	Fall Density [a/] (No./100 km²)
North Atlantic right whale		**0.075**	0.052	0.003	0.008
Humpback whale		0.084	**0.105**	0.042	0.067
Fin whale		**0.135**	0.119	0.078	0.039
Sei whale		0.025	**0.046**	0.004	0.013
Minke whale		0.045	**0.585**	0.164	0.046
Sperm whale		0.005	0.004	**0.010**	0.003
Long-finned pilot whale		**0.071**			
Bottlenose dolphin	N. migratory stock	4.606	7.028	**17.155**	16.827
	Offshore stock	4.606	7.028	**17.155**	16.827
Short beaked common dolphin		**6.517**	3.589	2.919	3.437
Atlantic white-sided dolphin		0.497	**0.731**	0.332	0.475
Atlantic spotted dolphin		0.016	0.037	**0.657**	0.526
Risso's Dolphin		**0.078**	0.043	0.027	0.040
Harbor porpoise		**3.374**	3.287	0.091	0.051
Harbor seal		**5.886**	5.257	0.497	1.587
Gray Seal		**5.886**	5.257	0.497	1.587