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Ocean Wind II, LLC

Application for Incidental Harassment Authorization for the Non-Lethal Taking of Marine Mammals during Site Characterization Surveys off New Jersey

Lease OCS-A 0532

April 2023

Application for Incidental Harassment Authorization for the Non-Lethal Taking of Marine Mammals:

Site Characterization Surveys

Leases OCS-A 0532

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List of Acronyms

µPa	micropascal
AA	Applied Acoustics
AMAPPS	Atlantic Marine Assessment Program for Protected Species
AWS	Atlantic white-sided (dolphin)
BOEM	Bureau of Ocean Energy Management
CETAP	Cetacean and Turtles Assessment Program
CFR	Code of Federal Regulations
CHIRP	Compressed High-Intensity Radiated Pulse
dB	decibel
DMA	Dynamic Management Area
DoN	Department of the Navy
DPS	distinct population segment
EA	environmental assessment
EBS	environmental baseline study
ECR	export cable route
EIS	environmental impact statement
ESA	Endangered Species Act
ET	EdgeTech
FR	*Federal Register*
G&G	geophysical and geotechnical
GAPS	Global Acoustic Positioning System
HF	high-frequency
HRG	high-resolution geophysical
IHA	Incidental Harassment Authorization
ISO	International Organization for Standardization
J	joule
LF	low-frequency
MAI	Marine Acoustics, Inc.
MABS	Mid-Atlantic Baseline Studies/Maryland Baseline Studies
MBES	multibeam echosounder
MF	mid-frequency
MMPA	Marine Mammal Protection Act
NARW	North Atlantic right whale
NJDEP	New Jersey Department of Environmental Protection
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Ocean Wind 02	Ocean Wind II, LLC
OCS	Outer Continental Shelf
OPR	Office of Protected Resources
Orsted	Orsted Wind Power North America LLC
PBR	Potential Biological Removal
PK	zero-to-peak sound pressure level
PSO	Protected Species Observer
PTS	permanent threshold shift
PW	phocid pinniped in water
re	referenced to
ROV	remotely operated vehicle

List of Acronyms
(Continued)

RPM	Reasonable and Prudent Measure
RWSAS	Right Whale Sighting Advisory System
SAR	Stock Assessment Report
SBP	sub-bottom profiler
SEL_{24h}	sound exposure level over 24-hours
SFV	sound field verification
SL	source level
SMA	Seasonal Management Area
SPL	root-mean-square sound pressure level
SSS	side-scan sonar
TL	transmission loss
TTS	temporary threshold shift
UHD	ultra-high definition
UME	Unusual Mortality Event
USBL	ultra-short baseline
USFWS	U.S. Fish and Wildlife Service
WEA	wind energy area
WFA	weighing factor adjustment

1.0   Description of Proposed Activities

The Applicant submits this request for Incidental Harassment Authorization (IHA) pursuant to Section 101(a)(5) of the Marine Mammal Protection Act (MMPA) for the incidental take of small numbers of marine mammals by Level B harassment during site characterization using high resolution geophysical (HRG) surveys conducted to support the development of offshore wind farm projects.. The Applicant is proposing to conduct the site characterization surveys within federal and state waters located in the area of the Outer Continental Shelf (OCS) Lease Area OCS-A 0532 (Lease Area) and potential export cable routes (ECRs) to landfall locations in New Jersey. The information provided in this document is submitted in response to the requirements of 50 Code of Federal Regulations (CFR) § 216.104 to allow for the incidental harassment of small numbers of marine mammals resulting from site characterization surveys.

1.1   PROJECT DESCRIPTION

Ocean Wind II, LLC (Ocean Wind 02), an affiliate of Orsted Wind Power North America LLC (Orsted) (Applicant), on its behalf and on behalf of any successors in interest or assignee, submits this application to the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) requesting the issuance of an IHA to allow for the incidental harassment of small numbers of marine mammals resulting from site characterization surveys which will be conducted to support the development of offshore wind farm projects. **Figure 1** shows the Project Area comprising the Lease Area and survey boundaries (gray shaded area) for the site characterization surveys, which include the potential ECR corridors.

Geophysical and geotechnical (G&G) surveys are required by BOEM and the Applicant to provide data concerning seabed (geophysical, geotechnical, and geohazard), ecological, and archeological conditions within the footprint of offshore wind facility development. Surveys are also conducted to support engineering design and to map Unexploded Ordinance (UXO survey). The IHA is being requested to allow for the incidental harassment of small numbers of marine mammals incidental to the operation of HRG sources with frequencies less than 180 kHz. An existing IHA which includes the Project Area was published in the Federal Register on 19 May 2022 (87 *FR* 30453) and is effective from 10 May 2022 through 9 May 2023. The period of coverage requested for HRG activities included in this Application is 1 August 2023 through 31 July 2024.
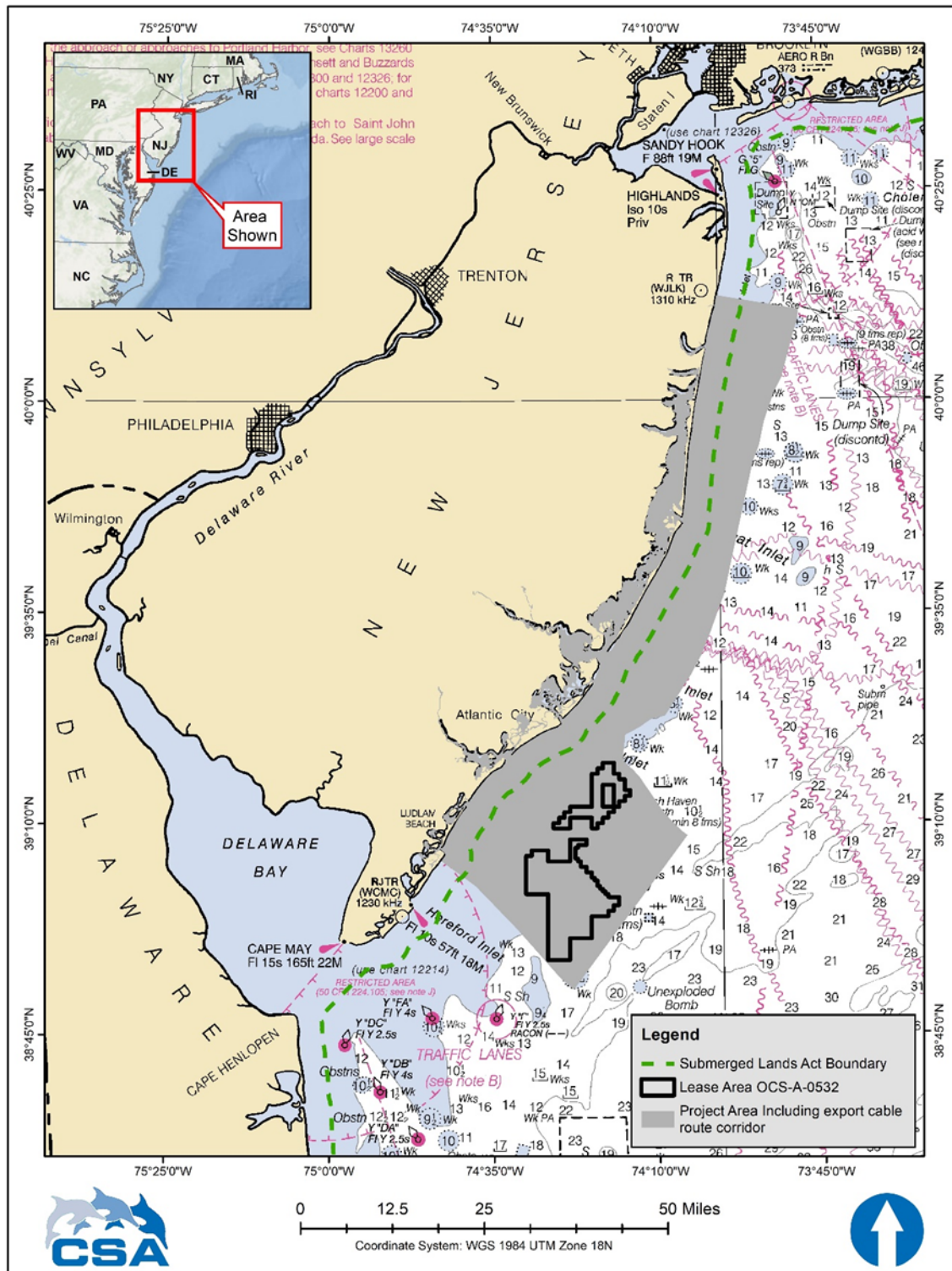
Figure 1.   Project Area for the site characterization surveys, indicated in gray, which includes the Lease Area and the potential export cable route area.

1.2   ACTIVITIES CONSIDERED IN THIS APPLICATION

Site characterization surveys described in this Application will include HRG surveys using sources with operating frequencies below 180 kHz which are not included in the list of sources unlikely to result in adverse effects by BOEM in their 2021 Biological Assessment (BA; Baker and Howson, 2021) or Tier 4 sources as defined by Ruppel et al. (2022) are considered in this Application. All source categories are described in **Section 1.3** below.

1.2.1   Acoustic Analysis of Activities Considered in this Application

1.2.1.1   Acoustic Terminology

This document follows International Organization for Standardization (ISO) 18405:2017 (ISO, 2017) for all acoustic terminology. Underwater acoustic source levels (SLs), exposure levels, and associated measurements are expressed in decibels (dB) referenced to (re) 1 micropascal (µPa). In turn, acoustic metrics can be expressed in several ways depending on the quantity being reported. **Table 1** provides a list of the acoustic units used in this document.

Table 1.   Acoustic metric definitions and their units used in this document adapted from International Organization for Standardization (ISO) 18405:2017 (ISO, 2017); abbreviations not provided in ISO (2017) follow Ainslie et al. (2018).

Quantity	Abbreviation	Units
Root-mean-square sound pressure level	SPL	dB re 1 µPa
Zero-to-peak sound pressure level (peak sound pressure level is a synonym)	PK	dB re 1 µPa
Sound exposure level over 24-hours	SEL_{24h}	dB re 1 µPa^2 s
Source level	SL	dB re 1 µPa m

µPa = micropascal dB = decibel; re = referenced to.

1.2.1.2   Regulatory Criteria

The included analysis applies the most recent noise exposure criteria utilized by NMFS Office of Protected Resources (OPR) to estimate acoustic harassment (NMFS, 2018a). The MMPA defines two levels of harassment: 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 is any act of pursuit, torment, or annoyance that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering. In the 2018 acoustic guidance, NMFS establishes acoustic thresholds that, if exceeded, have the potential to cause auditory injury or behavioral disturbance for marine mammals. In 2018, NMFS published a revision to the acoustic guidance for marine mammals for use in impact assessments (NMFS, 2018a).

NMFS recognizes two main types of sound sources: impulsive (e.g., sparkers, boomers) and non-impulsive (e.g., parametric sonars, CHIRPs); sources are further broken down into continuous or intermittent categories. Only impulsive and non-impulsive, intermittent sources are included in the list of equipment analyzed for potential acoustic impacts on marine mammals in this Application. After preliminary acoustic analysis of each equipment type based on its operating frequency, source levels, and operational modes, some sound sources were deemed to not have impact ranges expected to result in Level A or B take and were therefore not carried through to the take assessment of this Application (**Section 6.0**) due to the low likelihood of acoustic impacts from those sources (discussed further in **Section 1.3**). Sound source characteristics and acoustic thresholds are used to establish the ensonified area of received zero-to-peak sound pressure level, (PK), root-mean-square sound pressure level (SPL) or sound exposure level over 24-hours (SEL_{24h}) depending on the source type and marine mammal hearing group. This ensonified area constitutes the harassment zone, within which impacts and takes of marine mammals are considered.

Hearing Groups

Recognizing that marine mammal species do not have equal hearing capabilities, marine mammals are separated into hearing groups (Southall et al., 2007; NMFS, 2018a; NMFS, 2023; Southall et al., 2019). Hearing groups are used in acoustic impact assessment through the application of frequency weighting functions. Frequency weighting functions use physiological parameters to scale a species' sensitivity to a propagated sound source depending on the spectral content of the sound source and the hearing acuity of that animal to that spectral content. Sound energy contained within the hearing range of an animal has the potential to affect hearing while sound energy outside an animal's hearing range is unlikely to affect its hearing.

Marine mammal hearing groups, originally identified by Southall et al., 2007 then later modified by Finneran (2016) and adopted by NMFS (2018a), are categorized as low-frequency (LF) cetaceans, mid-frequency (MF) cetaceans, high-frequency (HF) cetaceans, phocid pinnipeds in water (PW), and otariid pinnipeds in water. Each category has a defined auditory weighting function and estimated acoustic threshold for the onset of temporary and injury-level hearing impacts.

More recently, Southall et al. (2019) conducted a broad, structured assessment of the audiometric, physiological, and acoustic output bases for the categorization of these hearing groups using the best available data at that time. Their assessment revealed several important features and distinctions present within the cetaceans that were not reflected in the less robust assessments used in previous categorizations of hearing groups. However, Southall et al. (2019) acknowledged that there is presently insufficient direct data within several groups to explicitly derive distinct thresholds and weighting functions. They thus proposed retaining the thresholds and functions developed by Finneran (2016) and adopted by NMFS (2018a), but with slightly different categorical identifiers. This results in slightly different grouping nomenclature from the NMFS (2018a) designations, but the overall conclusions of Southall (2019) remain congruent with the current MMPA guidance (NMFS, 2018a, 2023a).

The four hearing groups of marine mammals, based on the NMFS (2018a) nomenclature, that potentially occur in the Project Area include:

- LF cetaceans – baleen whales with a collective generalized hearing range of approximately 7 Hz to 35 kHz;
- MF cetaceans – most dolphins, all toothed whales except for *Kogia* spp., and all beaked and bottlenose whales with a generalized hearing range of approximately 150 Hz to 160 kHz;
- HF cetaceans – all true porpoises and *Kogia* spp. with a generalized hearing range of approximately 275 Hz to 160 kHz; and
- PW – all true seals with a generalized hearing range of 50 Hz to 86 kHz.

The 2018 NMFS guidance also defines an otariid pinniped underwater hearing group; however, species from this group do not occur within the Project Area.

Impact Levels

Level A auditory impacts under the MMPA include a permanent threshold shift (PTS), which is a condition that occurs when sound intensity is very high and/or of such long duration that the result is a permanent loss of hearing sensitivity which is an irreversible auditory tissue injury (Southall et al., 2007). Level A acoustic thresholds are defined as sound exposures that potentially elicit the onset of a PTS in marine mammal hearing. The acoustic thresholds are used to establish the ensonified area of received PK or SEL_{24h} depending on the source type and marine mammal hearing group.

For non-impulsive, intermittent sources, only the SEL_{24h} metric is used to assess potential injury-level impacts. For impulsive sources, both PK and SEL_{24h} criteria are identified to account for the intensity of impulsive sounds and the duration required to elicit PTS.

Level B harassment impacts include temporary threshold shift(s) (TTS) and behavioral responses. Compared to PTS, TTS is a lesser impact to hearing. TTS results when sounds of sufficient loudness cause a transient condition in which an animal's hearing sensitivity over the frequency band of exposure is impaired for a period of time (minutes to days). A TTS does not cause permanent damage and is not considered a tissue injury (Richardson et al., 1995; Southall et al., 2007). Similarly, underwater sound may elicit a behavioral response from marine mammals that may or may not be biologically significant. In principle, behavioral thresholds are lower than TTS thresholds. TTS thresholds are defined in the 2018 criteria; however, TTS thresholds and behavioral response thresholds have not yet been separated within a regulatory framework and are all considered Level B harassment. Currently, the regulatory framework uses interim guidance to define Level B thresholds (NMFS, 2023a) provided as unweighted SPL to assess Level B behavioral impacts (NMFS, 2023a).

The corresponding Level A and Level B acoustic threshold criteria are summarized in **Table 2**. While the Level B threshold for non-impulsive sources is an SPL of 120 dB re 1 µPa, an SPL of 160 dB re 1 µPa is considered more appropriate for intermittent sources such as those assessed in this Application.

Table 2. Summary of National Marine Fisheries Service acoustic criteria for Level A and Level B acoustic exposure from impulsive and non-impulsive, intermittent sources (NMFS, 2023a).

Hearing Group	Source Type				
	Non-Impulsive		Impulsive		
	Level B[1]	Level A[2]	Level B[1]	Level A[3]	Level A[2]
Low-frequency Cetacean	160	199	160	219	183
Mid-frequency Cetacean		198		230	185
High-frequency Cetacean		173		202	155
Phocid Pinniped (in water)		201		218	185

µPa = micropascal; dB = decibel; re = referenced to; PK = zero-to-peak sound pressure level; SEL_{24h} = sound exposure level over 24-hours; SPL = root-mean-square sound pressure level.
[1]Units expressed as SPL in dB re 1 µPa (unweighted). Level B criteria are the same for all intermittent sources, both non-impulsive and impulsive, which are considered in this Application.
[2]Units expressed as SEL_{24h} in dB re 1 µPa^2 s (weighted).
[3]Units expressed as PK in dB re 1 µPa.

1.3 SURVEY EQUIPMENT

Survey equipment is either towed, pole mounted, hull-mounted on the vessel, or equipment mounted on the source itself or on an ROV. Survey equipment will be deployed from multiple vessels or remotely operated vehicles (ROVs) during the HRG surveys conducted within the Project Area, however only one vessel would operate at a time within the Lease Area and ECR area. Typically, a survey ROV used for the proposed activities is a tethered platform that carries additional HRG equipment to increase the swath of the survey or the depth at which the equipment can be operated. The equipment deployed from an ROV is identical to the sources deployed from the survey vessel; however, sparker systems (described further in **Section 1.3**) are not normally deployed from an ROV due to the power supply required. HRG surveys will include the use of seafloor mapping equipment with operating frequencies above 180 kHz (e.g., side-scan sonar [SSS], multibeam echosounder [MBES]); magnetometers and gradiometers that have no acoustic output; and shallow- to medium-penetration sub-bottom profiling (SBP) equipment (e.g., parametric sonars, compressed high-intensity radiated pulses [CHIRPs], boomers, sparkers) with operating frequencies below 180 kHz. No deep-penetration SBP surveys (e.g., airgun or bubble gun surveys) will be conducted.

Typically, field-measured data is considered the best available science for HRG sources due to the high site- and operations-specific variables that direct frequency content, power, beamwidths, and other user-defined parameters. There are no accepted sound field verification reports for the proposed survey equipment operating in the Project Area; therefore, source information and associated analysis provided in Crocker and Fratantonio (2016); Baker and Howson (2021); and Ruppel et al. (2022) are used for source levels and propagation analysis for this Application.

In the analysis conducted by Ruppel et al., 2022 acoustic survey sources were categorized based on their potential to produce and propagate sound levels that may exceed marine mammal acoustic impact thresholds (NMFS, 2023a). All Project sources fall within the Tier 3 or Tier 4 categories defined by Ruppel et al. (2022) as:

- Tier 4 includes most high resolution geophysical, oceanographic, and communication/tracking sources, which are considered unlikely to result in incidental take of marine mammals and therefore termed *de minimis*.
- Tier 3 covers most non-airgun seismic sources, which either have characteristics that do not meet the *de minimis* category (e.g., some sparkers) or could not be fully evaluated in the analysis (e.g., bubble guns, some boomers).

Not every make and model of acoustic source that may be used in the project were analyzed in the three main references (Crocker and Fratantonio [2016]; Baker and Howson [2021]; and Ruppel et al. [2022]) used for source parameter information in the Application analysis. However, the operational parameters (e.g., operating frequency, SL, pulse duration, ping rate) for each piece of equipment, as well as the output parameters (e.g., SPLs, propagation distance, frequency content) are generally similar within each category; and therefore, the overall magnitude of impact radii can often be predicted based on the equipment category as described in Baker and Howson (2021) and Ruppel et al., (2022). Some source parameters, including SLs, described in Ruppel et al. (2022) are derived from data collected in Crocker and Fratantonio (2016); and are therefore congruent with the hierarchy used to select input parameters for the acoustic analysis. The following hierarchy was used for selecting input parameters for the NMFS User Spreadsheet Tool (NMFS, 2018b) and transmission loss (TL) equations:

1. For equipment that was measured by Crocker and Fratantonio (2016) and assessed in BOEM BA (Baker and Howson, 2021) or Ruppel et al., 2022, the reported SL for the most likely operational parameters was selected; and
2. For equipment not measured by Crocker and Fratantonio (2016) and/or not provided in Baker and Howson, 2021or Ruppel et al., 2022, the best available manufacturer specifications were selected. Use of manufacturer specifications represent the absolute maximum output of any source and do not adequately represent the operational source. Therefore, they should be considered an overestimate of the sound propagation range for that equipment.

