

Memo

Atlantic Shores Offshore Wind—Marine Mammal Exposure and Take Estimate Update

DATE: 10 February 2023
FROM: JASCO Applied Sciences (USA) Inc.
TO: Atlantic Shores Offshore Wind, LLC
VERSION: 2.0

This memo contains updated marine mammal exposure and take estimates provided in support of *Atlantic Shores Offshore Wind Application for Marine Mammal Protection Act (MMPA) Rulemaking and Letter of Authorization* (hereafter, the Application), which was deemed Adequate and Complete by NMFS on August 25, 2022. This update to the estimates provided in the Application uses the 2022 Duke University Marine Geospatial Ecology Laboratory (MGEL) Habitat-based Marine Mammal Density Models for the US Atlantic (Roberts et al. 2016, 2022), which were recently updated for all species, as well as the latest stock abundance estimate for the North Atlantic right whale from the 2022 draft stock assessment reports (SARs) (NOAA Fisheries 2023). All other stock sizes remain unchanged in the 2022 draft SARs.

Updates included in this memo:

- Roberts et al. (2022) marine mammal density updates (see Section 1) for:
 - Impact pile driving,
 - Vibratory pile driving for cofferdam installation and removal, and
 - HRG surveys.
- Updated exposures (see Section 2) for the following sound-producing activities:
 - Impact pile driving for 1) the Full Buildout of the Project, 2) Project 1 plus the overlap, and 3) Project 2 plus the overlap;
 - Vibratory pile driving for cofferdam installation and removal; and
 - HRG surveys.
- Updated take estimates (see Section 3) for the following sound-producing activities:
 - Impact pile driving for 1) the Full Buildout of the Project, 2) Project 1 plus the overlap, and 3) Project 2 plus the overlap;
 - Vibratory pile driving for cofferdam installation and removal; and
 - HRG surveys for 1) the Full Buildout of the Project, 2) Project 1 plus the overlap, and 3) for Project 2 plus the overlap.

- Updated take request (see Section 4) for all activities combined, assuming Construction Schedule 2, for:
 - The full project buildout,
 - Project 1, and
 - Project 2.
- Alternate take estimates (see Section 5) calculated using two proposed alternate construction schedules:
 - Schedule 1 and
 - Schedule 3.
- Supplemental figures (see Section 6) showing:
 - Monthly density differences for the North Atlantic right whale resulting from updating from the Roberts et al. (2021a, 2021b) right whale model (version 11) to the Roberts et al. (2022) right whale model.
 - How the zone of Influence diverged for coastal and offshore bottlenose dolphins to calculate densities and estimate take resulting from cofferdam installation/removal at the Monmouth site (see next paragraph).

Changes to methodology:

- When calculating exposures and takes for bottlenose dolphins for cofferdam installation/removal in the Application, it was assumed that the offshore stock would not be present in the near-shore waters where cofferdam activities would occur, so exposures and takes for this stock were assumed to be zero. This is true for the Atlantic cofferdam site where depth within the zone of influence (ZOI) does not exceed 20 m. However, the ZOI at the Monmouth site extends into waters >20 m deep. Therefore, for this memo, the area used to calculate bottlenose dolphin density as well as the ZOI were split at the 20 m isobath for the Monmouth site (see Supplemental Figure 3). The areas <20 m deep and >20 m deep were used to calculate exposures and takes for the coastal and offshore stocks of these species, respectively, at the Monmouth site. For the Atlantic cofferdam site, only the coastal stock of bottlenose dolphins is likely to occur so the total area and total density were used, which is unchanged from the Application.
- The time required for cofferdam installation/removal at the Atlantic site was reduced from 16 days (8 for installation and 8 for removal) to 12 days (6 for installation and 6 for removal) to reduce some of the conservatism that was used in the Application. Cofferdam installation at the Atlantic site is expected to require less time than at the Monmouth site because of the shallower water depths off Atlantic City.
- For the Project 1 and Project 2 breakdown, as a conservative measure, the estimated takes for cofferdam installation/removal at the Monmouth landfall site were used for both projects because these were higher for most species. For Project 1, it was assumed these takes would occur in year 1 (expected to be 2025) and for Project 2 it was assumed these takes would occur in year 2 (expected to be 2026). After the Roberts et al. (2022) density update was applied, take estimates for the Monmouth site were no longer conservative for coastal bottlenose dolphins because the estimated density for this species increased substantially near the Atlantic site. Therefore, takes for cofferdam installation/removal from the Atlantic Site were used for Project 1 in year 1 and estimated takes from the Monmouth site were used for Project 2 in year 2 to be more reflective of actual construction activities.