The operational characteristics and supplemental source information considered in the analyses for this Application, as well as justification for selected proxy equipment, and categories excluded from analysis, are provided below.

Equipment categories carried forward in take analysis

Medium penetration, impulsive SBPs (boomers) are used to map deeper subsurface stratigraphy as needed. A boomer is a broad-band sound source operating in the 3.5 Hz to 10 kHz frequency range. This system is commonly mounted on a sled and towed behind the vessel. The sound levels produced by these types of equipment could result in Level B exposures, and therefore these types of equipment were included in the take analysis of this application (**Section 6.0**).

Medium penetration, impulsive SBPs (sparkers) are used to map deeper subsurface stratigraphy as needed. Sparkers create acoustic pulses from 50 Hz to 4 kHz omnidirectionally from the source. Sparkers are typically towed behind the vessel with adjacent hydrophone arrays to receive the return signals. The sound levels produced by these

types of equipment could result in Level B exposures, and therefore these types of equipment were included in the take analysis of this application (**Section 6.0**).

Shallow penetration SBPs (CHIRPs) are used to map the near-surface stratigraphy (top 0 to 10 m) of sediment below seabed. These systems emit sonar pulses that increase in frequency from approximately 2 to 20 kHz over time. The pulse length frequency range can be adjusted to meet project variables. These shallow penetration SPBs are typically mounted on a pole, either over the side of the vessel or through a moon pool in the bottom of the hull; however, they can be used in several types of towed configurations. The sound levels produced by some models of CHIRP equipment could result in Level B exposures; and therefore, these types of equipment were included in the take analysis of this application (**Section 6.0**). However, the operational configuration and relatively narrow beamwidth of these sources help to reduce the likelihood of the beam intersecting an animal.

Equipment not carried forward in take analysis

Parametric SBPs and Sub-bottom Imagers (SBIs), also called sediment echosounders, are used for providing high data density in sub-bottom profiles that are typically required for cable routes, very shallow water, and archaeological surveys. There are no relevant information sources or measurement data within the Crocker and Fratantonio (2016) reference for parametric SBPs. Source information is available from the manufacturer; however, no field measurements or propagation characteristics are provided with the manufacturer specifications. Due to the highly specialized nature of these sonars (high frequencies and narrow beamwidths) the source information alone is not sufficient to fully evaluate the expected propagation. Additionally, since the parametric SPBs are typically mounted on a side pole, either over the side of the vessel or through a moon pool in the bottom of the hull; they are typically not towed behind the vessel, the likelihood of the beam intersecting an animal is significantly reduced.

The specific parametric sonar proposed for the HRG work, the Innomar SES-2000 or similar SBP, uses the principle of "parametric" or "nonlinear" acoustics to generate short, very narrow-beam sound pulses at very high frequencies (generally around 85 to100 kHz). The transducer projects a beamwidth of approximately 1° to 3.5°. The narrow beamwidth significantly reduces the impact range of the source while the high frequencies of the source are rapidly attenuated in sea water. Neither high frequency sonar nor narrow beamwidth sources are well-captured in the NOAA User Spreadsheets used to calculate Level A isopleths. Therefore, the manufacturer reported SLs expressed as SPL were converted to sound exposure levels over the pulse duration, then exposure distances were calculated for each hearing group following guidance provided by NMFS OPR (NMFS, 2019a) which considers both the beamwidth and frequency absorption as previously mentioned.

The Pangeo Sub-bottom Imager™ (SBI) or similar SBIs are also included in this category because they are typically deployed 3 to 4 m above the seafloor, the acoustic source associated with this equipment is a linear frequency-modulated sweep with output frequencies from 4.5 to 12.5 kHz, and operational beamwidths range from 49° to 120° depending on frequency (Pangeo Subsea, 2019; Spencer, 2021). Because of the high frequency of the source and narrow bandwidth, parametric SBPs do not produce Level A isopleths beyond 2 m and do not produce Level B isopleths beyond 4 m. No Level A or Level B exposures can be reasonably expected from the operation of these sources; therefore, the Innomar parametric SBPs and Pangeo SBIs were not carried forward in the take analysis in this Application.

Ultra-short baseline (USBL) positioning systems are used to provide high accuracy ranges to survey equipment by measuring the time between the acoustic pulses transmitted by the vessel transceiver and a transponder (or beacon) necessary to produce the acoustic profile. It is a two-component system with a moonpool- or side pole-mounted transceiver and one or several transponders mounted on other survey equipment. There are no relevant information sources or measurement data within the Crocker and Fratantonio (2016) reference for USBLs and only limited manufacturer SL information. USBLs have a wide variety of configurations, source levels, and beamwidths but have been shown to produce extremely small acoustic propagation distances in their typical operating configuration.

There are numerous options for make and model of USBLs and of combinations pairing USBL transceivers and beacons.

USBLs fall into the Tier 4 category of equipment in Ruppel et al., 2022. Additionally, geophysical sources have been extensively reviewed in the Gulf of Mexico OCS due to the large amount of ongoing and planned oil and gas G&G surveys. A Programmatic Environmental Impact Statement (EIS) was issued for G&G surveys in the Gulf of Mexico in 2017 (BOEM, 2017). Within this EIS, non-airgun HRG sources were considered for potential impacts. Notably, USBLs were not considered in the assessment. Additionally, in the recent incidental take regulation published for the Gulf of Mexico USBLs were not considered for take requests by NMFS in the final rule published on 19 January 2021 (86 *FR* 5322) and were considered unlikely to adversely affect marine mammals in the BOEM BA (Baker and Howson, 2021). In both assessments, HRG surveys with equipment comparable to the equipment proposed in these activities were fully evaluated and USBLs were not considered in the take evaluation.

There is, therefore, precedence for not considering USBLs as sound sources likely to propagate sound levels reaching Level A or Level B thresholds. Based on this information, no Level A or Level B exposures can be reasonably expected from the operation of these sources; therefore, the USBLs were not carried forward in the take analysis in this Application.

MBESs are used to determine water depths and general bottom topography. MBES sonar systems project sonar pulses in several angled beams from a transducer mounted to a ship's hull. The beams radiate out from the transducer in a fan-shaped pattern orthogonally to the ship's direction. The proposed MBESs all have operating frequencies >180 kHz; are outside the general hearing range of marine mammals likely to occur in the Project Area and are not likely to affect these species. Therefore, this equipment category will not be discussed further in this Application.

SSS are used for seabed sediment classification purposes and to identify natural and man-made acoustic targets on the seafloor. The sonar device emits conical or fan-shaped pulses down toward the seafloor in multiple beams at a wide angle, perpendicular to the path of the sensor through the water column. The acoustic return of the pulses is recorded in a series of cross-track slices, which can be joined to form an image of the sea bottom within the swath of the beam. SSSs are typically towed beside or behind the vessel or from an autonomous vehicle. The proposed SSSs all have operating frequencies >180 kHz; are outside the general hearing range of marine mammals likely to occur in the Project Area and are not likely to affect these species. Therefore, this equipment category will not be discussed further in this Application.

1.3.1   Equipment Summary

The operational parameters for each piece of equipment are typically provided as a range of options that can be specified by the user. The precise settings are often field-specific depending on each contractor's individual survey methodologies and data needs. The selected parameters will affect the impact analysis for each piece of equipment within each category; therefore, the parameters used in the analysis must be as closely aligned as possible with the expected operation at the time of the survey. This information helps determine the expected acoustic output for this Project by selecting the appropriate measurements reported in Crocker and Fratantonio (2016). As mentioned previously, the BOEM BA (Baker and Howson, 2021) also used information from Crocker and Fratantonio (2016); however, the BA used the highest source operational settings which do not match the source settings proposed by the Applicants to meet the needs of their survey. As previously discussed for equipment that was not measured by Crocker and Fratantonio (2016), manufacturer information was used with the most applicable operational parameters (**Table 3**).

SFV measurements on most proposed equipment types were previously conducted by the Applicant on this Lease and on other wind farm areas between 2015 and 2018. However, due to significant variation in SFV methodologies and SFV reporting, NMFS OPR provided supplemental guidance to the Applicant in July 2019 for methods applied

in lieu of using SFVs (NMFS, 2019a). Because there are no standardized field measurements for HRG survey equipment, NMFS recommended that the controlled measurements provided in Crocker and Fratantonio (2016) be the primary reference for equipment SLs with manufacturer information supplementing for equipment that was not measured in the Crocker and Fratantonio (2016) study. Where applicable, SFV measurements are provided in equipment descriptions to supplement the data used in the analysis; however, SFV measurements were not used to define SLs or acoustic threshold distances.

Although the final equipment choices will vary depending on the final survey design, vessel availability, make and model updates, and survey contractor selection, all sources that are representative of those that could be employed during the HRG surveys are provided in **Table 3** along with details of the parameters used in acoustic analyses within this Application.

Table 3.   List of all representative geophysical sound sources with operating frequencies below 180 kHz that may be used during the site characterization surveys and were assessed for marine mammal takes. Equipment types not carried through for take analysis are not included in the table. All source information that was used to calculate threshold isopleths are provided in the table[1].

Equipment	Source Type	WFA in User Spreadsheets (kHz)[2]	Reference for SL	Operating Frequency (kHz)	SL (SPL dB re 1 µPa m)	SL (SEL dB re 1 µPa^2 m^2 s)	SL (PK dB re 1 µPa m)	Pulse Duration (width) (millisecond)	Repetition Rate (Hz)	Beamwidth (degrees)	Deployment Method
Shallow Sub-bottom Profilers (CHIRPS)											
ET 216 (2000DS or 3200 top unit)	Non-impulsive, mobile, intermittent	N/A[3]	MAN	2–16 2–8	195	178	-	20	6	24	PM/T/EM
ET 424 3200-XS	Non-impulsive, mobile, intermittent	N/A[3]	CF	4–24	176	152	-	3.4	2	71	PM/T/EM
ET 512i	Non-impulsive, mobile, intermittent	N/A[3]	CF	0.7–12	179	158	-	9	8	80	PM/T/EM
GeoPulse 5430A	Non-impulsive, mobile, intermittent	N/A[3]	MAN	2–17	196	183	-	50	10	55	PM/T/EM
Teledyne Benthos Chirp III - TTV 170	Non-impulsive, mobile, intermittent	N/A[3]	MAN	2–7	197	185	-	60	15	100	PM/T/EM
Impulsive, Medium Sub-bottom Profilers (Sparkers & Boomers)											
AA, Dura-spark UHD Sparker (400 tips, 500 J)[4]	Impulsive, mobile	1	CF	0.3–1.2	203	174	211	1.1	4	Omni	T
AA, Dura-spark UHD Sparker Model 400 x 400[4]	Impulsive, mobile	1	CF	0.3–1.2	203	174	211	1.1	4	Omni	T
GeoMarine, Dual 400 Sparker,	Impulsive, mobile	1.5	CF	0.4–5	203	174	211	1.1	2	Omni	T

Table 3.   (Continued).

Model Geo-Source 800[4,5]											
GeoMarine Sparker, Model Geo-Source 200-400[4,5]	Impulsive, mobile	1	CF	0.3–1.2	203	174	211	1.1	4	Omni	T
GeoMarine Sparker, Model Geo-Source 200 Lightweight[4,5]	Impulsive, mobile	1	CF	0.3–1.2	203	174	211	1.1	4	Omni	T
AA, triple plate S-Boom(700–1,000 J)[6]	Impulsive, mobile	3.4	CF	0.1–5	205	172	211	0.6	4	80	T

µPa = micropascal; AA = Applied Acoustics; CF = Crocker and Fratantonio (2016); CHIRP = compressed high-intensity radiated pulses; dB = decibel; EM = equipment mounted; ET = edgetech; J = joule; Omni = omnidirectional source; re = referenced to; PK = zero-to-peak sound pressure level; PM = pole mounted; SBI = sub-bottom imager; SL = source level; SPL = root-mean-square sound pressure level; T = towed; TB = Teledyne benthos; UHD = ultra-high definition; WFA = weighting factor adjustment.

[1]Operational parameters listed here differ from those listed in the Bureau of Ocean Energy Management Biological Assessment published in February 2021 (Baker and Howson, 2021).

[2]WFAs were selected in the User Spreadsheet were based on estimated hearing sensitivities of marine mammals and the operational frequency of the source.

[3]All CHIRP equipment have operational beamwidths <180° and sweep through a range of frequencies per pulse, so ranges to Level A thresholds were therefore calculated using MATLAB code provided by the National Marine Fisheries Service Office of Protected Resources (NMFS, 2021a).

[4]The Dura-spark measurements and specifications provided in Crocker and Fratantonio (2016) were used for all sparker systems proposed for the survey. The data provided in Crocker and Fratantonio (2016) represent the most applicable data for similar sparker systems with comparable operating methods and settings when manufacturer or other reliable measurements are not available.

[5]The AA Dura-spark (500 J, 400tips) was used as a proxy source.

[6]Crocker and Fratantonio (2016) provide S-Boom measurements using two different power sources (CSP-D700 and CSP-N). The CSP-D700 power source was used in the 700 J measurements but not in the 1,000 J measurements. The CSP-N source was measured for both 700 J and 1,000 J operations but resulted in a lower SL; therefore, the single maximum SL value was used for both operational levels of the S-Boom.

1.4 DISTANCES TO REGULATORY ACOUSTIC THRESHOLDS

Because impulsive sources use dual metrics (SEL_{24h} and PK) for Level A exposure criteria, the metric resulting in the largest isopleth distance was used for exposure estimation. Weighting factor adjustments (WFAs) for Level A isopleths used to account for differences in marine mammal hearing were determined by examining the frequency range and spectral densities for each source. The selected WFAs were then compared to the Applicable Frequencies Table located in the WFA tab of the NMFS User Spreadsheet Tool (NMFS, 2018b). If the determined frequency was lower than the applicable frequency for all hearing groups, it was entered as the WFA. When the frequency of a source exceeded the applicable frequency for a certain hearing group, an additional worksheet was created that applied the "use" frequency of the exceeded hearing group as indicated by NMFS (2018b). All the non-impulsive sources included in the take assessment of this Application (**Table 3**) have operational beamwidths <180° and sweep through multiple frequencies within a single pulse, so ranges to Level A exposure criteria were therefore calculated using MATLAB code provided by NMFS OPR (NMFS, 2021a).

The User Spreadsheet does not calculate distances to Level B thresholds; the ranges to the Level B thresholds for omnidirectional sources (beamwidths >180°) were instead determined by applying spherical spreading loss to the SL for that equipment. For directional sources with reported beamwidths <180°, operational depth and directionality can greatly influence how the sound propagates and can influence the resulting isopleth distance, so these parameters were considered for sources that had reported beamwidths. Narrow beamwidths allow geophysical equipment to be highly directional, focusing its energy in the vertical direction and minimizing horizontal propagation, which greatly reduces the possibility of direct path exposure to receivers (i.e., marine mammals) from sounds emitted by these sources. Therefore, for directional sources, isopleth distances were calculated following NMFS OPR interim guidance (NMFS, 2019a) to account for the influence of beamwidth and frequency on the horizontal propagation of these sources.

The estimated distances to Level A and Level B isopleths calculated for each marine mammal hearing group are given in **Table 4**.

Table 4. Maximum distance to weighted Level A and unweighted Level B thresholds for equipment categories included in take analysis for all marine mammal hearing groups[1].

Source	Distance to Level A Threshold (m)					Distance to Level B (m)
	LF (SEL_{24h} threshold)	MF (SEL_{24h} threshold)	HF (SEL_{24h} threshold)	HF (PK threshold)	PW (SEL_{24h} threshold)	All (SPL threshold)
Shallow SBP's (CHIRPS)	1.5	<1	18	-	<1	48
Boomers	<1	0	0	4.7	0	34
Sparkers	<1	0	0	2.8	0	141

μPa = micropascal; CHIRP = compressed high-intensity radiated pulses; dB = decibel;; HF = high-frequency; LF= low-frequency; MF = mid-frequency; PK = zero to peak sound pressure level in dB re 1 μPa; PW = phocids in water; re= referenced to; SBP = sub-bottom profiler; SEL_{24h} = cumulative sound exposure level in dB re 1 $μPa^2$ s; SPL = root-mean-square sound pressure level;

[1]The Level A and B isopleths were calculated to comprehensively assess the potential impacts of the predicted source operations as required for this Application. However, as described in **Section 5.0**, Level A takes are not expected and not requested.

2.0   Survey Dates, Duration, and Specific Geographic Region

2.1   SURVEY ACTIVITY DATES AND DURATION

Site characterization surveys considered under this application are expected to occur between 1 August 2023 and 31 July 2024 with a total of 275 vessel survey days. A vessel survey day is defined here as a 24-hour activity period in which the assumed number of line km are surveyed. Vessel days are defined as the number of days any single vessel is in operation regardless of any other vessel operations (i.e., if two vessels are working concurrently within the same 24-hour period, each vessel would be counted as having a vessel day for a total of two vessel days even though the activity occurs within a single 24-hour period). The number of anticipated survey days was calculated as the number of days needed to reach the overall level of effort required to meet survey objectives assuming any single vessel covers, on average 70 line km per 24-hour operations.

During the one-year period covered by this IHA, the Applicant is proposing up to 275 vessel survey days during which HRG surveys will be conducted within Lease Area OCS-A 0532 and the associated ECR area (**Figure 1**).

2.2   SPECIFIC GEOGRAPHIC REGION

The proposed survey activities will occur within the Project Area in federal waters in the Lease Area and potential ECR area to landfall locations in New Jersey, as shown in **Figure 1**. The proposed survey area totals 3,801 km^2 and includes the Lease Area totaling approximately 343.8 km^2 and potential export cable routes (ECRs). Water depths in the Lease Area range from approximately 15 to 35 m. Water depths in the ECR area extend out from shoreline to approximately 39 m.

2.3   SURVEY ACTIVITIES

Site characterization survey activities will include multibeam depth sounding, seafloor imaging, and shallow and medium penetration sub-bottom profiling to meet BOEM requirements as set out in the Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585 [March, 2017]; the Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585 [May 2020],as applicable or amended; and to support engineering design and UXO surveys. All surveys will follow the BOEM Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection (dated 11/22/2021 or as amended).

Up to two concurrent vessels, which may include 24-hour vessels and/or 12-hour vessel, will be used to complete the surveys. Site characterization survey activities considered in this IHA will use combinations of the equipment listed in **Table 3** to collect multiple aspects of geophysical data along each transect. Equipment with operating frequencies above 180 kHz (e.g., SSS, MBES) and equipment that does not have an acoustic output (e.g., magnetometers) will also be used but are not considered in the IHA analysis. Combinations of sources may be used during any single survey and selection of equipment combinations is based on specific survey objectives that may not be known at the time of the application. Field operation modes of each acoustic equipment source are based on expected survey parameters and as-needed modification due to field conditions and data quality constraints may be applied once operations begin.

3.1   PROTECTED POPULATIONS

All marine mammal species are protected under the MMPA. Some marine mammal stocks (defined as a group of nonspecific individuals that are managed separately) (Hayes et al., 2021; NMFS, 2022) may be designated as strategic under the MMPA.

A stock is considered strategic if:

- Direct human-caused mortality exceeds its Potential Biological Removal (PBR) level (defined as the maximum number of animals, not including natural mortality, that can be removed from the stock while still allowing the stock to reach or maintain its optimum sustainable population level);
- It is listed under the ESA;
- It is declining and likely to be listed under the ESA; or
- It is designated as depleted under the MMPA.

A depleted species or population stock is defined by the MMPA as any case in which:

- The Secretary, after consultation with the Marine Mammal Commission and the Committee of Scientific Advisors on Marine Mammals established under MMPA Title II, determines that a species or population stock is below its optimum sustainable population;
- A State, to which authority for the conservation and management of a species or population stock is transferred under Section 109 of the MMPA, determines that such species or stock is below its optimum sustainable population; or
- A species or population stock is listed as an Endangered species or a Threatened species under the ESA.

Some species are further protected under the ESA. Under the ESA, a species is considered Endangered if it is "in danger of extinction throughout all or a significant portion of its range." A species is considered Threatened if it "is likely to become an Endangered species within the foreseeable future throughout all or a significant portion of its range" (NMFS, 2020).

3.2   MARINE MAMMAL SPECIES

There are 36 species (comprising 37 stocks) of marine mammals in the Western North Atlantic OCS Region that are protected by the MMPA (**Table 5**) (Hayes et al., 2021; NMFS, 2022). The marine mammal assemblage comprises 31 cetacean species, including 25 members of the suborder Odontoceti (toothed whales, dolphins, and porpoises) and 6 of the suborder Mysticeti (baleen whales). There are five whale species listed as Endangered under the ESA with ranges that include the Project Area:

- Fin whale (*Balaenoptera physalus*);
- Sei whale (*Balaenoptera borealis*);
- Blue whale (*Balaenoptera musculus*);
- North Atlantic right whale (*Eubalaena glacialis*); and
- Sperm whale (*Physeter macrocephalus*).

Along with cetaceans, seals are also protected under the MMPA; four species of phocids (true seals) with ranges that include the Project Area include harbor seals (*Phoca vitulina*), gray seals (*Halichoerus grypus*), harp seals (*Pagophilus groenlandicus*), and hooded seals (*Cystiphora cristata*) (Waring et al., 2008). Lastly, one species of sirenian, the Florida manatee (*Trichechus manatus latirostris*), is an occasional visitor to the region during summer months (USFWS, 2021). The manatee is listed as Threatened under the ESA and is protected under the MMPA along with the other marine mammals.

The expected occurrence of each species is based on the following criteria and/or on the habitat models (i.e., Best et al., 2012; Roberts et al.,2022) for the Project Area and for species available in the model analyses:

- Common – occurring consistently in moderate to large numbers;
- Regular – occurring in low to moderate numbers on a regular basis or seasonally;
- Uncommon – occurring in low numbers or on an irregular basis;
- Rare – records for some years but limited; and
- Not expected – range includes the Project Area but due to habitat preferences and distribution information, species are not expected to occur in the Project Area although records may exist for adjacent waters.

The protection status, stock identification, occurrence, and abundance estimates of the species listed in **Table 5** are discussed in more detail in **Section 4.0**.

Table 5.　Marine mammals protected by the Marine Mammal Protection Act with geographic ranges that include the Project Area (NMFS 2023b; USFWS, 2022).

Common Name	Scientific Name	Stock	Federal ESA/ MMPA Status[1]	Relative Occurrence in the Project Area	Best Estimate[1]
Low-frequency Cetaceans					
Fin whale	*Balaenoptera physalus*	Western North Atlantic	ESA Endangered/ Depleted and Strategic	Regular	6,802
Minke whale	*Balaenoptera acutorostrata*	Canadian East Coast	Non-strategic	Regular	21,968
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine	Non-strategic	Common	1,396
North Atlantic right whale	*Eubalaena glacialis*	Western North Atlantic	ESA Endangered/ Depleted and Strategic	Regular	338
Sei whale	*Balaenoptera borealis*	Nova Scotia	ESA Endangered/ Depleted and Strategic	Uncommon	6,292
Blue whale[2]	*Balaenoptera musculus*	Western North Atlantic	ESA Endangered/ Depleted and Strategic	Rare	402
Mid-frequency Cetaceans					
Sperm whale	*Physeter macrocephalus*	North Atlantic	ESA Endangered/ Depleted and Strategic	Uncommon	4,349
Risso's dolphin	*Grampus griseus*	Western North Atlantic	Non-strategic	Common	35,215
Long-finned pilot whale	*Globicephala melas*	Western North Atlantic	Strategic	Common	39,215
Short-finned pilot whale	*Globicephala macrorhynchus*	Western North Atlantic	Strategic	Uncommon	28,924

Table 5.   (Continued).

Common Name	Scientific Name	Stock	Federal ESA/ MMPA Status[1]	Relative Occurrence in the Project Area	Best Estimate[1]
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic	Non-strategic	Uncommon	93,233
Common dolphin	*Delphinus delphis*	Western North Atlantic	Non-strategic	Common	172,974
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic	Non-strategic	Uncommon	39,921
Common bottlenose dolphin[3]	*Tursiops truncatus*	Western North Atlantic, Offshore	Non-strategic	Uncommon	62,851
Common bottlenose dolphin[3]	*Tursiops truncatus*	Western North Atlantic, northern migratory coastal	Strategic	Common	6,639
Dwarf sperm whale	*Kogia sima*	Western North Atlantic	Non-strategic	Rare	7,750
Pygmy sperm whale	*Kogia breviceps*	Western North Atlantic	Non-strategic	Rare	7,750
Killer whale	*Orcinus orca*	Western North Atlantic	Non-strategic	Rare	Unknown
Pygmy killer whale	*Feresa attenuata*	Western North Atlantic	Non-strategic	Not Expected	Unknown
False killer whale	*Pseudorca crassidens*	Western North Atlantic	Strategic	Rare	1,791
Northern bottlenose whale	*Hyperoodon ampullatus*	Western North Atlantic	Non-strategic	Not Expected	Unknown
Cuvier's beaked whale	*Ziphius cavirostris*	Western North Atlantic	Non-strategic	Rare	5,744
Mesoplodon beaked whales	*Mesoplodon* spp.	Western North Atlantic	Depleted	Rare	10,107
Melon-headed whale	*Peponocephala electra*	Western North Atlantic	Non-strategic	Not Expected	Unknown
White-beaked dolphin	*Lagenorhynchus albirostris*	Western North Atlantic	Non-strategic	Rare	536,016
Pantropical spotted dolphin	*Stenella attenuata*	Western North Atlantic	Non-strategic	Rare	6,593
Striped dolphin	*Stenella coeruleoalba*	Western North Atlantic	Non-strategic	Rare	67,036
Fraser's dolphin	*Lagenodelphis hosei*	Western North Atlantic	Non-strategic	Rare	Unknown
Rough toothed dolphin	*Steno bredanensis*	Western North Atlantic	Non-strategic	Rare	136
Clymene dolphin	*Stenella clymene*	Western North Atlantic	Non-strategic	Not Expected	4,237
Spinner dolphin	*Stenella longirostris*	Western North Atlantic	Non-strategic	Rare	4,102
High-frequency Cetaceans					
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/ Bay of Fundy	Non-strategic	Uncommon	95,543
Phocid Pinniped in Water					
Harbor seal	*Phoca vitulina*	Western North Atlantic	Non-strategic	Regular	61,336

Table 5. (Continued).

Common Name	Scientific Name	Stock	Federal ESA/ MMPA Status[1]	Relative Occurrence in the Project Area	Best Estimate[1]
Gray seal	*Halichoerus grypus*	Western North Atlantic	Non-strategic	Regular	27,300
Harp seal	*Pagophilus groenlandica*	Western North Atlantic	Non-strategic	Rare	7,600,000
Hooded seal	*Cystophora cristata*	Western North Atlantic	Non-strategic	Rare	Unknown
Sirenians					
Florida manatee	*Trichechus manatus latirostris*	-	ESA Threatened/ Depleted and Strategic	Rare	8,237[3]

- = not applicable for this species; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act; NMFS = National Marine Fisheries Service; USFWS = U.S. Fish and Wildlife Service.

[1]Best estimate from the most recently published Draft National Oceanic and Atmospheric Administration Stock Assessment (NMFS, 2022) was used.

[2] Blue whale abundance used minimum population estimate (Nmin); Nbest is not provided in the Stock Assessment Reports.

[3]Common bottlenose dolphins likely to occur in this area belong to two distinct stocks.

4.0   Affected Species Status and Distribution

Of the 36 marine mammal species with geographic ranges that include the Project Area (**Table 5**), 16 species can be reasonably expected to reside, traverse, or occasionally visit the Project Area and may be considered affected. Species information is based on NMFS stock assessment reports (SARs) (Waring et al., 2007, 2010, 2015; Hayes et al., 2017, 2019, 2020, 2021, 2022; NMFS, 2022); regional survey records (e.g., Cetacean and Turtle Assessment Program [CETAP], 1982; Atlantic Marine Assessment Program for Protected Species [AMAPPS], 2010 to 2014 [Palka et al, 2017]; North Atlantic Right Whale Sighting Survey and Right Whale Sighting Advisory System (RWSAS); BOEM Mid-Atlantic EA [BOEM, 2012]; the Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles [Kraus et al., 2016]); modeling studies (Pace, 2021); species working group reports (Pettis et al., 2021); and preliminary results (unpublished) of PSO mitigation surveys conducted by the Applicant during site investigation surveys during 2022.

Affected species are those that have a common, regular, or uncommon relative occurrence in Project Area (**Table 5**) or have a very wide distribution with limited distribution or abundance details. Species that are rare or not expected are not carried forward in this application. Therefore, the Applicant requests an IHA for Level B disturbance for the 16 species (one of which comprises two stocks) listed below and described in the following sections.

- North Atlantic right whale (*Eubalaena glacialis*)
- Humpback whale (*Megaptera novaeangliae*)
- Fin whale (*Balaenoptera physalus*)
- Sei whale (*Balaenoptera borealis*)
- Minke whale (*Balaenoptera acutorostrata*)
- Sperm whale (*Physeter microcephalus*)
- Risso's dolphin (*Grampus griseus*)
- Long-finned pilot whale (*Globicephala melas*)
- Short-finned pilot whale (*Globicephala macrorhynchus*)
- Atlantic white-sided dolphin (*Lagenorhynchus acutus*)
- Common dolphin (*Delphinus delphis*)
- Atlantic spotted dolphin (*Stenella frontalis*)
- Common bottlenose dolphin (*Tursiops truncatus*)
  - Western North Atlantic offshore stock
  - Northern migratory stock
- Harbor porpoise (*Phocoena phocoena*)
- Harbor seal (*Phoca vitulina*)
- Gray seal (*Halichoerus grypus*)

Species will not be equally affected by the proposed activities due to individual exposure patterns, the context in which noise is received, and, most prominently, individual hearing sensitivities. To account for acoustic sensitivity, marine mammal species are categorized into hearing groups that are designated to better predict and quantify impacts of noise (NMFS, 2018a; Southall et al., 2007, 2019). These functional hearing groups are described below with associated reference frequencies. While all these species likely hear beyond these bounds, primary sensitivities fall within the listed frequencies (**Section 1.2.1.1**).

The following information summarizes data on the status and trends, distribution and habitat preferences, behavior and life history, and auditory capabilities of marine mammals found in the Project Area as available in published literature and reports, including NMFS marine mammal SARs (Waring et al., 2007, 2010, 2015; Hayes et al., 2017, 2019, 2020, 2021; NMFS, 2022).

4.1 MYSTICETES

4.1.1 North Atlantic Right Whale (*Eubalaena glacialis*)

The North Atlantic right whale (NARW) is the only member of the mysticete family Balaenidae found in North Atlantic waters. They are skim feeders that primarily consume zooplankton including copepods, euphausiids, and cyprids. The NARW is listed as Endangered and is considered one of the most Endangered large whale species in the world (Jefferson et al., 2011; Hayes et al., 2022; Pettis et al., 2021). The most recent draft NMFS SAR estimated a population size for the Western North Atlantic stock of only 338 individuals based on a published state-space model of the sighting histories of individual whales using photo identification techniques which included information up through November 2019 (NMFS, 2022).

The most recent draft NMFS SAR (NMFS, 2022) identified seven areas where Western North Atlantic NARW aggregate seasonally: the coastal waters of the southeastern U.S., 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 (Brown et al., 2001; Cole et al., 2013). Several of these congregation areas correlate with seasonally high copepod concentrations (Pendleton et al., 2009). New England waters are a primary feeding habitat for NARWs during late winter through spring, with feeding moving into deeper and more northerly waters during summer and fall. Less is known regarding winter distributions; however, it is understood that calving takes place during this time in coastal waters of the Southeastern U.S.

Passive acoustic studies of NARWs have demonstrated their year-round presence in the Gulf of Maine (Morano et al., 2012; Bort et al., 2015), New Jersey (Whitt et al., 2013), and Virginia (Salisbury et al., 2016). Additionally, NARWs were acoustically detected off Georgia and North Carolina during 7 of the 11 months monitored (Hodge et al., 2015). All of this work further demonstrates the highly mobile nature of NARWs. Movements within and between habitats are extensive and the area off the Mid-Atlantic states is an important migratory corridor. While no critical habitat is listed within the Project Area, 11 NARWs were identified in the Mid-Atlantic Baseline Studies (MABS) surveys conducted between 2012 and 2014 with a total of nine sightings occurring in February and March (Williams et al., 2015a,b). Davis et al. (2017) recently examined detections from passive acoustic monitoring devices and documented a broad-scale use of much more of the U.S. Eastern Seaboard than was previously believed, and an apparent shift in habitat use patterns to the south of traditionally identified NARW congregations. Increased use of Cape Cod Bay and decreased use of the Great South Channel were also observed (Davis et al., 2017).

Off the coast of New Jersey, NARWs were acoustically detected in all seasons and visually observed in winter, spring, and summer during an environmental baseline study (EBS) conducted by New Jersey Department of Environmental Protection (NJDEP, 2010). The greatest number of acoustic detections occurred during April and May (Whitt et al., 2013). Reports from the RWSAS show 40 visual records and 265 acoustic detections off the coast of New Jersey since 2017 (NOAA, 2021).

The major threat to the NARW stock is human-caused mortality through incidental fishery entanglement that averaged 5.7 incidents per year and ship strikes that averaged 2.0 incident records per year based on data from 2015 through 2019 (NMFS, 2022).

In June 2017, NMFS declared an Unusual Mortality Event (UME) following an increase in NARW mortalities in the U.S. and Canada. As of 4 April 2023, a total of 98 dead stranded whales have been reported under the UME. The preliminary cause of death for most of these cases was determined to be due to vessel strike or entanglement (NMFS, 2023b). The draft SAR for NARW sets the PBR level at 0.7; therefore, any mortality or serious injury for this stock can be considered significant (NMFS, 2022). The Western Atlantic stock is considered strategic by NMFS because the average annual human-related mortality and serious injury exceeds PBR, and because the NARW is an Endangered species. Based on data from the Marine Mammal Stranding Center (MMSC), NJ strandings of NARWs occurred in 2002 (1); 2017 (1); and 2020 (2).

Seasonal Management Areas (SMAs) for reducing ship strikes of the NARW have also been designated in the U.S. and Canada. All vessels greater than 19.8 m in overall length must operate at speeds of 10 knots or less within these areas during specified time periods (NMFS, 2023c). A proposed modification to this rule was published in October, 2022 [87 FR 46921] and would reduce the size of vessel requirement to 10.6 m and adjust the geographic ranges of the SMAs (**Figure 2**) (NMFS, 2023c). Based on the 2022 rule modifications, the entire Project Area would be under an SMA from 1 November to 30 April (**Figure 2**).
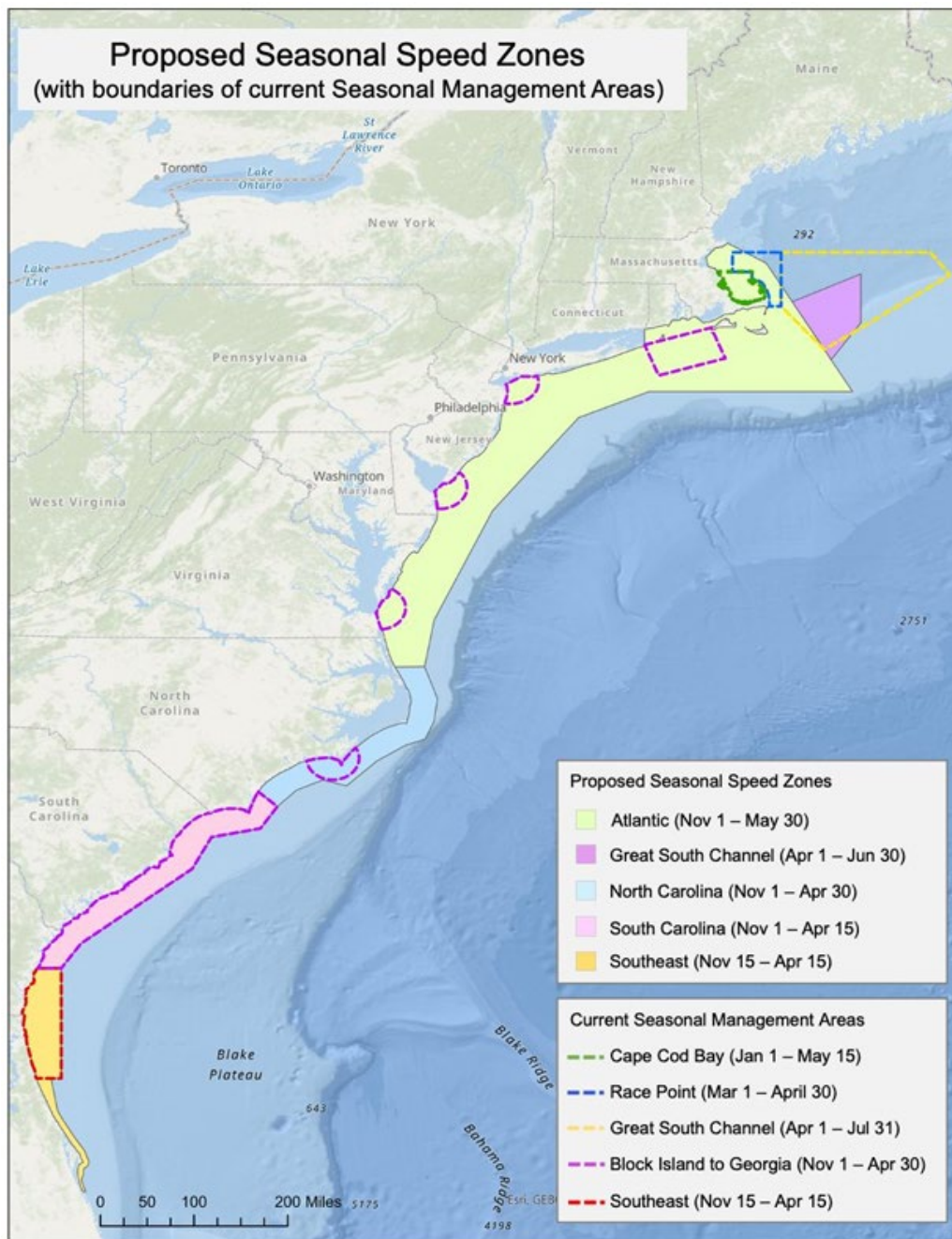
Figure 2.   Proposed Seasonal Management Areas for North Atlantic right whales (*Eubalaena glacialis*). (NMFS, 2023c).

The NARW underwent a NMFS 5-year review in 2017, which resulted in no change to its listing status. In 2009, NMFS received a petition to expand the critical habitat, and the agency considered this petition in the rulemaking process. In January 2016, two additional units comprising over 102,000 km^2 of marine habitat were designated as critical habitat to encompass the northeast feeding area in the Gulf of Maine/Georges Bank and the southeast calving grounds from North Carolina to Florida.

The following final rules notices are associated with the NARW:

- Critical Habitat Designation: 59 *FR* 28805, June 3, 1994;
- Atlantic Large Whale Take Reduction Plan: 62 *FR* 39157, July 22, 1997;
- Federal Regulations Governing the Approach to North Atlantic right whales: 69 *FR* 69536, November 30, 2004;
- Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic right whales: 73 *FR* 60173, October 10, 2008;
- Findings on Petition to Revise Critical Habitat: 75 *FR* 61690, October 6, 2010;
- Final Rule to Remove the Sunset Provision of the Final Rule Implementing Vessel Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic right whales 78 *FR* 73726 December 9, 2013; and
- Final Rule for North Atlantic right whale (*Eubalaena glacialis*) Critical Habitat 81 *FR* 4837, January 27, 2016.
- Amendments to the North Atlantic Right Whale Vessel Strike Reduction Rule 87 *FR* 46921, August 1, 2022.

NARWs are LF cetaceans that vocalize using a number of 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 NARW vocalization is the "up call"; a short sweep that rises from roughly 50 to 440 Hz over a period of 2 seconds. These up calls are characteristic of NARWs and are used by research and monitoring programs for indication of species presence. A characteristic "gunshot" call is believed to be produced by male NARWs. These pulses can have SLs of 174 to 192 dB re 1 µPa m 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 SLs between 137 and 162 dB re 1 µPa m.