- When calculating exposures and takes from HRG surveys for pilot whales and seals, the densities provided by Roberts et al. (2016, 2022) were scaled by the relative abundances of the two species in each guild to get species-specific density estimates.
- All other methodology remains the same as in the Application.

The tables provided in this memo are intended as replacement tables for those in the Application where data have been updated. All other tables in the application remain unchanged and thus are not included here. For ease of comparison, the tables and figures provided below use the same numbering as in the Application. For all details on the modeling and take calculation methodology, please refer to the Application.

Additional analyses:

After submission of the Application, the Proponent conducted an analysis of underwater sound transmission of aircraft used during construction of the Project (see Volume II of the COP Section 4.7.2 and Appendix II-L). Underwater sound transmission of aircraft is highly variable, and the majority of aircraft sound is reflected off the surface of the water. While research on the marine mammal behavioral responses to aircraft is limited, existing research suggests that the impact of aircraft sound on the behavioral responses of marine mammals is low. Therefore, although temporary behavioral response to aircraft at low altitudes may be exhibited by some species of cetaceans, due to the intermittent nature of aircraft use and the limited propagation of the sound source in the water column, the risk of aircraft impact to marine mammals is expected to be negligible, and therefore is not included herein.

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1. Density Estimates

The 2022 MGEL models (Roberts et al. 2016, 2022) provide monthly marine mammal density estimates (animals per 100 square kilometers [animals/100 km²]) for all 5 × 5 km grid cells within the US Atlantic Exclusive Economic Zone. This is an increase in resolution from the former models, which used 10 × 10 km grid cells for all species except the North Atlantic right whale (NARW), with an unchanged 5 × 5 km spatial resolution for this species. The 2022 updated NARW model (v12) provides model predictions for three eras, 2003–2019, 2003–2009, and 2010–2019, to reflect the apparent shift in NARW distribution around 2010. The modeling reported herein used the 2010–2019 density predictions as recommended by Roberts et al. (2022). Similarly, the 2022 updated humpback whale model (v11) provides model predictions for three eras, 2002–2019, 2002–2008, and 2009–2019. The modeling reported herein used the 2009–2019 density predictions as recommended by Roberts et al. (2022). Details on how density is calculated can be found in the Application.