4.1.2 Humpback Whale (*Megaptera novaeangliae*)

The humpback whale is a robust and medium-sized mysticete. It is distinguished from all other cetaceans by its long flippers, which are approximately one-third the length of the body (Jefferson et al., 2008). One species of the humpback whale is currently recognized (Committee on Taxonomy, 2021). Humpback whales are largely piscivorous, feeding primarily on herring (*Clupea* spp.), sand lance (*Ammodytes* spp.), and other small fishes as well as euphausiids in the Gulf of Maine (Hayes et al., 2019). Humpbacks show fidelity to feeding sites; however, local distribution is driven by prey availability and bathymetry, resulting in the whales transiting widely throughout their feeding habitat between spring and fall in search of prey. Feeding is the principal activity of humpback whales in New England waters, and their distribution in this region has been largely correlated to prey species and abundance (Payne et al., 1986, 1990).

The humpback whales occurring within the Project Area are believed to be mainly part of the Gulf of Maine stock (Hayes et al., 2021). Humpback whales have a global distribution and follow a migratory pattern of feeding in the high latitudes during summers and spending winters in the lower latitudes for calving and mating. The Gulf of Maine stock follows this pattern with winters spent in the Caribbean and West Indies, although acoustic recordings show a small number of males persisting in Stellwagen Bank throughout the year (Vu et al., 2012). The Gulf of Maine stock is comprised of an estimated 1,396 individuals (NMFS, 2022).

Sightings of humpback whales in the Mid-Atlantic are common (Barco et al., 2002), as are strandings (Wiley et al., 1995). Barco et al. (2002) suggested that the Mid-Atlantic region primarily represents a supplemental winter feeding ground used by humpbacks. During the MABS surveys, a total of 13 humpback whales were recorded between 2012 and 2014: eight during the winter, one during the summer, and four during the fall (Williams et al., 2015a, b). There was a total of 17 groups sighted during the NJDEP EBS, nine of which occurred during winter months (Whitt et al., 2015).

Primary threats to humpback whales are fishing gear entanglements and ship strikes. Mortality and serious injury records for large whales in the Western North Atlantic over a 40-year period (1970 to 2009) were reviewed to assess the magnitude of human related mortalities (van der Hoop et al., 2013). Results showed that roughly 27% of mortalities and serious injuries were humpback whale records. Of the humpback records where a cause could be determined (203 records), 57% of mortalities were caused by entanglements in fishing gear and 15% were attributable to vessel strikes. Glass et al. (2009) reported that between 2002 and 2006, humpback whales belonging to the Gulf of Maine stock were involved in 77 confirmed fishing gear entanglements and nine confirmed ship strikes.

Stock assessment records between 2014 and 2018 resulted in a minimum annual rate of human-caused mortality and serious injury to the Gulf of Maine stock of 15.25 animals per year (Hayes et al., 2021). This value includes an annual rate of incidental fishery interactions (9.45) and vessel strikes (5.8) (Hayes et al., 2021).

In 2016, a high number of humpback mortalities prompted NMFS to declare a UME starting in January, 2016. As of 4 April 2023, a total of 191 humpback whales have been found dead between Maine and Florida. Of these mortalities, eight occurred in Delaware, four in Maryland, 28 in New Jersey, and 36 in New York. Of the carcasses examined, over 50% had evidence of human interaction such as vessel strike or entanglement (NMFS, 2023d). Based on data from the Marine Mammal Stranding Center (MMSC), humpback what strandings occurred in NJ in 2003,2006, 2007, 2009, 2011, 2013, and 2014 with each year reporting one humpback stranding. Elevated strandings in NJ were reported in 2016 (2), 2017 (3), 2018 (2), 2019 (7), 2020 (6); 2022 (4); and 2023 (7 as of 27 March 2023).

On 8 September 2016 NMFS published a final decision changing the status of humpback whales under the ESA (81 *FR* 62259), effective as of 11 October 2016. Previously, humpback whales were listed under the ESA as an Endangered species worldwide. In the 2016 decision, NMFS recognized the existence of 14 distinct population segments (DPSs), of which four were listed as Endangered, one was listed as Threatened, and the remaining nine did not warrant protection under the ESA. A status review of the humpback whale was undertaken by NMFS in 2015 (Bettridge et al., 2015) to identify taxonomic units such as DPSs and assess the extinction risk of these units. To be considered a DPS, a population or group of populations must be "discrete" from the remainder of the taxon to which it belongs, and "significant" to the taxon to which it belongs. Information on distribution, ecological situation, genetics, and other factors is used to evaluate a population's discreteness and significance. This review process resulted in the identification of a West Indies DPS, which includes the Gulf of Maine stock. The West Indies DPS was considered not to be at risk of extinction. Subsequently, the Gulf of Maine stock is not a strategic stock, and no critical habitat has been designated for the humpback whale (Hayes et al., 2021).

Like other large whales, increases in noise levels may affect this species' ability to transmit and access acoustic cues in the environment. For example, Clark et al. (2009) predicted an 8% reduction in communication space due to shipping for singing humpback whales in the northeast. Humpbacks are an LF species, 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 in 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, LF pulses (with SLs up to 176 dB re 1 µPa m) between 25 and 90 Hz (Clark and Clapham, 2004; Vu et al., 2012).

4.1.3 Fin Whale (*Balaenoptera physalus*)

Fin whales are a widely distributed species found in all oceans of the world. The fin whale is listed as Endangered under the ESA and a Final Recovery Plan for fin whales is available (NMFS, 2010). Fin whales transit between summer feeding grounds in the high latitudes and their wintering, calving, or mating habitats in low latitudes or offshore. However, acoustic records indicate that fin whale populations may be less migratory than other mysticetes whose populations make distinct annual migrations (Watkins et al., 2000). Fin whales typically feed on sand lance, capelin (*Mallotus villosus*), euphausiids, herring, copepods, and cephalopods (i.e., squid) in deeper waters near the edge of the continental shelf (90 to 180 m) but will migrate towards coastal areas following prey distribution.

The fin whales that occur within the Project Area are part of the Western North Atlantic stock of fin whales. This is considered a strategic stock because fin whales are listed as Endangered throughout their range. In February 2019, NMFS undertook a 5-year status review (NMFS, 2019b) of the fin whale and determined that there should be no change in its listing status. The best population abundance estimate is 6,802 individuals (NMFS, 2022).

Along the Atlantic seaboard, they are mainly found from Cape Hatteras northward with a distribution in both continental shelf and deep-water habitats (NMFS, 2022). The Northern fin whale subspecies is found within the Project Area. Fin whales accounted for 46% of the large whales sighted during aerial surveys along the continental shelf (CETAP, 1982) between Cape Hatteras and Nova Scotia from 1978 to 1982. Fin whales were also the most frequently sighted large whale species during the NJDEP EBS with 37 groups sighted throughout all seasons (Whitt et al., 2015). MABS reported two fin whales during the winter and two during the spring (Williams et al., 2015a,b).

Threats to fin whales are entanglements in fishing gear and ship strikes. For the period between 2015 through 2019, the minimum annual rate of human-caused mortality and serious injury to fin whales was 1.85 individuals per year. This value includes 1.45 fishery interaction records per year and 0.4 vessel strike records per year (NMFS, 2022). The total human-caused mortality and serious injury is less than the calculated PBR; however, it cannot be considered insignificant due to uncertainties regarding these estimates and the current Endangered status of this population which make this a strategic stock under the MMPA. There is no designated critical habitat for this stock (NMFS, 2022). Based on data from the MMSC, NJ strandings of fin whales occurred in 2003 (1); 2004 (2); 2007 (1); 2008 (2); 2009 (1); 2012 (1); 2014 (1); 2017 (1); 2018 (1); 2019 (1), and 2021 (2).

Fin whales are LF cetaceans that produce short-duration, down sweep calls between 15 and 30 Hz, typically termed "20-Hz pulses" as well as tonal calls up to 150 Hz. The SL of the fin whale vocalizations can reach 186 dB re1 µPa m, making it one of the most powerful biological sounds in the ocean (Charif et al., 2002).

4.1.4 Sei Whale (*Balaenoptera borealis*)

Sei whales are a widespread species throughout the world's temperate, subpolar, subtropical, and tropical oceans (Waring et al., 2015). They are very similar in appearance to fin and Bryde's whales (*Balaenoptera edeni*). Two subspecies of sei whales are currently recognized (Committee on Taxonomy, 2021) one of which the Northern sei whale (*B. b. borealis*) is known to occur within the Project Area. The sei whales occurring in the Project Area are part of the Nova Scotia stock (formerly the Western North Atlantic stock). Sei whales are most common in deeper waters along the continental shelf edge (NMFS, 2022) but will forage occasionally in shallower, inshore waters. The average spring abundance estimate for surveys conducted between 2010 and 2013 is 6,292 individuals, which is considered the best available abundance estimate for the Nova Scotia stock because these surveys covered the largest portion of its range (NMFS, 2022).

Sei whales are most abundant in Northeastern U.S. waters during the spring, with sightings concentrated along the eastern and southwestern margins of Georges Bank in the area of Hydrographer Canyon (CETAP, 1982). Less is known about the sei whale in the Mid-Atlantic region. AMAPPS data indicate this species is distributed through the Mid-Atlantic, particularly in spring when they are more widely dispersed, but they are more concentrated along the shelf edge (Palka et al., 2017). No sei whales were sighted during the NJDEP EBS. Only one sei whale was reported

during the MABS surveys, and this sighting occurred during the winter survey (Williams et al., 2015a). The sei whale feeds primarily on euphausiids and copepods, but will also prey upon fish and local abundance is largely driven by prey availability. The occurrence and abundance of sei whales on feeding grounds may shift dramatically from one year to the next.

From 2015 through 2019, the minimum rate of confirmed human-caused serious injury and mortality to the Nova Scotia stock was 0.8 individuals per year, which was attributed to fisheries interactions (0.4), vessel strikes (0.2), and other human-caused mortality (0.2) (NMFS, 2022). The Nova Scotia stock is strategic because the species is listed as Endangered under the ESA and the average human-related mortality and serious injury exceeds the PBR. There is no designated critical habitat for this species (NMFS, 2022). Based on data from the MMSC, NJ strandings of sei whales occurred in 2003 (1); 2004 (2); 2007 (1); 2008 (2); 2009 (1); 2012 (1); 2014 (1); 2017 (1); 2018 (1); 2019 (1), and 2021 (2).

There are limited confirmed sei whale vocalizations; however, studies indicate that this species produces several, mainly LF (<1,000 Hz) vocalizations. Several 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 (Baumgartner et al., 2008; Rankin and Barlow, 2007; McDonald et al., 2005).

4.1.5   Minke Whale (*Balaenoptera acutorostrata*)

The minke whale is a small mysticete that is divided into two species: the common minke whale and the Antarctic minke whale. The common minke whale is further divided into three subspecies (Committee on Taxonomy, 2021). The subspecies *B. a. acutorostrata* occurs throughout the North Atlantic. Generally, minke whales occupy warmer waters during the winter and travel north to colder regions in the summer, with some animals migrating as far as the ice edge. Minke whales are frequently observed in coastal or shelf waters along with humpback and fin whales owing to their piscivorous feeding habitats where prey includes sand lance and herring (Hayes et al., 2019). The current best abundance estimate for the Canadian East Coast stock is 21,968 individuals (NMFS, 2022).

Little is known about their specific movements through the Mid-Atlantic region; however, acoustic detections show that minke whales migrate south in mid-October to early November, and return from wintering grounds starting in March through early April (Risch et al., 2014). Northward migration appears to track the warmer waters of the Gulf Stream along the continental shelf, while southward migration is made farther offshore (Risch et al., 2014). The MABS surveys reported six minke whales between 2012 and 2014; one during spring surveys, two during fall surveys, and three during winter surveys. Four groups were observed during the NJDEP EBS in the winter and spring (Whitt et al., 2015).

Like other baleen whales, threats to minke whales include ship strikes and fisheries interactions. However, unlike the larger whales, minke whales are more susceptible to bycatch threats from bottom trawls, lobster trap/pot, gillnet, and purse seine fisheries. During the period from 2015 to 2019, the average annual minimum detected human-caused mortality and serious injury was 10.55 minke whales per year. This number was composed of 9.55 whales per year from unobserved U.S. fisheries bycatch, 0.2 from U.S. fisheries based on observer data, and 0.8 whale per year from ship strikes (NMFS, 2022). Estimated rates of serious injury and mortality are less than the calculated PBR, but it cannot be considered insignificant or approaching zero (NMFS, 2022). Vessel strikes have been documented from Maine to South Carolina (NMFS, 2022).

In January 2017, a UME was been declared due to minke whale mortalities occurring between Maine and South Carolina. As of 3 March 2023, a total of 142 strandings have been reported with 22 of those occurring in New York and 11 in New Jersey. Examinations for several of the whales showed evidence of human interactions such as vessel strike or entanglement, or infectious disease (NMFS, 2023e). Additionally, minke whales continue to be hunted as part of an ongoing whaling industry in the northeastern North Atlantic, the North Pacific, and Antarctic (Reeves et

al., 2012; NMFS, 2021h). Based on data from the MMSC, NJ strandings of minke whales occurred in 2003 (1); 2004 (2); 2007 (1); 2008 (2); 2009 (1); 2012 (1); 2014 (1); 2017 (1); 2018 (1); 2019 (1), and 2021 (2).

Minke whale recordings have resulted in some of the most variable and unique vocalizations of any marine mammal. Common calls for minke whales found in the North Atlantic include repetitive, LF (100 to 500 Hz) pulse trains that may consist of either grunt-like pulses or thump-like pulses. The thumps are very short in duration (50 to 70 milliseconds) with peak energy between 100 and 200 Hz. The grunts are slightly longer in duration (165 to 320 milliseconds) with most energy between 80 and 140 Hz. In addition, minke whales will repeat a 6 to 14-minute pattern of 40 to 60 second pulse trains over several hours (Risch et al., 2014). Minke whales produce a unique sound called the "boing" which consists of a short pulse at 1.3 kHz followed by an undulating tonal call around 1.4 kHz. This call was widely recorded but remained unidentified for many years and scientists widely speculated as to its source (Rankin and Barlow, 2005). The call frequency of minke whales suggests a hearing sensitivity higher than that of other baleen whales.

4.2   ODONTOCETES

4.2.1   Sperm Whale (*Physeter macrocephalus*)

Sperm whales can easily be distinguished in visual surveys by their large, blunt head; narrow underslung jaw; and characteristic blow shape resulting from the S-shaped blowhole set at the front-left of the head (Jefferson et al., 2008). They can be found throughout the world's oceans; they have been observed near the edge of the ice packs in both hemispheres and are also common along the equator. The North Atlantic stock is distributed mainly along the continental shelf edge, over the continental slope, and mid-ocean regions, where they prefer water depths of 600 m or more. Sperm whales are uncommon in waters <300 m deep (Waring et al., 2015). Sperm whales are listed as Endangered under the ESA and are considered a strategic stock by NMFS (Waring et al., 2015). Data are insufficient to assess population trends and the current abundance estimate was based on only a fraction of the known stock range (Waring et al., 2015). The best recent abundance estimate for sperm whales is the sum of the estimates from 2016 surveys totaling 4,349 (Hayes et al., 2021).

In winter, sperm whales concentrate east and northeast of Cape Hatteras. In spring, distribution shifts northward to east of Delaware and Virginia, and is widespread throughout the central Mid-Atlantic Bight and the southern part of Georges Bank. In the fall, sperm whale occurrence on the continental shelf south of New England reaches peak levels, and there remains a continental shelf edge occurrence in the Mid-Atlantic Bight (Waring et al., 2015). No sperm whales were recorded during the MABS surveys or the NJDEP EBS. CETAP and NMFS Northeast Fisheries Science Center sightings in shelf-edge and off-shelf waters included many social groups with calves/juveniles (CETAP, 1982). Sperm whales were usually seen at the tops of seamounts and rises and did not generally occur over slopes. Sperm whales were recorded over depths varying from 800 to 3,500 m. Although the likelihood of occurrence within the Project Area remains very low, the sperm whale was included as an affected species due to its high seasonal densities east of the Project Area.

Historically, thousands of sperm whales were killed during the early 18th Century. Presently, no hunting is allowed for any purposes in the North Atlantic. Occasionally, sperm whales become entangled in fishing gear or struck by ships off the east coast of the U.S. However, this rate of mortality is not believed to have biologically significant impacts. The annual average human-caused mortality for 2008 to 2012 was estimated to be 0.8 individuals due to entanglement and vessel strikes. During this same period, a total of 14 sperm whale strandings have been reported in the U.S.; while the reasons for stranding could not be determined for all these cases, possible causes include vessel strikes, entanglement, pollution, and changes to their environment (Waring et al., 2015). However, there were no documented reports of human-caused mortality or serious injury for the period between 2013 and 2017 (Hayes et al., 2020). This stock is considered strategic under the MMPA due to its Endangered status, but since human-caused mortality and serious injury is less than PBR, it is not considered significant (Hayes et al., 2020). Based on data from the MMSC, there is 1 report of a sperm whale stranding for NJ is 2022.

Sperm whales are in the MF hearing group with an estimated auditory range of 150 Hz to 160 kHz (Southall et al., 2007). Sperm whales produce short-duration, repetitive broadband clicks used for communication and echolocation. These clicks range in frequency from 0.1 to 30 kHz, with dominant frequencies between the 2 to 4 kHz and 10 to 16 kHz ranges (Department of the Navy [DoN], 2008). Echolocation clicks from adult sperm whales are highly directional and have an estimated SL of up to 236 dB re 1 μPa m.

4.2.2 Risso's Dolphin (*Grampus griseus*)

Risso's dolphins are large dolphins with a characteristic blunt head and light coloration, often with extensive scarring. They are widely distributed in tropical and temperate seas. In the Western North Atlantic they occur from Florida to eastern Newfoundland (Leatherwood et al., 1976; Baird and Stacey, 1991). Off the U.S. Northeast Coast, Risso's dolphins are primarily distributed along the continental shelf, but can also be found swimming in shallower waters to the mid-shelf (Waring et al., 2016).

The status of the Western North Atlantic stock of the Risso's dolphin in the U.S. Atlantic Exclusive Economic Zone is not well documented. An abundance estimate of 35,215 individuals in this stock was generated from a shipboard and aerial survey conducted between Florida and Newfoundland during 2016 (NMFS, 2022). Risso's dolphins are not listed as Threatened or Endangered under the ESA and the Western North Atlantic stock is not considered strategic under the MMPA.

Risso's dolphins occur along the continental shelf edge from Cape Hatteras to Georges Bank during spring, summer, and autumn. In winter, they are distributed in the Mid-Atlantic from the continental shelf edge outward (Hayes et al., 2019). The majority of sightings during the 2011 surveys occurred along the continental shelf break with generally lower sighting rates over the continental slope (Palka, 2012). Risso's dolphins can be found in Mid-Atlantic waters year-round and are more likely to be encountered offshore given their preference for deeper waters along the shelf edge. However, previous surveys have commonly observed this species in shallower waters, making it possible this species could be encountered in the Project Area, particularly in summer when they are more abundant in this region (Curtice et al., 2019; Williams et al., 2015a,b; Waring et al., 2016).

Entanglement and fisheries interactions are the primary threats to Risso's dolphins in the U.S. Atlantic. Estimated annual rates of serious injury and mortality from 2015 to 2019 were 34 mortalities in observed fisheries and no mortalities from non-fishery-related strandings (NMFS, 2022). There were 31 strandings were reported during this period, none of which had confirmed evidence of human interactions (NMFS, 2022). Total human-related mortality does not exceed the calculated PBR but is not considered to be insignificant or approaching zero for this population (NMFS, 2022). Based on data from the MMSC, NJ strandings of Risso's dolphins occurred in 2005 (5); 2007 (2); 2009 (1), 2016 (1), 2017 (1), and 2021 (1).

Risso's dolphins are in the MF 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).

4.2.3 Long-finned Pilot Whale (*Globicephala melas*)

There are two species of pilot whale in the Western North Atlantic: long-finned (*G. melas*) and short-finned (*G. macrorhynchus*) (**Section 4.2.4**). The species overlap, are difficult to tell apart, and parameters that define their distributions are not well differentiated. The best distinguishing characteristic of the long-finned pilot whale are the long, slender flippers, which are typically not visible during aerial or shipboard surveys (Jefferson et al., 2011). However, it is generally accepted that pilot whale sightings above approximately 42° N are most likely long-finned pilot whales (Waring et al., 2015).

Pilot whales are distributed along the continental shelf waters off the Northeastern U.S. coast in the winter and early spring. By late spring, pilot whales migrate into more northern waters including Georges Bank and the Gulf of

Maine and remain there until fall (NMFS, 2022). Long-finned and short-finned pilot whales overlap in the Mid-Atlantic along the shelf edge between New Jersey and the southern flank of Georges Bank, making it likely that both species of pilot whale may be found in the Project Area (NMFS, 2022).

Long-finned pilot whales occur over the continental slope in high densities during winter and spring, then move inshore and into shelf waters during summer and autumn following prey populations of cephalopods (i.e., squid) and mackerel (*Scomber* spp.) (Reeves et al., 2012). They will also readily feed on other fish, cephalopods, and crustaceans. Pilot whales are common in central and northern Georges Bank, Great South Channel, Stellwagen Bank, and in the Gulf of Maine during the summer and early fall (May and October) (NMFS, 2022). Long-finned pilot whales are highly social, vocal, and are typically observed in groups of 10 to 20 surface-active individuals. Long-finned pilot whales are not listed as Threatened or Endangered, and the Western North Atlantic stock is not considered strategic under the MMPA. The best population estimate for the Western North Atlantic stock of long-finned pilot whales is 39,215 individuals (NMFS, 2022).

A source of mortality and injury to long-finned pilot whales is bycatch during gillnet fishing, pelagic trawling, longline fishing, and purse seine fishing. For the period between 2015 and 2019, the observed average fishery-related mortality or serious injury was 9 long-finned pilot whales per year (NMFS, 2022). The highest observed bycatch rate for all pilot whales occurred in the pelagic longline fishery, with peak bycatch occurring during September and October along the Mid-Atlantic coast. However, based on biopsy data, the majority, if not all, of the bycatch whales were short-finned. Other fisheries mortalities (e.g., bottom trawls, mid-water trawls, gillnets) are more frequently observed north of 40° N; therefore, these fisheries likely have a higher proportional impact on long-finned pilot whales. Mean human-caused annual mortality and serious injury does not exceed the calculated PBR for this stock; however, it is not considered insignificant or approaching zero. There is no designated critical habitat for this species (NMFS, 2022).

Long-finned pilot whales also demonstrate a propensity to mass strand; however, the role that human activities play in these strandings is not known. From 2015 to 2019, 7 long-finned pilot whales stranded between Maine and Florida, none of which showed any signs of human interaction (NMFS, 2022). Bioaccumulated toxins are also a potential source of human-caused mortality in pilot whales. Polychlorinated biphenyls and chlorinated pesticides (e.g., DDT, DDE, dieldrin) have been found in pilot whale blubber (Muir et al., 1988; Weisbrod et al., 2000) and bioaccumulation levels of these toxins were more similar in whales from the same stranding group than from animals within the same sex or age category (Weisbrod et al., 2000).

Long-finned pilot whales are part of the MF hearing group with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al., 2007). All pilot whales echolocate and produce tonal calls. Long-finned pilot whales produce burst-pulses which ranged from 100 to 22,000 Hz. The primary tonal calls of the long-finned pilot whale range from 1 to 8 kHz with a mean duration of about 1 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).

4.2.4   Short-finned Pilot Whale (*Globicephala macrorhynchus*)

Short-finned pilot whales are similar in size to long-finned pilot whales (**Section 4.2.3**) (Jefferson et al., 2011). Data indicate that short-finned pilot whales inhabit primarily the Southeast Atlantic and Caribbean, however, strandings have been documented as far north as Massachusetts. Short-finned pilot whales are not listed under the ESA, and the North Atlantic stock is not considered strategic. Recent surveys conducted between central Florida and Georges Bank in the summer of 2016 provided an abundance estimate of 28,924 individuals of this species in the Western North Atlantic (NMFS, 2022).

There is limited information on the distribution of short-finned pilot whales; they prefer warmer or tropical waters and deeper waters offshore, and in the Northeast U.S. they are often sighted near the Gulf Stream (NMFS, 2022).

Like the long-finned morphotype, short-finned pilot whales are social and are often observed in groups of 20 to 50 animals. They have been given the nickname "cheetahs of the deep sea" due to the high-speed dives that this species undertakes while foraging in relation to other deep-diving cetacean species (Aguilar Soto et al., 2008).

During visual surveys, it is often difficult to distinguish between long- and short-finned pilot whales so exact distributions of these species in the Mid-Atlantic are uncertain. As discussed in **Section 4.2.3**, these species overlap spatially offshore New Jersey, making it likely that both may be present in the Project Area (NMFS, 2022). Recent tagging studies have observed short-finned pilot whales as far north as Nantucket Sholes, however in the northern extent of their range, short-finned pilot whales are thought to inhabit primarily offshore waters along the shelf break, limiting the number of individuals that may be encountered during surveys (NMFS, 2022).

The annual rate of fisheries-related injury and mortality for short-finned pilot whales is uncertain due to the fact that bycatch rates are provided for undifferentiated pilot whales. In recent years, the likelihood of these interactions between fisheries and short-finned pilot whales was determined with a logistic regression model using sea surface temperature data (NMFS, 2022). Due to the higher water temperatures recorded during the 5-year period from 2015 to 2019, they were estimated to have a 90% probability of being short-finned species (NMFS, 2022). Based on these observations and the expected distribution of short-finned pilot whales, the mean annual fishery-related mortality and serious injury during this period was estimated to be 136 whales due to the pelagic longline fishery (NMFS, 2022). This does not exceed the calculated PBR for this stock; however, as with long-finned pilot whales, it is not considered insignificant or approaching zero (NMFS, 2022).

Like long-finned pilot whales, short-finned pilot whales are also susceptible to mass strandings, and it is estimated that between 2 and 168 pilot whales have stranded annually along the U.S. east coast since 1980. Between 2015 and 2019, there were approximately 47 reported strandings of short-finned pilot whales between Massachusetts and Florida, although the precise cause of these strandings is uncertain and evidence of human interaction was only detected for 2 of the strandings. Habitat contamination is also a concern for this stock, although the population effects of observed levels of contaminants in their habitat are unknown (NMFS, 2022).

Short-finned pilot whales fall into the same MF auditory category as the long-finned morphotype, but recorded vocalizations for this species are slightly higher. Burst-pulse sounds had a frequency range from 1 to greater than 30 kHz (versus long-finned pilot whale burst-pulses which ranged from 100 to 22,000 Hz), and foraging clicks had a peak frequency between 8 and 39 kHz (Erbe et al., 2016).

4.2.5   Atlantic White-Sided Dolphin (*Lagenorhynchus acutus*)

The Atlantic white-sided (AWS) dolphin is a robust animal characterized by a strongly "keeled" tail stock and distinctive color pattern (Jefferson et al., 2008; Waring et al., 2015). The AWS dolphin occurs primarily along the 100-m depth contour within temperate and subpolar waters of the North Atlantic. Seasonally, AWS dolphins occupy northern, inshore waters during summer and southern, offshore waters in the winter. AWS dolphins that potentially occur in the Project Area are all part of the Western North Atlantic stock, which inhabit waters from central West Greenland to North Carolina (about 35° N) (Waring et al., 2015). There is some evidence supporting the division of the Western Atlantic population into three separate stocks; however, this has not been clearly established (NMFS, 2022). The estimated average annual human-related mortality does not exceed the PBR for this stock and the AWS dolphin is not listed as Threatened or Endangered; therefore, the stock is not considered strategic under the MMPA. The best abundance estimate for the Western North Atlantic AWS dolphin stock is 93,233 individuals (NMFS, 2022).

AWS dolphins feed on a variety of fish such as herring, hake (*Merluccius* spp.), smelt (*Osmerus* spp.), capelin, and cod (*Gadus* spp.) as well as cephalopods and crustaceans (i.e., squid and shrimp). Like many dolphins, this species is highly gregarious and will often travel in groups of 100 or more and are highly vocal when in these aggregations.

Breeding takes place between May and August with most calves born in June and July (Rasmussen and Miller, 2002).

The Virginia and North Carolina observations appear to represent the southern extent of the species range. Prior to the 1970s, AWS dolphins in U.S. waters were found primarily offshore on the continental slope, while white-beaked dolphins (*L. albirostris*) were found on the continental shelf. During the 1970s, there was an apparent switch in habitat use between these two species. This shift may have been a result of the decrease in herring and increase in sand lance in the continental shelf waters (Katona et al., 1993; Kenney et al., 1996). AWS dolphins are opportunistic feeders and their diet is based on available prey (Craddock et al., 2009). MABS data indicate this species may be present around the Project Area between fall and spring, remaining primarily on the shelf edge and only occasionally traveling inshore (Williams et al., 2015a,b).

Mortality to AWS dolphins resulting from fisheries interactions averaged 27 dolphins per year between 2015 and 2019. This number was comprised of recorded mortality or serious injury from fisheries observer data (27 per year), and possible non-fishery human-caused mortalities (0.2 per year) (NMFS, 2022). There was a total of 204 documented strandings of this species in both the U.S. and Canada during this period, 16 of which were released alive; human interaction, such as pollution, was indicated for four of these cases (NMFS, 2022). The total human-caused annual mortality and serious injury is less than the calculated PBR but is not considered insignificant or approaching zero (NMFS, 2022). Based on data from the MMSC, NJ strandings of Atlantic white-sided dolphins occurred from 2002 through 2011 with one to six individuals reported.

AWS dolphins are in the MF hearing group with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al., 2007). Their vocalizations range from 6 to 15 kHz (DoN, 2008).

4.2.6   Common Dolphin (*Delphinus delphis*)

The common dolphin may be one of the most widely distributed species of cetaceans, as it is found worldwide in temperate, tropical, and subtropical seas (Waring et al., 2015). Two species were previously recognized: the long-beaked common dolphin (*D. capensis*) and the short-beaked common dolphin; however, Cunha et al. (2015) summarized the relevant data and analyses, along with additional molecular data and analysis, and recommended that the long-beaked common dolphin not be further used for the Atlantic stock. This taxonomic convention is used by the Society for Marine Mammalogy. The best population estimate for this stock is 172,947 individuals. The species is not listed as Threatened or Endangered under the ESA, and the stock is not classified as a strategic or depleted stock (NMFS, 2022).

Common dolphins are distributed in waters off the U.S. East Coast from Cape Hatteras to Georges Bank (35° N to 42° N) during mid-January to May and move as far north as the Scotian Shelf from mid-summer to autumn (CETAP, 1982; Hamazaki, 2002; Hayes et al., 2020; Selzer and Payne, 1988). Common dolphins are primarily found at the shelf and shelf break along the Gulf Stream, however, common dolphins are known to occur in both nearshore and deep offshore waters (Perrin, 2002). Common dolphins aggregate in large schools numbering in the hundreds, although the typical group size is 30 or fewer (Reeves et al., 2012).

A total of 270 common dolphin were recorded during the 2012 to 2014 MABS surveys. These recorded sightings occurred in all seasons (Williams et al., 2015a, b). During the NJDEP EBS there were 32 groups of common dolphins sighted during fall and winter. Mean water depth for these sightings was 23.2 m (Whitt et al., 2015). These sightings are consistent with known seasonal migrations of this species into Mid-Atlantic waters during colder months.

The common dolphin feeds on small schooling fish and squid; as such, common dolphins are subject to bycatch in gillnets, pelagic trawls, and longline fisheries (Hayes et al., 2021; Reeves et al., 2012). During 2015 to 2019, an estimated average of 390 common dolphins were taken each year in fisheries activities, plus 0.2 individuals per year

from research takes and 0.2 individuals per year from non-fishery stranding mortalities (NMFS, 2022). During this period, 546 common dolphins were reported stranded between Maine and Florida, 124 of which were either released or last seen alive. Signs if human interaction were detected in 28 of these cases from activities such as fishery interaction, vessel strike, or public harassment (NMFS, 2022). The total annual mortality and serious injury does not exceed the calculated PBR, but it cannot be considered insignificant or approaching zero for this population. There is no designated critical habitat for this species (NMFS, 2022). Based on data from the MMSC, common dolphins are one of the most commonly reported strandings in NJ with near annual stranding reports 2002 through 2023 comprising one to twenty individuals. Common dolphins are in the MF hearing group with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al., 2007). Their vocalizations range widely from 200 Hz to 150 kHz (DoN, 2008).

4.2.7 Atlantic Spotted Dolphin (*Stenella frontalis*)

Atlantic spotted dolphins are widely distributed in tropical and warm temperate waters of the Western North Atlantic (Leatherwood et al., 1976). They range from southern New England south through the Gulf of Mexico, and from the Caribbean to Venezuela (Leatherwood et al., 1976; Perrin et al., 1994). Atlantic spotted dolphins are not listed as Threatened or Endangered under the ESA. Atlantic species of spotted dolphins were not differentiated during surveys, resulting in insufficient data to determine the population trends. The stock status is also unknown (Waring et al., 2014). The best estimate of abundance derived from 2016 surveys for the Western North Atlantic stock of Atlantic spotted dolphins is 39,921 individuals (Hayes et al., 2021).

Atlantic spotted dolphins regularly occur in the inshore waters south of Chesapeake Bay and near the continental shelf edge and continental slope waters north of this region (Payne et al., 1984; Mullin and Fulling, 2003). Atlantic spotted dolphins north of Cape Hatteras also associate with the north wall of the Gulf Stream and warm-core rings (Waring et al., 2014). Four sightings of Atlantic spotted dolphins were recorded between 2012 and 2014 during the summer MABS surveys (Williams et al., 2015a,b).

Between 2013 and 2017, 21 Atlantic spotted dolphins were reported stranded in the U.S. Atlantic. None showed definitive signs of human interaction (Hayes et al., 2020). There were also no reports of injury or mortality due to fisheries interactions during this period; therefore fisheries interactions are considered insignificant for this population. There is no designated critical habitat for this population (Hayes et al., 2020).

Atlantic spotted dolphins are in the MF hearing group with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al., 2007). Vocalizations typically range from 100 Hz to 130 kHz (DoN, 2008).

4.2.8 Bottlenose Dolphin (*Tursiops truncatus*)

The common bottlenose dolphin occupies a wide variety of habitats, occurring in both peripheral seas and oceans in tropical and temperate climates (Stewart et al., 2002). They are common all along the U.S. East Coast year-round (Hayes et al., 2020, 2021). Within the Western North Atlantic, there are two distinct common bottlenose dolphin forms: coastal and offshore. The two forms are genetically and morphologically distinct although regionally variable (Jefferson et al., 2008; Waring et al., 2015). Both inhabit waters in the Western North Atlantic Ocean (Hersh and Duffield, 1989; Mead and Potter, 1995; Curry and Smith, 1997) along the U.S. Atlantic Coast. The common bottlenose dolphin is not listed as Threatened or Endangered under the ESA.

The Western North Atlantic offshore stock expected to occur in the Project Area is not listed as depleted under the MMPA. The offshore stock is distributed primarily along the outer continental shelf and slope, from Georges Bank to Cape Hatteras during the spring and summer (CETAP, 1982; Kenney, 1990). Stock status within U.S. Atlantic waters is unknown and data are insufficient to determine population trends. The best available abundance estimate for the offshore morphotype of common bottlenose dolphins in the Western North Atlantic is 62,851 individuals (Hayes et al., 2021).

Spatial distribution data and genetic studies indicate the coastal morphotype comprises multiple stocks distributed throughout coastal and estuarine waters of the U.S. East Coast. One such stock, the northern migratory coastal stock, ranges from North Carolina to New York and is likely to occur in the Project Area (Hayes et al., 2021). There is likely some interaction between the northern and southern migratory stocks, but the bottlenose dolphins in the Project Area are expected to be from the northern migratory stock (Hayes et al., 2021). All coastal stocks are listed as depleted (Waring et al., 2010). The best abundance estimates for the northern migratory coastal stock of common bottlenose dolphin is 6,639 individuals (Hayes et al., 2021).

North of Cape Hatteras, there is separation of the offshore and coastal morphotypes across bathymetric contours during summer months. Aerial surveys flown from 1979 through 1981 indicated a concentration of common bottlenose dolphins in waters <25 m deep that corresponded with the coastal morphotype, and an area of high abundance along the shelf break that corresponded with the offshore stock (Hayes et al., 2021). Torres et al. (2003) found a statistically significant break in the distribution of the morphotypes; almost all dolphins found in waters >34 m depth and >34 km from shore were of the offshore morphotype. The coastal stock is best defined by its summer distribution, when it occupies coastal waters from the shoreline to the 20-m isobath between Virginia and New York (Hayes et al., 2021). This stock migrates south during late summer and fall, and during colder months it occupies waters off Virginia and North Carolina (Hayes et al., 2021). Therefore, during the summer, dolphins found inside the 20-m isobath in the Project Area are likely to belong to the coastal stock, while those found in deeper waters or observed during cooler months belong to the offshore stock.

Total U.S. fishery-related mortality and serious injury for coastal stocks cannot be directly estimated due to the spatial overlap of several stocks in North Carolina. Best estimates of fishery-related annual average mortality and serious injury for the northern migratory coastal stock for 2014 through 2018 range from 12.2 to 21.5 individuals per year (Hayes et al., 2021). During this period, 692 common bottlenose dolphins determined to be part of the northern migratory coastal stock were reported stranded between North Carolina and New York. Evidence of human interaction was found for 80 of these cases, including 51 due to fisheries interactions and 4 due to vessel strikes (Hayes et al., 2021). This stock was also impacted by a UME from 2013 to 2015 which was attributed to a morbillivirus epidemic that caused 1,614 strandings between New York and Florida (Hayes et al., 2021). Because overlap in coastal stocks makes population trends difficult, the precise impact of these strandings on this population is uncertain, but the majority of the animals found were thought to belong to the northern migratory coastal stock. PBR due to human-caused mortality and serious injury, although not the primary cause of strandings for this stock, are not considered insignificant or approaching zero (Hayes et al., 2021). Based on data from the MMSC, bottlenose dolphins are one of the most commonly reported strandings in NJ with annual stranding reports from 2002 through 2023 comprising three to 150 individuals reported.

For the offshore stock, annual fishery-caused mortality and serious injury for the offshore stock of common bottlenose dolphin from 2013 to 2017 was estimated to be 28 individuals due to interactions with sink gillnet and bottom trawl fisheries (Hayes et al., 2020). Total human-caused mortality and serious injury for this stock is considered insignificant, and this stock is not strategic under the MMPA. There is no designated critical habitat for this species (Hayes et al., 2020).

Coastal and offshore stocks of bottlenose dolphins are in the MF 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).

4.2.9   Harbor Porpoise (*Phocoena phocoena*)

The harbor porpoise is the only porpoise species found in the Atlantic. It is a small, stocky cetacean with a blunt, short-beaked head. There are four subspecies, with *P. phocoena* residing in the North Atlantic (Committee on Taxonomy, 2021). The harbor porpoises that occur in the Project Area comprise the Gulf of Maine/Bay of Fundy stock. This stock is not considered strategic under the MMPA because they are not listed as Threatened or

Endangered. In 2001, NMFS conducted a status review for the stock, mainly due to the level of bycatch in fisheries (66 *FR* 53195). The determination from the review was that listing the harbor porpoise under the ESA was not warranted and the species was removed from the candidate list. Population trends for this species are unknown. The best, and most recent, abundance estimate for harbor porpoise in the Gulf of Maine/Bay of Fundy stock is 95,543 individuals (NMFS, 2022).

Harbor porpoises commonly occur throughout Massachusetts Bay from September through April. During the fall and spring, harbor porpoises are widely distributed along the U.S. East Coast from New Jersey to Maine. During the summer, the porpoises are concentrated in the Northern Gulf of Maine and Southern Bay of Fundy in water depths <150 m. In winter, densities increase in the waters off New Jersey to North Carolina and decrease in the waters from New York to New Brunswick; however, specific migratory timing or routes are not apparent. Although still considered uncommon, harbor porpoises were regularly detected offshore of Maryland during winter and spring surveys (Wingfield et al., 2017). They were the second most frequently sighted cetacean during the NJDEP EBS, with 90% of the sightings during the winter, three during the spring, and one during the summer (Whitt et al., 2015). The lack of sightings during the fall was attributed to low visibility conditions during those months, but available data indicate this species is likely present offshore New Jersey during fall and winter (Whitt et al., 2015).

Harbor porpoises feed on small schooling fish such as mackerel, herring, and cod, as well as worms, cephalopods, and sand eels (*Hyperoplus* spp.). Their foraging habits and habitats make this species particularly susceptible to mortality in bottom-set gill nets (Waring et al., 2015). The average estimated human-caused mortality or serious injury for this stock for the period between 2015 and 2019 was 164 harbor porpoises per year, from U.S. fisheries observer data (163 per year) and non-fishery caused stranding mortalities (0.6 per year) (NMFS, 2022). In 2010, a final rule was published for the existing Harbor Porpoise Take Reduction Plan in the Federal Register (75 *FR* 7383) to address closure areas and timing based on bycatch rates. A total of 417 harbor porpoises were stranded in the U.S. between 2015 and 2019, 17 of which showed evidence for human interaction such as entanglement or fishery interaction, vessel strike, or public harassment (NMFS, 2022). The total annual human-related mortality rates do not exceed the PBR but cannot be considered insignificant or approaching zero. There is no designated critical habitat for this species (NMFS, 2022). Based on data from the MMSC, harbor porpoise are one of the most commonly reported strandings in NJ with nearly annual stranding reports from 2002 through 2023 comprising one to 19 individuals.

The harbor porpoise is the only potentially affected species in the Project Area within the HF hearing group that uses ultrasonic echolocation clicks to navigate and hunt prey. The click frequency is between 110 and 150 kHz, which is consistent with harbor porpoise hearing sensitivity centered between 100 and 120 kHz (Thompson et al., 2013). Click trains can have very short inter-click intervals when close to a prey item, which results in a "feeding buzz" due to the rapid succession of individual clicks, making them highly identifiable in acoustic surveys.

4.3   PHOCIDS

4.3.1   Harbor Seal (*Phoca vitulina*)

The harbor seal is found in all nearshore waters of the Atlantic Ocean and adjoining seas north of 30° N (NMFS, 2022). In the Western North Atlantic, they are distributed from Eastern Canada to southern New England and New York, and occasionally to the Carolinas (Payne and Selzer, 1989). Harbor seals are the most abundant seals in the Eastern U.S.; they are not listed as Threatened or Endangered. The harbor seals within the Project Area are part of the single Western North Atlantic stock, which is not considered strategic under the MMPA. The best population estimate of harbor seals for this stock is 61,336 (NMFS, 2022).

Harbor seals exploit a variety of available food sources and feed both in shallow coastal habitats and offshore (Waring, 2015). Typical prey items include cephalopods (i.e., squid) and small schooling fish (i.e., herring, alewife [*Alosa pseudoharengus*], flounder [*Paralichthys* spp. and *Pseudopleuronectes* spp.], redfish [*Sciaenops ocellatus*],

cod, yellowtail flounder [*Pleuronectes ferruginea*], sand eel, hake) and spend up to 85% of the day diving, presumably foraging.

Harbor seals can be found year-round in the coastal waters of Eastern Canada and Maine. Between September and May they undergo seasonal migrations into Southern New England and the Mid-Atlantic (NMFS, 2022). The NJDEP EBS reported one harbor seal offshore New Jersey in June 2008 in approximately 18 m of water (Whitt et al., 2015). Three other pinnipeds were observed during this study; however, they could not be identified to species level.

Fisheries interactions are common, and harbor seals are legally killed in Canada, Norway, and the United Kingdom to protect fish farms or local fisheries (Reeves et al., 2013). Harbor seals are also susceptible to bycatch in gillnets, trawls, and purse seines. For the period from 2015 to 2019, the average human-caused mortality and serious injury to harbor seals was 339 individuals per year, of which 334 occurred in fisheries interactions. Other causes of mortality for this population include human interactions such as vessel strikes, pollution, and harassment; storms; abandonment by the mother; disease; and predation (NMFS, 2022).

In July 2018, a UME was declared for both the harbor seal and gray seal due to mortalities throughout the Northeast U.S. Based on results of preliminary examinations, the 3,152 strandings (which include both species) reported through 13 March 2020 were determined to be the result of phocine distemper virus (NMFS, 2023f). This UME is currently inactive and pending closure. In June 2022, a separate pinniped UME was declared for harbor and gray seals along the Maine coast. There have been 266 confirmed harbor seal strandings reported under this UME between 1 June 2022 and 21 March 2023 (NMFS, 2023g). Preliminary testing of has found some harbor and gray seals positive for highly pathogenic avian influenza (HPAI) H5N1; this UME is ongoing and continues to be researched (NMFS, 2023g). The total human-caused mortality and serious injury does not exceed the PBR but, cannot be considered insignificant for this population (NMFS, 2022).

Harbor seals are part of the PW hearing group. Male harbor seals produce underwater vocalizations during mating season to attract females and defend territories (Sabinsky et al., 2012). These calls are comprised of "growls" or "roars" with a peak energy at 1.2 kHz (Sabinsky et al., 2012). Captive studies have shown that harbor seals have good (>50%) sound detection thresholds between 0.1 and 80 kHz, with primary sound detection between 0.5 and 40 kHz (Kastelein et al., 2009).

4.3.2   Gray Seal (*Halichoerus grypus*)

Gray seals within the Project Area are part of the Western North Atlantic stock. They are not listed as Threatened or Endangered and the stock is not considered strategic under the MMPA. The best population estimate of gray seals for this stock is 27,300 individuals (NMFS, 2022). A U.S. population estimate for this species is not available; however, the Canadian gray seal population was estimated to be 424,300 individuals in 2016 (NMFS, 2022). Gray seals will aggregate in large numbers to breed, molt, and rest. Gray seals will exploit a variety of available food sources and will feed both in shallow coastal habitats and offshore (Waring, 2015). Typical prey items include cephalopods, sessile organisms, small schooling fish (i.e., herring, alewife, flounder, redfish, cod, yellowtail flounder, sand eel, hake), and crustaceans. Gray seals will go on extensive dives to depths of up to 475 m to capture food (Waring, 2015).

The gray seal has a year-round range from Canada to Massachusetts and may seasonally migrate further south to northern parts of New Jersey between September and May (NMFS, 2022). Stranding records extend as far south as Cape Hatteras, North Carolina (Gilbert et al., 2005).

Gray seals are susceptible to bycatch and fisheries interactions and, like the harbor seal, are legally killed in some countries to protect fisheries resources. The gray seal is also taken commercially outside the U.S. The average estimated human-caused mortality and serious injury of gray seals between 2015 and 2019 was 4,453 seals per year

for both the U.S. and Canada (NMFS, 2022). As discussed in **Section 4.3.1**, there was a UME declared for this population likely due to viral infection which is currently pending closure (NMFS, 2021i). As with the harbor seal, the total annual human-caused mortality and serious injury does not exceed the PBR, but it cannot be considered insignificant (NMFS, 2022).

In July 2018, a UME was declared for both the harbor seal and gray seal due to mortalities throughout the Northeast U.S. Based on results of preliminary examinations, the 3,152 strandings (which include both species) reported through 13 March 2020 were determined to be the result of phocine distemper virus (NMFS, 2023f). This UME is currently inactive and pending closure. In June 2022, a separate pinniped UME was declared for harbor and gray seals along the Maine coast. There have been 35 confirmed gray seal strandings reported under this UME between 1 June 2022 and 21 March 2023 (NMFS, 2023g). Preliminary testing of has found some harbor and gray seals positive for highly pathogenic avian influenza (HPAI) H5N1; this UME is ongoing and continues to be researched (NMFS, 2023g). The total human-caused mortality and serious injury does not exceed the PBR but, cannot be considered insignificant for this population (NMFS, 2022).

Gray seals, like harbor seals, belong to the PW hearing group. As with all pinnipeds, they are assigned to hearing groups based on the medium (air or water) through which they are detecting the sounds, for an estimated underwater auditory bandwidth of 75 Hz to 75 kHz (Southall et al., 2007). Vocalizations range from 100 Hz to 3 kHz (DoN, 2008).

5.0   Type of Incidental Take Requested

The Applicant requests an IHA pursuant to Section 101 (a)(5)(D) of the MMPA for incidental take of small numbers of marine mammals by Level B harassment during geophysical surveys conducted as part of site characterization activities within the Project Area. Proposed activities, as outlined in **Section 1.0**, have the potential to impact marine mammals within the Project Area from sounds generated by survey equipment. The maximum range to a Level A threshold is <21 m and Level A take is not anticipated during HRG surveys. No PTS, physiological damage, or injury is expected to occur to marine mammals from the noise generated by the survey equipment or vessels during proposed surveys; therefore no Level A takes are calculated or requested.

The calculations for Level B take assumed that all 275 vessel days of geophysical surveys conducted during the survey window will use the source producing the largest Level B acoustic isopleths of 141 m (**Table 4**). Vessel days are defined as the number of days any single vessel is in operation regardless of any other vessel operations (i.e., if two vessels are working concurrently within the same 24-hour period, each vessel would be counted as having a vessel day for a total of two vessel days even though the activity occurs within a single 24-hour period). This assumption provides a conservative approach to predicting potential impacts on marine mammal species from active survey operations while also providing a realistic representation of anticipated survey effort.

The most likely Level B take is expected to result from minor behavioral reactions such as avoidance and temporary displacement for some individuals or groups of marine mammals near the proposed activities. It is expected that the severity of behavioral effects will vary with the duration of operations, the behavior of the animal at the time of reception of the sound, and the distance and received SPL of the sound. The Level B take is unlikely to manifest as TTS (Southall et al., 2007) and no TTS exposures are anticipated.

Potential impacts will be mitigated through following the BOEM *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* dated 22 November 2021 [BOEM PDC's] (BOEM, 2021), or as amended in any updated versions; implementing a visual monitoring program and an associated vessel activity management program, all of which are described in **Section 11.0**.

6.0   Take Estimates for Marine Mammals

The Applicant is seeking authorization for potential "taking" of small numbers of marine mammals under the jurisdiction of NMFS in the proposed region of activity, as described in **Section 2.0**. The 16 species listed below are described in **Section 4.0**. Each species has a geographic distribution that encompasses the Project Area and has at least a minimal potential to be "taken" during the proposed surveys.

Authorization for Level B harassment is sought for the following 16 species:

- North Atlantic right whale;
- Humpback whale;
- Fin whale;
- Sei whale;
- Minke whale;
- Sperm whale;
- Risso's dolphin;
- Long-finned pilot whale;
- Short-finned pilot whale;
- Atlantic white-sided dolphin;
- Common dolphin;
- Atlantic spotted dolphin;
- Common bottlenose dolphin;
  - Western North Atlantic offshore stock, and
  - Northern migratory stock;
- Harbor porpoise;
- Harbor seal; and
- Gray seal.

The only anticipated impacts to marine mammals are associated with noise and are limited to the use of HRG survey equipment operating sources less than 180 kHz and have the potential to result in Level B exposures as described in **Section 1.3**. The potential activities are not expected to take more than a small number of marine mammals or have more than a negligible effect on their populations based on their seasonal density and distribution and known reactions to underwater sound exposure. The source activity is described in **Section 1.2**, survey equipment is listed in **Section 1.3**, and species status and distributions in **Section 4.0**.

6.1   BASIS FOR ESTIMATING NUMBERS OF MARINE MAMMALS THAT MIGHT BE TAKEN BY HARASSMENT

Estimating exposures of marine mammal species assumes that exposure of an animal to a specified noise level within a region of ensonification will result in a take of that animal. The ensonified area is calculated based on the SL and operational mode of the equipment (**Table 3**). Potential Level B take exposures are estimated within the ensonified area as an SPL exceeding 160 dB re 1 µPa for impulsive sources (e.g., sparkers, boomers) within an average day of activity. The potential number of exposed animals is estimated from the mean monthly densities (animals km^{-2}) of a given species expected within the Project Area. These densities are then multiplied by the maximum number of survey days. These calculations result in unmitigated take estimates for each affected species over the entire survey period.

6.1.1   Harassment Zone Calculations

The harassment zone is a representation of the maximum extent of the ensonified area around a sound source over a 24-hour period. The harassment zone for each piece of equipment operating below 180 kHz was calculated per the following formulae:

Stationary Source: Harassment Zone = πr^2

Mobile Source: Harassment Zone = (Distance/day $\times$ 2r) + πr^2

Where r is the linear distance from the source to the isopleth for Level A or Level B thresholds and day = 1 (i.e., 24 hours).

The estimated potential daily active survey distance of 70 km was used as the estimated areal coverage over a 24-hour period. This distance accounts for the vessel traveling at roughly 4 knots and only for periods during which equipment <180 kHz is in operation. A vessel traveling 4 knots can cover approximately 110 km per day; however, based on data from 2017, 2018, and 2019 surveys, survey coverage over a 24-hour period is closer to 70 km per day. For daylight only vessels, the distance is reduced to 35 km per day; however, to maintain the potential for 24-hour surveys, the corresponding Level B harassment zones provided in **Table 6** were calculated for each source category based on the Level B threshold distances in **Table 4** with a 24-hour (70 km) operational period.

Table 6.   Calculated harassment zones Level B thresholds for each sound source or comparable sound source category.

Source	Level B ZOI (km^2)
Shallow SBP's (CHIRPS)	3.1
Boomers	4.8
Sparkers	19.8

CHIRP = compressed high-intensity radiated pulses; SBP = sub-bottom profiler;

For sources that have operating beamwidths that are less than 180°, the harassment zone will be conical below the source with maximum radial propagation widths dependent upon the water depth and absorption. For these equipment cases (boomers), the radial distance was calculated using interim recommendations provided by NMFS (2019a) and provided as part of the User Spreadsheet submitted with this application.

A conservative approach to estimate the Level B take distances for the survey was implemented by using the equipment that produced the greatest Level B isopleth distance from apparent or measured SL to define the impact radii of all proposed equipment within that group. The maximum estimated distance from a geophysical source to the Level B threshold (SPL of 160 dB re 1 µPa) were for the sparkers at 141 m and subsequent 19.8 km^2 harassment zone. (**Table 4**).

6.1.2   Marine Mammal Density Calculation

The density calculation methodology applied to take estimates for this application is derived from the model results produced by Roberts et al. (2016) and then updated by Roberts et al. (2022) for the entire U.S. East Coast region. To determine cetacean densities for take estimates, only those density blocks which overlapped with any portion of the Project Area were selected for this assessment (**Figure 3**). These files were retrieved as raster files from the website https://seamap.env.duke.edu/models/Duke/EC/ (Roberts et al., 2016; Roberts, 2022). These estimates are considered the best information currently available for calculating marine mammal densities in the U.S. Atlantic by NMFS. Currently, no density estimates are available for the portion of the ECR area in Delaware Bay, so the marine

mammal densities from Roberts et al. (2022), were assumed to apply to this area, and the level of effort needed for site investigation surveys in this region was included in overall number of surveys days used in the take assessment (**Section 6.1.3**).

6.1.2.1 Marine Mammal Guild Densities

Due to limited data availability and difficulties identifying individuals to species level during visual surveys, individual densities are not able provided for all species and they are instead grouped into "guilds" (Roberts et al., 2022). These guilds include pilot whales, common bottlenose dolphins, and seals.

Long- and short-finned pilot whales are difficult to distinguish during shipboard surveys so individual habitat models were not able to be developed. Although there may be some bias toward long-finned pilot whales in the Project Area, both species are assumed to have the same potential to occur in this region, densities are assumed to apply to both species. Short-finned and long-finned pilot whales are nearly impossible to distinguish from one another when observed by commercial shipboard PSOs; therefore, any detections would likely be assigned to the generic "pilot whale" guild. However, all pilot whales may occur in large groups; thus, a sighting of pilot whales during the surveys could result in a large number of exposures in one detection event. Therefore, 100% of the pilot whale guild densities were assigned both the long-finned pilot whale and the short-finned pilot whale for the total 275 days.

The density models do not distinguish between common bottlenose dolphin stocks due to limited data regarding distributions of these stocks. As discussed in **Section 4.2.8**, both the northern migratory coastal stock and the Western North Atlantic offshore stock are expected to occur in the Project Area. To try and estimate densities for both stocks using these models, the density blocks within the Project Area were divided using the 20-m isobath (red line in **Figure 3**) following guidance from NMFS 2020 SAR (Hayes et al., 2021). Any density blocks located between the coastline and the 20-m isobath were assigned to the migratory coastal stock, and density blocks beyond this isobath were assigned to the offshore stock. Because the survey scope is not known at this time, the total 275 days was assigned to the generalized bottlenose dolphin guild and takes were only requested for the generalized guild rather than for any individual bottlenose dolphin stock.

Gray seals and harbor seals are reasonably identifiable during shipboard visual surveys; therefore it is expected that some sightings will be assigned to species rather than to the generalized seal guild. Additionally, seals tend to occur in very small numbers when away from haul out areas; therefore, sighting events are not likely to constitute large numbers of animals. For these reasons, the seal guild density was split evenly between both gray and harbor seal species.

Density blocks which overlapped with the Project Area were selected for this analysis. Densities from each of the selected density blocks were averaged for each month available to provide monthly densities estimates for each species, along with the average annual density derived from the monthly densities (**Table 7**).
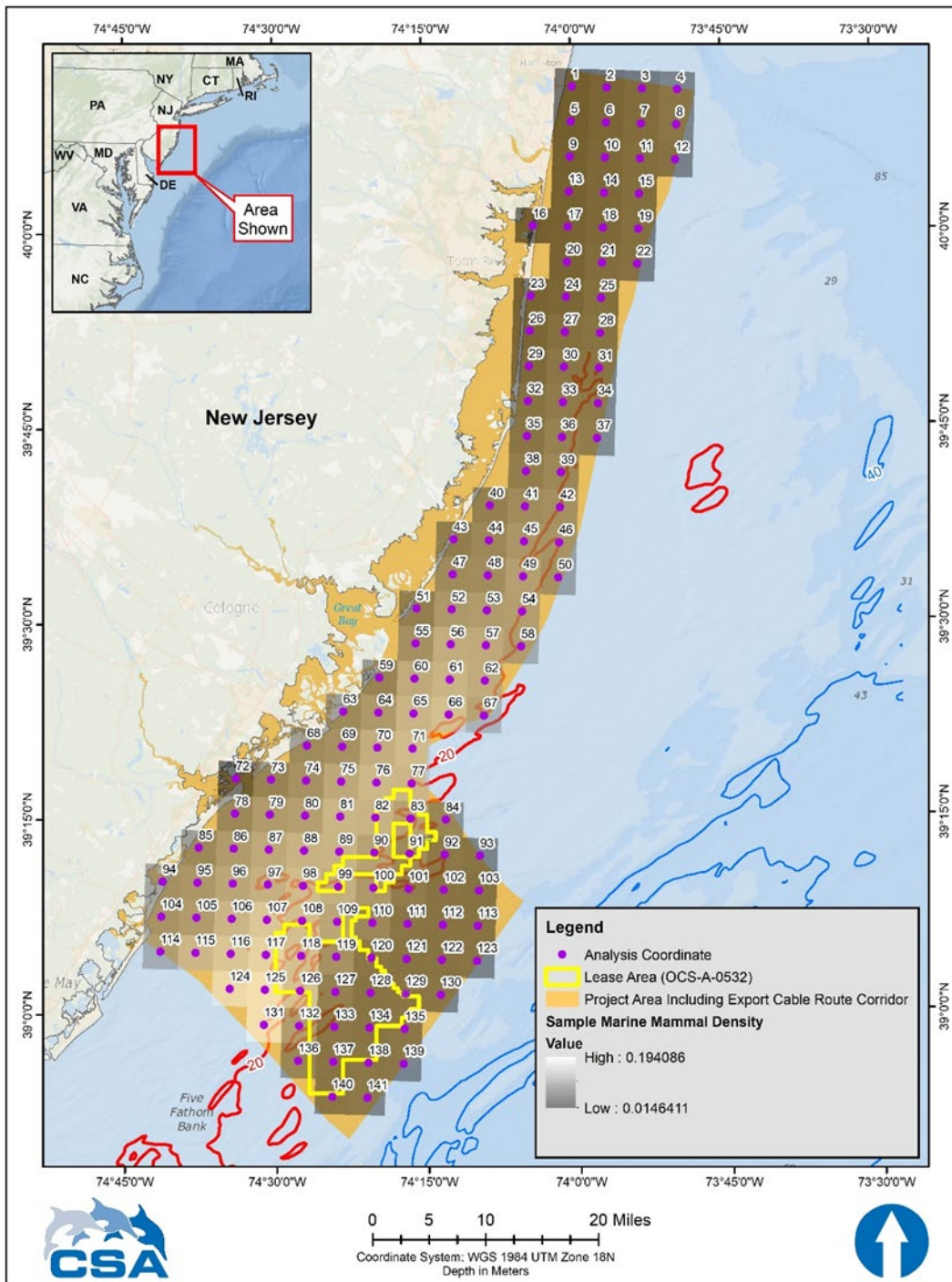
Figure 3.   Sample density blocks (Roberts et al. 2022) from models used to determine monthly marine mammal densities within the Project Area. The 20-m depth contour used to differentiate common bottlenose dolphin stocks has been highlighted red for reference.

Table 7.   Estimated monthly and average annual density (animals km^{-2}) of potentially affected marine mammals within the Project Area based on monthly habitat density models (Roberts et al., 2022).

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual Density (km^{-2})
Low-frequency Cetaceans													
Fin whale	0.0018	0.0009	0.0010	0.0012	0.0006	0.0006	0.0003	0.0002	0.0003	0.0004	0.0004	0.0017	**0.0008**
Sei whale	0.0003	0.0002	0.0003	0.0005	0.0002	0.0001	0.0000	0.0000	0.0000	0.0001	0.0003	0.0006	**0.0002**
Minke whale	0.0004	0.0005	0.0006	0.0068	0.0065	0.0013	0.0003	0.0001	0.0001	0.0007	0.0001	0.0003	**0.0015**
Humpback whale	0.0012	0.0008	0.0011	0.0011	0.0007	0.0005	0.0001	0.0001	0.0002	0.0007	0.0012	0.0019	**0.0008**
North Atlantic right whale	0.0011	0.0010	0.0007	0.0004	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0006	**0.0004**
Mid-frequency Cetaceans													
Sperm whale	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	**0.0000**
Atlantic white-sided dolphin	0.0020	0.0012	0.0014	0.0043	0.0036	0.0025	0.0001	0.0000	0.0003	0.0029	0.0043	0.0038	**0.0022**
Atlantic spotted dolphin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0010	0.0006	0.0005	0.0004	0.0000	**0.0002**
Common bottlenose dolphin (Offshore)[1]	0.0269	0.0088	0.0126	0.0443	0.1149	0.1594	0.1630	0.1551	0.1502	0.1590	0.1702	0.1151	**0.1066**
Common bottlenose dolphin (Migratory)[1]	0.0651	0.0242	0.0508	0.2379	0.5992	0.7624	0.7395	0.7979	0.9206	0.8443	0.7515	0.4039	**0.5164**
Long-finned pilot whale[1]	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	**0.0001**
Short-finned pilot whale[1]	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	**0.0001**
Risso's dolphin	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0005	**0.0001**
Common dolphin	0.0132	0.0056	0.0077	0.0170	0.0171	0.0057	0.0027	0.0010	0.0001	0.0066	0.0371	0.0340	**0.0123**
High-frequency Cetaceans													
Harbor porpoise	0.0315	0.0287	0.0271	0.0355	0.0078	0.0002	0.0001	0.0000	0.0000	0.0001	0.0003	0.0277	**0.0133**
Pinnipeds[1]													
Gray seal	0.0036	0.0026	0.0024	0.0035	0.0030	0.0024	0.0004	0.0002	0.0004	0.0025	0.0038	0.0042	**0.0024**
Harbor seal	0.0036	0.0026	0.0024	0.0035	0.0030	0.0024	0.0004	0.0002	0.0004	0.0025	0.0038	0.0042	**0.0024**

[1]See Section 6.1.2.1. for density discussion regarding bottlenose dolphin, pilot whale, pinniped guilds.

6.1.3 Take Calculation

Based on the average annual densities for each species in the Project Area (**bolded** numbers in **Table 7**) and the harassment zones (**Table 6**), the estimated number of Level A takes per equipment type was determined, and the estimated number of Level B takes for the sparker sources was determined. Calculations were based on vessel-towed geophysical survey equipment operating 275 vessel days in the Project Area, with the sources producing the largest threshold distances (i.e., sparkers) operating during 100% of vessel days.

Estimates of take are calculated according to the following formula:

$$\text{Estimated Take} = D \times \text{Harassment Zone} \times \text{\# of Survey Days}$$

Where: D = average species density (km^{-2}); and Harassment Zone = maximum ensonified area that equates to NMFS thresholds for noise impact criteria. To estimate take, the density of marine mammals within the Project Area (animals km^{-2}) was multiplied by the daily ensonified harassment zone (km^2). That result is then multiplied by the number of survey days (rounded to the nearest whole number) to arrive at the estimated take. This final number equals the instances of take for the entire operational period. The result is an estimate of the maximum potential number of instances that marine mammals could be exposed to sounds above the Level A or Level B harassment thresholds over the duration of survey activities. The Applicant has proposed mitigation measures to reduce potential Level B harassment and eliminate the possibility of any Level A harassment (**Section 11.0**).

6.1.3 Survey Activities Conducted Under 2022 – 2023 IHA.

Ocean Wind II has conducted site investigation surveys that included the Project Area (**Figure 1**) between May and July 2022. During this period, protected species observers (PSOs), have been deployed on all survey vessels. The PSOs have documented all marine mammal detections and have estimated the number of Level B takes based on equipment operations and Level B harassment zones. The PSO interim report has been provided to NMFS OPR under separate cover and estimated takes presented in **Table 4.** The only reported detections of marine mammals within the Level B zones while the sources were active were of unidentified dolphin species (10 individuals over 2 detection events) that voluntarily approached the vessel. These individuals may have received acoustic exposures meeting Level B criteria. It is expected that these detections would be comprised of the dolphin species identified during other detection events and for which authorization has been issued.

Table 4. Authorized Level B harassment takes from current incidental harassment authorization (87 *Federal Register* [*FR*] 30453) and estimated Level B takes realized between 10 May 2022 and 12 July 2022.

Species		Authorized Takes (87 *FR* 30453)	Estimated Takes during 2022 survey activities
North Atlantic Right Whale	*Eubalaena glacialis*	11	0
Humpback Whale	*Megaptera novaeangliae*	2	0
Fin Whale	*Balaenoptera physalus*	4	0
Sei Whale	*Balaenoptera borealis*	1	0
Minke Whale	*Balaenoptera acutorostrata*	1	0
Sperm Whale	*Physeter macrocephalus*	3	0
Short-finned Pilot Whale	*Globicephala macrorhynchus*	20	0
Long-finned Pilot Whale	*Globicephala melas*	20	0

Bottlenose Dolphin	*Tursiops truncatus*	1,842	0
Common Dolphin	*Delphinus delphis*	400	0
Atlantic White-sided Dolphin	*Lagenorhynchus acutus*	50	0
Atlantic Spotted Dolphin	*Stenella frontalis*	15	0
Risso's Dolphin	*Grampus griseus*	30	0
Harbor Porpoise	*Phocoena phocoena*	90	0
Gray Seal	*Phoca vitulina*	25	0
Harbor Seal	*Halichoerus grypus*	25	0

6.2 ESTIMATED NUMBERS OF MARINE MAMMALS THAT MIGHT BE TAKEN BY HARASSMENT

The Applicant is requesting approval for the incidental harassment takes of marine mammals associated with geophysical surveys. Take estimates were projected based on marine mammal presence, calculated density estimates, and activity-specific noise source propagation characteristics.

6.2.1 Estimated Level B Harassment of Marine Mammals

Level B exposures were estimated by multiplying the average annual density of each species (**Tables 7** and **8**) (Roberts et al. 2022) by the daily harassment zone that was estimated to be ensonified to an SPL exceeding 160 dB re 1 µPa (**Table 6**), times the number of operating days expected for the survey in each area assessed. In this Application, it was assumed the sparker systems were operating all 275 survey days in the Project Area as it is the sound source expected to produce the largest harassment zone.

Table 9 summarizes the Level B take estimates for the Project Area for all species occurring in the Project Area that are considered common, uncommon, or regular (**Section 3.0**).

Table 9.   Summary of maximum potential Level B take exposures resulting from 100% usage of the sparker systems during all 275 survey days in the Project Area.

Species	Density	Total Calculated Takes
North Atlantic Right Whale	0.0004	2
Humpback Whale	0.0008	4
Fin Whale	0.0008	4
Sei Whale	0.0002	1
Minke Whale	0.0015	8
Sperm Whale	0.0000	0
Short-finned Pilot Whale[1]	0.0001	1
Long-finned Pilot Whale[1]	0.0001	1
Common Bottlenose Dolphin (Offshore)[1]	0.4078	2,221
Common Bottlenose Dolphin (Migratory)[1]		
Common Dolphin	0.0123	67
Atlantic White-sided Dolphin	0.0022	12
Atlantic Spotted Dolphin	0.0002	1
Risso's Dolphin	0.0001	1
Harbor Porpoise	0.0133	72
Gray Seal[1]	0.0024	13
Harbor Seal[1]	0.0024	13

[1]See Section 6.1.2.1. for density discussion regarding bottlenose dolphin, pilot whale, pinniped guilds.

6.2.3   Requested Level B Takes

The estimated Level B exposures in **Table 9** are based on the operation of the sparker sources that produced the largest threshold isopleth (141 m) during 100% of the proposed vessel days. All non-sparker sources were estimated to produce Level B isopleths less than 48 m. This method provides conservative estimates of the potential Level B exposures to any of the species or stocks expected to occur within the Project Area because maximum isopleths for each of the equipment groups were used.

The requested number of Level B takes provided in **Table 10** are based on the exposures calculated in **Section 6.2.2**. Small numbers or no takes were calculated for the sei whale, sperm whale, or Risso's dolphin; however, based on anticipated species distributions and data from previous surveys conducted in the region, it is likely these species could be encountered. Therefore, requested takes are based on estimated group sizes for these species.

Table 10. Summary of requested Level B takes for this Project.

Species		Requested Takes[1]	% Population
North Atlantic Right Whale	*Eubalaena glacialis*	2	0.592%
Humpback Whale	*Megaptera novaeangliae*	4	0.287%
Fin Whale	*Balaenoptera physalus*	4	0.059%
Sei Whale	*Balaenoptera borealis*	1	0.016%
Minke Whale	*Balaenoptera acutorostrata*	8	0.036%
Sperm Whale	*Physeter macrocephalus*	0 (3)	0.069%
Short-finned Pilot Whale[2]	*Globicephala melas*	1 (20)	0.069%
Long-finned Pilot Whale[2]	*Globicephala melas*	1 (20)	0.051%
Common Bottlenose Dolphin[3]	*Tursiops truncatus*	2,221	No guild-based abundance estimate
Common Dolphin	*Delphinus delphis*	67 (400)	0.231%
Atlantic White-sided Dolphin	*Lagenorhynchus acutus*	12 (50)	0.054%
Atlantic Spotted Dolphin	*Stenella frontalis*	1 (15)	0.038%
Risso's Dolphin	*Stenella frontalis*	1 (30)	0.085%
Harbor Porpoise	*Phocoena phocoena*	72	0.075%
Harbor Seal[4]	*Phoca vitulina*	13	0.021%
Gray Seal[4]	*Halichoerus grypus*	13	0.048%

W.N.A = Western North Atlantic.

[1]Parenthesis denote changes from calculated take estimates. Calculated takes were adjusted for requested takes in two ways: 1) For species for which calculated take was significantly (subjectively) less than the number of individuals reported in the posted PSO reports and any available draft data (e.g., ongoing surveys) in the area, the total number of individuals reported were used for take requests; 2) For species with no calculated takes, or takes were less than mean group size, requested takes for HRG surveys were based on one take event for that species comprising the mean group sizes derived from the following references:

- Sperm whale: Barkaszi and Kelly, 2019
- Atlantic white-sided dolphin: NMFS, 2021c;
- Atlantic spotted dolphin: NMFS, 2021d;
- Pilot whales: Kenney and Vigness-Raposa, 2010;
- Risso's dolphin: Barkaszi and Kelly, 2019;
- Common dolphin: Based on a review of the posted PSO reports and any available draft data (e.g., ongoing surveys) in the area. Mean group sizes and total daily sightings were considered in the estimated adjustment.

[2]Roberts et al. (2022) only provides density estimates for "generic" pilot whales; therefore, an equal potential for takes has been assumed either for species or stocks within the larger group.

[3]While both the offshore and northern migratory coastal common bottlenose dolphin stocks may be present in the Project Area, Roberts et al. (2022) does not provide density estimates for individual stocks. The maximum potential Level B exposures calculated for each stock of common bottlenose dolphin are based on the full survey duration occurring inside or outside the 20-m isobath; however only a portion of the survey will occur in each area. The exact number of survey days that may occur in each is not currently known, therefore the maximum number of calculated takes (2,221) is assumed to apply to all common bottlenose dolphins potentially present during the proposed survey activities regardless of stock

[4]Roberts et al. (2022) only provides density estimates for "generic" seals; therefore, densities were split evenly between the two species.

7.0   Effects on Marine Mammal Species or Stocks

Marine mammals exposed to natural or man-made sound may experience non-auditory and auditory impacts which range in severity (Southall et al., 2007; 2019; NMFS, 2018a; Wood et al., 2012). The potential exists for small numbers of marine mammals to be exposed to underwater sound associated with survey activities. These impacts are likely to affect individual species, but have only negligible effects on the marine mammal stocks and; therefore, will not adversely affect the population of any species. Mitigation is not considered in the take estimates; inclusion of mitigation would likely reduce the take estimates.

7.1   MULTIPLE EXPOSURES AND SEASONALITY

Level B exposures likely include the same individuals across multiple days and not exposures to the entire stock; therefore, they can be considered instances of exposure rather than a discrete count of individuals that have received regulatory-level sound exposures. The acoustic metric used to establish Level B isopleths (SPL) does not consider a duration of exposure (SEL_{24h}) in its calculations. The SPL assumes that an animal within the Level B isopleth, regardless of the length of time, is taken by exposure. The take estimates assume that an animal will only be taken once over a 24-hour period; however, an activity may result in multiple takes of the same animal during this period resulting in an inflated percent of the population taken which is not realized during actual events.

Additionally, estimates using the habitat density data (Roberts et al., 2022) may not fully reflect the actual observations in the field. In the case of the NARW, seasonal, patchy densities increase the average annual densities across an entire lease area for only a short period of time, resulting in much fewer detections during the surveys when compared to the calculated exposure estimates. Population percentages represent the maximum potential take numbers, whereas in actuality, a limited number of marine mammals may realize behavioral modification.

7.3   NEGLIGIBLE IMPACTS

Animals in an area of exposure may move location depending on their acoustic sensitivity, life stage, and acclimation (Wood et al., 2012), and may or may not demonstrate behavioral responses. Therefore, while the number of takes and the affected population percentages represent the maximum potential take numbers, in actuality, a limited number of marine mammals may realize behavioral modification.

Under the requirements of 50 CFR § 216.104, NMFS has defined negligible impact as an impact that is not reasonably expected to adversely affect a species or stock through effects on annual rates of recruitment or survival. The negligible impact determination is not based on take estimates alone; rather, for NMFS to make a negligible impact determination, small numbers must denote that the portion of a marine mammal species or stock in the take estimates will have a negligible impact on that species or stock.

As discussed in **Sections 9.0** and **10.0**, physical auditory effects, vessel strikes, PTS or TTS, and long-term impacts to habitat or prey species are not expected to occur. Temporary masking may occur in localized areas for short periods of time when an animal is in proximity to the survey. Masking occurs when an animal's acoustic "space" (i.e., auditory perception and discrimination) is covered up by noise of similar frequency, but at higher amplitudes of biologically important sounds. However, due to movement of the sources, masking effects are expected to be negligible and will not contribute significantly to other noise sources operating in the region.

The primary potential impact on marine mammals from exposure to survey-related underwater sound is behavioral response, which will not necessarily constitute significant changes in biologically important behaviors. The National Research Council (2005) noted that an action or activity becomes biologically significant to an individual animal when it affects the ability of the animal to grow, survive, and reproduce, wherein an impact on individuals can lead to population-level consequences and affect the viability of the species. The reasonably expected impacts from the

proposed activities are based on noise exposure thresholds that can potentially elicit a behavioral response and are categorized as Level B takes under the MMPA. Here, due to the variability in species reaction to sound sources, short time period of the survey operations, and use of mitigation measures, any behavioral reactions are expected to be minor, localized, short-term, and have negligible effects on individuals and stocks. It is expected that behavioral reactions will mainly comprise a temporary shift in spatial use. No long-term or population effects are expected from the behavioral reactions to the proposed surveys.

8.0   Minimization of Adverse Effects to Subsistence Uses

This section addresses NFMS' requirement to identify methods to minimize adverse effects of the proposed activity on subsistence uses.

There are no current subsistence hunting areas in the vicinity of the proposed Project Area and there are no activities related to the proposed surveys that may affect the availability of a species or stock of marine mammals for subsistence uses. Consequently, there are no available methods to minimize potentially adverse effects to subsistence uses.

9.0 Anticipated Impacts on Habitat

This section addresses NFMS' requirement to characterize the short- and long-term impacts of the proposed activity on marine mammals associated with the predicted loss or modification of habitat and to address available methods and likelihood of restoration of lost or modified habitat.

9.1 SHORT-TERM IMPACTS

The proposed activity has the potential to affect marine mammal habitat primarily through short-term impacts from increases in ambient noise levels from survey equipment that may result in masking of acoustic habitat. Auditory masking occurs when sound signals used by marine mammal overlap in time, space, and frequency with another sound source (Richardson et al. 1995). Masking can reduce communication space, limit the detection of relevant biological cues, and reduce echolocation effectiveness. A growing body of literature is focused on improving the framework for assessing the potential for masking of animal communication by anthropogenic noise and understand the resulting effects. More research is needed to understand the process of masking, the risk of masking by anthropogenic activities, the ecological significance of masking, and what anti-masking strategies are used by marine animals and their degree of effectiveness before masking can be incorporated into regulation strategies or mitigation approaches (Erbe et al. 2016).

The expected short-term impacts to the acoustic habitat are highly localized and transient during the survey; and therefore, have the potential to only temporarily affect marine mammals.

9.2 LONG-TERM IMPACTS

Due to the short duration of the potential activities and the minimal acoustic disturbance expected, no long-term, permanent impacts associated with loss or modification of habitat are anticipated.

10.0   Anticipated Effects of Habitat Impacts on Marine Mammals

This section addresses NFMS' requirement to characterize the short- and long-term impacts of the proposed activity on predicted habitat loss or modification. The predicted impacts to marine mammal habitat have been summarized in **Sections 10.1** and **10.2**.

10.1   SHORT-TERM IMPACTS

Marine mammals use sound to navigate, communicate, find open water, avoid predators, and find food. Acoustic acuity within the habitat must be available for species to conduct these ecological processes. If noise levels within critical frequency bands preclude animals from accessing the acoustic properties of that habitat, then availability and quality of that habitat has been diminished. The sounds that marine mammals hear and generate will vary in terms of dominant frequency, bandwidth, energy, temporal pattern, and directionality. The same variables in ambient noise will; therefore, determine a marine mammal's acoustic resource availability. In the case of marine mammals, anthropogenic noise can be viewed as a form of habitat fragmentation resulting in a loss of acoustic space that could otherwise be occupied by vocalizations or other acoustic cues (Rice et al., 2014). Primary acoustic habitat for a species will be focused within the vocal ranges for that species; therefore, habitat impact assessment should be conducted within those vocal ranges. The functional extent of the ensonified space around operations employing HRG sources will require an understanding of the distribution of SPLs by their spectral probability density and knowledge of received exposure levels with coordinated species densities. Therefore, marine mammals may experience some short-term loss of acoustic habitat, but the nature and duration of this loss is not expected to represent a significant loss of habitat.

Masking effects

Masking of LFC communications is considered more likely due to the overlap of vessel noise and survey frequencies with lower-frequency signals produced by these species compared to other hearing groups. However, as the HRG source levels are typically higher in frequency than the predominate ship noise, effects of masking would be generated primarily by the vessel and not the HRG equipment.

A comprehensive review of the literature (Richardson et al. 1995; Erbe et al. 2019) revealed that most of the reported adverse effects of vessel noise and presence are changes in behavior, though the specific behavioral changes vary widely across species. Physical behavioral responses include changes to dive patterns (Finley et al. 1990), disruption to resting behavior (Mikkelsen et al. 2019), increases in swim velocities (Finley et al. 1990; Sprogis et al. 2020; Williams et al. 2022), and changes in respiration patterns (Nowacek et al. 2006; Hastie et al. 2006; Sprogis et al. 2020). These responses have, in certain cases, been correlated with numbers of vessels and their proximity, speed, and directional changes. Responses have been shown to vary by gender and by individual. The energetic consequences of any avoidance behavior or masking effects foraging are not expected affect any individual's ability to successfully obtain enough food to maintain their health or impact the ability of any individual to make seasonal migrations or participate in breeding or calving.

Reduction of Prey Availability

Reduction of prey availability could affect marine mammals if rising sound levels alter prey abundance, behavior, and/or distribution (McCauley et al., 2000; Popper and Hastings, 2009; Slabbekoorn et al., 2010). Prey species may show responses to noise; however, there are limited data on hearing mechanisms and potential effects of noise on common prey species (i.e., crustaceans, cephalopods, fish) that would result loss of availability to marine mammals. These species have been increasingly researched as concern has grown related to noise impacts on the food web. Invertebrates appear to be able to detect sounds and particle motion (André et al., 2016; Budelmann, 1992; Solé et al., 2016, 2017) and are most sensitive to low-frequency sounds (Packard et al., 1990; Budelmann and Williamson, 1994; Lovell et al., 2005a,b; Mooney et al., 2010).

Squid and other cephalopods are an extremely important food chain component for many higher order marine predators. Cephalopods (i.e., octopus, squid) and decapods (i.e., lobsters, shrimps, crabs) are capable of sensing low-frequency sound. Packard et al. (1990) showed that three species of cephalopod were sensitive to particle motion, not sound pressure, with the lowest particle acceleration thresholds reported as 0.002 to 0.003 m s^{-2} at 1 to 2 Hz. Solé et al. (2017) showed that SPL ranging from 139 to 142 dB re 1 µPa at one-third octave bands centered at 315 Hz and 400 Hz may be suitable threshold values for trauma onset in cephalopods. Cephalopods have exhibited behavioral responses to low frequency sounds under 1,000 Hz, including inking, locomotor responses, body pattern changes, and changes in respiratory rates (Kaifu et al., 2008; Hu et al., 2009). In squid, Mooney et al. (2010) measured acceleration thresholds of -26 dB re 1 m s^{-2} between 100 and 300 Hz and an SPL threshold of 110 dB re 1 µPa at 200 Hz. Lovell et al. (2005a) found a similar sensitivity for prawn (*Palaemon serratus*), SPL of 106 dB re 1 µPa at 100 Hz, noting that this was the lowest frequency at which they tested and that the prawns might be more sensitive at frequencies below this. Hearing thresholds at higher frequencies have been reported, such as 134 and 139 dB re 1 µPa at 1,000 Hz for the oval squid (*Sepioteuthis lessoniana*) and the common octopus (*Octopus vulgaris*), respectively (Hu et al., 2009). McCauley et al. (2000) reported that of caged squid exposed to seismic airguns showed behavioral responses such as inking. Wilson et al. (2007) exposed two groups of squid (*Loligo pealeii*) in a tank to killer whale echolocation clicks at SPL from 199 to 226 dB re 1 µPa, which resulted in no apparent behavioral effects or any acoustic debilitation. However, both the McCauley et al. (2000) and Wilson et al. (2007) experiments used caged squid, so it is unclear how unconfined animals would react. André et al. (2011) exposed four cephalopod species (European squid [*Loligo vulgaris*], cuttlefish [*Sepia officinalis*], octopus, and Southern shortfin squid [*Ilex coindetii*]) to 2 hours of continuous noise from 50 to 400 Hz at received SPL of 157 dB re 1 µPa ± 5 dB and reported lesions occurring on the statocyst's sensory hair cells of the exposed animals that increased in severity with time, suggesting that cephalopods are particularly sensitive to low-frequency sound. Similar to André et al. (2011), Solé et al. (2013) conducted a low-frequency (50 to 400 Hz) controlled exposure experiment on two deep-diving squid species (Southern shortfin squid and European squid), which resulted in lesions on the statocyst epithelia. Sóle et al. (2013) described their findings as "morphological and ultrastructural evidence of a massive acoustic trauma induced by…low-frequency sound exposure." In experiments conducted by Samson et al. (2014), cuttlefish exhibited escape responses (i.e., inking, jetting) when exposed to sound frequencies between 80 and 300 Hz with SPL above 140 dB re 1 µPa and particle acceleration of 0.01 m s^{-2}; the cuttlefish habituated to repeated 200 Hz sounds. The intensity of the cuttlefish response with the amplitude and frequency of the sound stimulus suggest that cuttlefish possess loudness perception with a maximum sensitivity of approximately 150 Hz (Samson et al., 2014).

Several species of aquatic decapod crustaceans are also known to produce sounds. Popper et al. (2001) concluded that many are able to detect substratum vibrations at sensitivities sufficient to tell the proximity of mates, competitors, or predators. Popper et al. (2001) reviewed behavioral, physiological, anatomical, and ecological aspects of sound and vibration detection by decapod crustaceans and noted that many decapods also have an array of hair-like receptors within and upon the body surface that potentially respond to water- or substrate-borne displacements as well as proprioceptive organs that could serve secondarily to perceive vibrations. However, the acoustic sensory system of decapod crustaceans remains poorly studied (Popper et al., 2001). Lovell et al. (2005a,b, 2006) reported potential auditory-evoked responses from prawns (*Palaemon serratus*) showing auditory sensitivity of sounds from 100 to 3,000 Hz, and Filiciotto et al. (2016) reported behavioral responses to vessel noise within this frequency range.

Marine fish are typically sensitive to the 100 to 500 Hz range, which is below most HRG sources. However, several studies have demonstrated that seismic airguns and impulsive sources might affect the behavior of at least some species of fish. For example, field studies by Engås et al. (1996) and Løkkeborg et al. (2012) showed that the catch rate of haddock (*Melanogrammus aeglefinus*) and Atlantic cod (*Gadus morhua*) significantly declined over the 5 days immediately following seismic surveys, after which the catch rate returned to normal. Other studies found only minor responses by fish to noise created during or following seismic surveys, such as a small decline in lesser sand eel (*Ammodytes marinus*) abundance that quickly returned to pre-seismic levels (Hassel et al., 2004) or no permanent changes in the behavior of marine reef fishes (Wardle et al., 2001). However, both Hassel et al. (2004)

and Wardle et al. (2001) noted that when fish sensed the airgun firing, they performed a startle response and sometimes fled. Squid (*Sepioteuthis australis*) are an extremely important food chain component for many higher order marine predators, including sperm whales (*Physeter macrocephalus*). McCauley et al. (2000) recorded caged squid responding to airgun signals. Given the generally low sound levels produced by HRG sources in comparison to airgun sources, no short-term impacts to potential prey items (fishes, cephalopods, crustaceans) are expected from the proposed survey activities.

Minimal data are available for zooplankton responses to HRG sounds or other disturbance. A 2022 study (Guihen et al., 2022) found a noted avoidance of Antarctic krill species to the presence of an autonomous glider carrying a single-beam echosounder. However, these disturbances had small ranges (~40 m) and did not show a large-scale movement in krill. It is expected that although reactionary behavior to acoustic disturbance by zooplankton is likely, the localized, temporary nature of the movement would not cause significant loss in the availability of the species to marine mammals.

10.2   LONG-TERM IMPACTS

Due to the short duration of the potential activities and the minimal disturbance expected, no long-term impacts to marine mammals associated with loss or modification habitat are anticipated.

This section addresses NMFS' IHA requirement to assess the availability and feasibility (economic and technological), methods, and manner of conducting this survey activity that has the least practicable impact upon affected species or stock, its habitat, and its availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

The Applicant has demonstrated a commitment to minimizing impacts to marine mammal species through a comprehensive and progressive mitigation and monitoring program, described here. The Applicant has committed to engaging in ongoing consultations with NMFS and following a comprehensive set of mitigation measures during site characterization surveys. These measures include the following components which are described in detail below:

- Vessel strike avoidance procedures;
- Establishment of pre-start clearance and shutdown zones;
- Visual monitoring, including low visibility monitoring tools;
- Area clearance;
- Ramp-up procedures;
- Operational shutdowns and delays;
- Communication of sightings between vessels; and
- Maintaining situational awareness across project vessels and personnel.

The mitigation protocols have been designed to provide protection to marine mammals, both individuals and, by extension, species' stocks where designated, by minimizing exposure to potentially disruptive noise levels during site characterization activities. The mitigation measures will also reduce the likelihood of ship strikes to large whales in the area.

Project-specific training will be conducted for all vessel crew prior to the start of a survey and during any changes in crew such that all survey personnel are fully aware and understand the mitigation, monitoring, and reporting requirements. Prior to implementation with vessel crews, the training program will be provided to NMFS for review and approval. 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 member understands and will comply with the necessary requirements throughout the survey activities.

11.1   VESSEL STRIKE AVOIDANCE PROCEDURES

The Applicant will ensure that vessel operators and crew maintain a vigilant watch for cetaceans and pinnipeds, and change course, slow down, or switch the engines to neutral, as safely as applicable, to avoid striking these protected species. The applicant will follow speed guidance and regulated approach requirements provided by NMFS (50 CFR § 224.103 and 224.105); and all requirements in amended proposed rule (87 FR 46921; 1 August 2022) should they go into effect by the time of the survey.

Survey vessel crew members responsible for navigation duties will receive site-specific training on marine mammal detection and identification, sighting/reporting, and vessel strike avoidance measures. 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.

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

- All vessel operators will comply with 10 knot speed restrictions in any SMA or DMA;

- All vessel operators will reduce vessel speed to 10 knots or less when larger assemblages of non-delphinid cetaceans (particularly for ESA-listed species), mother/calf pairs, or pods are observed near an underway vessel;
- All vessels will maintain the following minimum separation distance between marine mammal:
  - 500 m for NARW
  - 100 m for all other large whales (baleen whales and sperm whales)
  - 50 m for dolphins, porpoises, and seals/

- If underway, vessels must steer a course away from any sighted NARW at 10 knots or less until the 500-m minimum separation distance has been established. If a NARW is sighted in a vessel's path, the underway vessel must reduce speed and/or shift the engine to neutral. Engines will not be engaged until the NARW has moved outside of the vessel's path and beyond 500 m. If the whale is stationary, the vessel must not engage engines until the NARW has moved beyond 500 m;
- All vessels will maintain a separation distance of 100 m or greater from any sighted lare whale (other than a NARW). If sighted within 100 m, the vessel underway must reduce speed and/or shift the engine to neutral and must not engage the engines until the non-delphinid cetacean has moved outside of the vessel's path and beyond 100 m. If a survey vessel is stationary, the vessel will not engage engines until the non-delphinid cetacean has moved out of the vessel's path and beyond 100 m;
- All vessels will maintain a separation distance of 50 m or greater from any sighted dolphin, porpoise or seal. Any vessel underway should remain parallel to the animal's course whenever possible and avoid excessive speed or abrupt changes in direction; and

11.2 RIGHT WHALE OPERATING REQUIREMENTS

Members of the monitoring team will consult NMFS' NARW reporting system and Whale Alert, as able, for the presence of NARWs throughout survey operations, and for the establishment of a DMA. If NMFS should establish a DMA in the Lease Areas during the survey, the vessels will abide by speed restrictions in the DMA per the lease conditions.

11.3 CLEARANCE, SHUTDOWN, AND LEVEL B HARASSMENT ZONES

Three distinct zones are defined to better describe the monitoring activities and mitigation actions associated with the detection of a marine mammals during the survey. Visual monitoring will be conducted around the sound source and the vessel at all times. All marine mammals seen during monitoring will be recorded regardless of the distance at which the animal is observered. The Applicant will employ the following zones and conditions during all site characterization survey activities using boomers, sparkers and CHIRP sources that operate below 180kHz.

Level B Zones for All Marine Mammals:

- 141 m around active sparker or boomer sound sources.
- 48 m around active CHIRP sources operating below 180 kHz

Pre-start Clearance Zones:

- 500 m for NARWs and all other ESA-listed whales;
- 100 m for non-ESA listed large whales; and
- 50 m for dolphins, seals, and porpoises.

Shutdown Zones:

- 500 m for NARWs;
- 100 m for all other whales;

- 50 m for all dolphins, seals, and porpoises; however, shutdown requirements will be waived for all dolphin, seal, and porpoise species for which take is authorized; and

- The shutdown zone may or may not encompass the Level B zone. A marine mammal's entry into the shutdown zone does not necessarily represent a take.

11.4   VISUAL MONITORING

Visual monitoring of the established zones and monitoring zone will be performed by the NMFS-approved PSOs (Protected Species Observers).

PSOs will be stationed on all survey vessels and will work in shifts such that observers obtain adequate rest periods between active watch periods. For all HRG survey activities , PSOs will work in shifts as stipulated above such that one PSO will be on watch during all daylight hours and two PSOs equipped with nighttime monitoring devices will be on watch during all hours of reduced visibility, including hours of darkness. One PSO on active watch at all times during daytime operations and two PSOs on active watch during nighttime operations will be sufficient to monitoring during the proposed survey activities. On a case-by-case basis, and upon approval from NMFS, changes in the PSO numbers, schedule, or 3rd party status may be adjusted during the project. During PSO observations the following guidelines shall be followed:

- Other than brief alerts to bridge of personnel of maritime hazards and the collection of ancillary wildlife data, no additional duties may be assigned to the PSO during his/her visual observation watch.

- No PSO will be allowed more than four consecutive hours on watch before being allocated a break from visual watch.

- No PSO will be assigned a combined watch schedule of more than 12 hours in a 24-hour period.

- The PSOs will stand watch in a suitable location that will not interfere with the navigation or operation of the vessel and affords an optimal view of the sea surface.

- Position data will be recorded using hand-held or vessel GPS units for each sighting.

- The PSOs will be responsible for visually monitoring and identifying marine mammals approaching or entering the established zones during survey activities. It will be the responsibility of the Lead PSO on duty to communicate to the vessel operator the presence of marine mammals as well as to communicate and enforce the action(s) that are necessary to ensure mitigation and monitoring requirements are implemented as appropriate.

- PSOs will share sighting data between Project survey vessels, as able, in near real-time via computer, radio, phone, or other methods.

- Each PSO on watch will be equipped with reticled binoculars that have an internal compass in order to estimate range and bearing to detected marine mammals. Digital, single-lens reflex camera equipment will be used to record sightings and assist in subsequent verification of species identification.

11.4.1 Nighttime Monitoring

During night operations, night vision equipment (night vision goggles with thermal clip-ons) and/or infrared/thermal imaging technology will be used.

11.4.2 Data Recording

PSOs will record all sightings of marine mammals while monitoring during day or night. Data on all PSO observations will be recorded based on standard PSO collection requirements. This will include dates and locations of construction operations; 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. Visual detections will be shared between vessels in near-real time, to the extent possible via computer, radio, phone, or other methods, thus increasing situational awareness.

11.5   PRE-START CLEARANCE OF THE EXCLUSION ZONE

The Applicant will implement a 30-minute clearance period of the pre-start clearance zones prior to the initiation of ramp-up (**Section 11.6**). After 30 minutes of monitoring, if any marine mammal has entered their respective clearance zone, ramp-up will not be initiated until the animal is confirmed outside the clearance zones or until the following time has elapsed since the last sighting of the animal in their respective clearance zone:

- 30 minutes for whales, including the NARW; and
- 15 minutes for dolphins, porpoises, and seals.

After the clearance period survey activities may commence, unless a marine mammal is detected within or entering the applicable shutdown zone. After the clearance period and once surveys have commenced, surveys can continue into darkness or inclement weather even if the shutdown zones, Level B Zones, and/or monitoring zone are not fully visible to PSOs.

11.6   RAMP-UP PROCEDURES

A ramp-up procedure will be used, to the extent practicable, at the beginning of HRG survey activities in order to provide additional protection to marine mammals near the survey by allowing them to vacate the area prior to the commencement of survey equipment use. Where technically feasible, a ramp-up procedure will be used for HRG survey equipment capable of adjusting energy levels at the start or restart of HRG survey activities. A ramp-up would begin with powering up of the HRG equipment that has the lowest source level output and starting it at its lowest practical power appropriate for the survey. The ramp-up will proceed by either adding equipment with higher source levels, increasing the power output of the operating equipment, or a combination of both.

The ramp-up procedure will not be initiated (i.e., equipment will not be started) during periods of inclement conditions when the marine mammal pre-start clearance zone cannot be adequately monitored by the PSOs for a 30-minute period using the appropriate visual technology. If any marine mammal enters the clearance zone, ramp-up will not be initiated until the animal is confirmed outside the marine mammal clearance zone, or until the appropriate time (30 minutes for whales, 15 minutes for dolphins, porpoises, and seals) has elapsed since the last sighting of the animal in the clearance zone.

11.7   SHUTDOWN PROCEDURES

An immediate shutdown of sparkers, boomers or CHIRP sources operating below 180 kHz will be required if a whale is sighted at or within the corresponding marine mammal shutdown zones. Survey equipment will not be shut down for dolphins, porpoises or seals. There is no shutdown requirement for any fauna group for categorical sources not listed in **Table 4** (i.e., Parametric SBPs [Innomars], acoustic corers, USBL, MBES, SSS).

The vessel operator must comply immediately with any call for shutdown by the Lead PSO. Any disagreement between the Lead PSO and vessel operator should be discussed only after shutdown has occurred. Subsequent restart of the survey equipment can be initiated if the animal has been observed exiting its respective shutdown zones or has

not been re-sighted within their respective shutdown zone for the appropriate time period (30 minutes for whales). If a marine mammal enters the respective clearance or shutdown zone during a shutdown period, the equipment may not restart until that animal is confirmed outside the clearance zone as stated previously in the pre-start clearance procedures (**Section 11.5**), or until the appropriate time listed below has elapsed since the last sighting of the animal within the zone.

11.8   SURVEY COMMUNICATION AND COORDINATION FOR SIGHTINGS

The Applicant will utilize radios and available software to communicate sightings between all vessels. This will allow all PSOs and vessel crew to maintain awareness of marine mammal observations and adjust activities accordingly. The Applicant will also utilize the Whale Alert application to report all NARW detections and monitor for DMAs. Whale Alert will be checked at least once every 4 hours by the PSOs on the vessel while underway.

12.0   Arctic Plan of Cooperation

This requirement is applicable only for activities that occur in Alaskan waters north of 60° N latitude. The proposed survey activities will not take place within the designated region and, therefore, will not have an adverse effect on the availability of marine mammals for subsistence uses. As such, there is no need to form such a plan.

13.0   Monitoring and Reporting

As required in the conditions of Lease OCS-A 0532, the Applicant will comply with the marine mammal reporting requirements for site characterization activities detailed below.

Reporting Injured or Dead Species. The Applicant will ensure that sightings of any injured or dead marine mammals are reported to the Greater Atlantic (Northeast) Region Marine Mammal and Sea Turtle Stranding & Entanglement Hotline (866-755-NOAA [6622]) within 24 hours of a sighting, regardless of whether the injury or death is caused by a vessel. In addition, if the injury or death was caused by a collision with a Project-related vessel, the Applicant will ensure that BOEM is notified of the strike within 24 hours. The notification of such a strike will include the date and location (latitude/longitude) of the strike, the name of the vessel involved, and the species identification or a description of the animal, if possible. If the Project activity is responsible for the injury or death, the Applicant will supply a vessel to assist in any salvage effort as requested by NMFS.

Reporting of Observed Impacts to Species. The observers will report any observations concerning impacts on marine mammals to BOEM and NMFS within 48 hours. Any observed takes of listed marine mammals resulting in injury or mortality must be reported within 24 hours to BOEM and NMFS.

Final Report. The Applicant will provide BOEM and NMFS with a report within 90 calendar days following the completion of survey activities, including a summary of the survey activities and an estimate of the number of marine mammals taken during these survey activities. Data on all marine mammal observations will be recorded and based on standards of observer collection data by the PSOs. This information will include dates, times, and locations of survey operations; time of observation, location, and weather; details of marine mammal sightings (e.g., species, numbers, behavior); and details of any observed taking (e.g., behavioral disturbances, injury/mortality).

14.0   Suggested Means of Coordinated Research

This section addresses the IHA requirement to suggest means of learning, encouraging, and coordinating research opportunities, plans, and activities related to reducing incidental take and evaluating its effects.

While no direct research on marine mammals or marine mammal stocks is expected from the Project, there is the opportunity for the proposed activity to contribute greatly to the noise characterization in the region and to specific sound source measurements.

Data acquired during the mitigation and monitoring may provide valuable information to direct or refine future research on marine mammal species present in the area. Sightings data (e.g., date, time, weather conditions, species identification, approximate sighting distance, direction, heading in relation to sound sources, behavioral observations) may be useful in designing the location and scope of future marine mammal survey and monitoring programs.

The applicant will immediately share all NARW sightings with NOAA.

All marine mammal data collected by the Applicant during marine characterization survey activities will be provided to NMFS and BOEM through the reporting processes. In addition, the data may be made available to educational institutions and environmental groups upon request.

CSA Ocean Sciences Inc.

- Mary Jo Barkaszi, Marine Mammal Programs Manager
- Kayla Hartigan, Project Scientist

Orsted

- Carl Poole: Ocean Wind II Permit Manager
- Kirsten Holland Nantz: Senior Environmental & Permitting Specialist
- Clayton Starr: Environmental & Permitting Specialist
- Sharon Whitesell: Senior Biologist

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