1.1. Densities Used for Impact Pile Driving Analysis

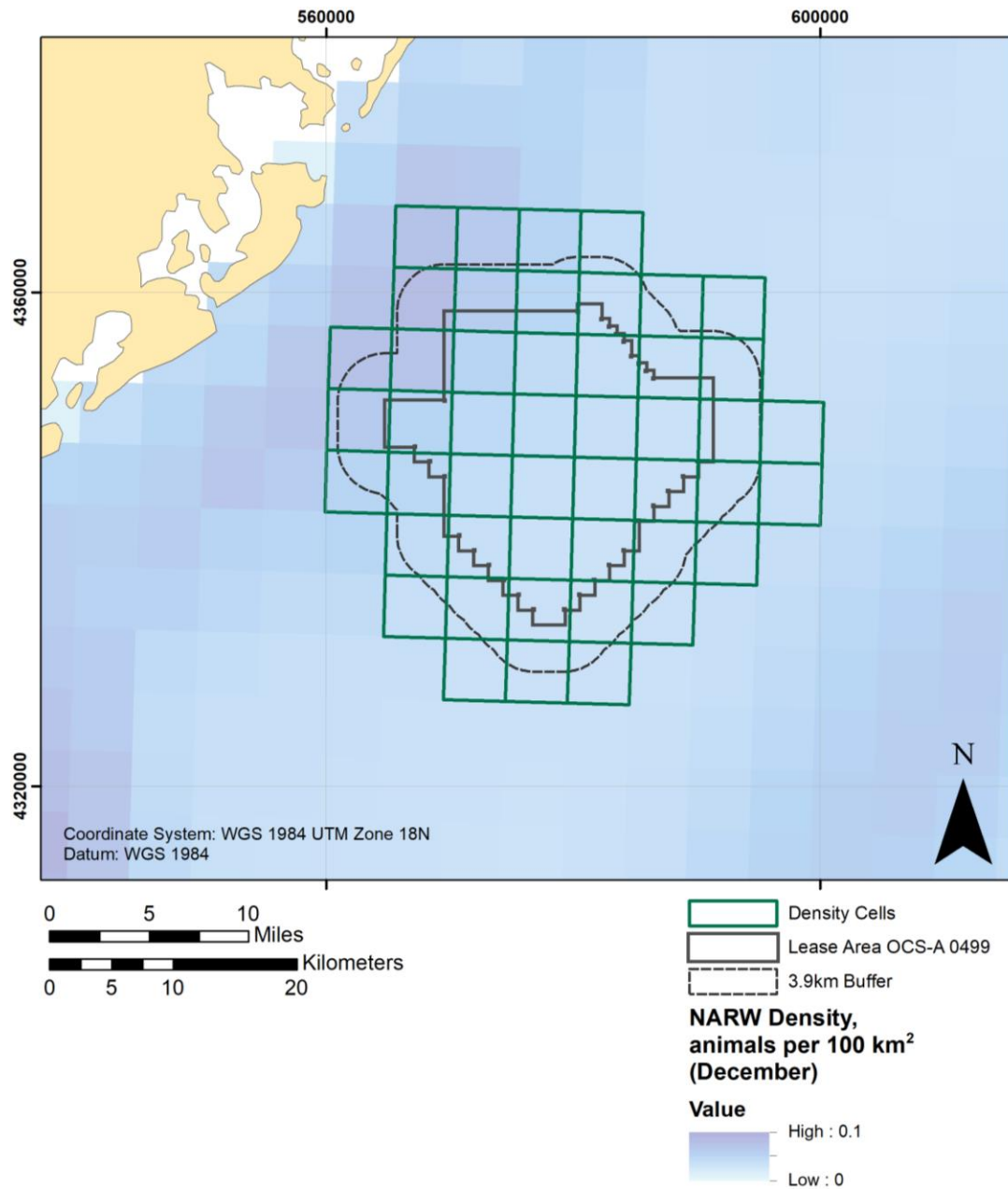


Figure 12. Marine mammal (e.g., NARW) density map showing highlighted grid cells used to calculate mean monthly species estimates within a 3.9 km buffer around the OCS-A 0499 lease area (Roberts et al. 2016, 2022).

Table 12. Mean monthly marine mammal density estimates for all modeled species within a 3.9 km buffer around the Atlantic Shores OCS-A 0499 Lease Area.

Species		Monthly density (animals/100 km ²) ^a												Annual mean	May to Dec mean
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
LF	Fin whale ^b	0.178	0.123	0.098	0.099	0.088	0.075	0.047	0.028	0.029	0.031	0.038	0.141	0.081	0.060
	Minke whale	0.051	0.049	0.049	0.737	0.810	0.202	0.054	0.026	0.015	0.066	0.016	0.042	0.176	0.154
	Humpback whale	0.093	0.065	0.084	0.101	0.091	0.058	0.011	0.006	0.020	0.065	0.086	0.121	0.067	0.057
	North Atlantic right whale ^b	0.069	0.074	0.062	0.046	0.010	0.003	0.001	0.001	0.002	0.004	0.010	0.042	0.027	0.009
	Sei whale ^b	0.026	0.016	0.034	0.074	0.027	0.006	0.001	0.001	0.002	0.008	0.026	0.042	0.022	0.014
MF	Atlantic spotted dolphin	0.001	0.000	0.001	0.003	0.006	0.012	0.028	0.133	0.109	0.147	0.113	0.008	0.047	0.070
	Atlantic white-sided dolphin	0.355	0.225	0.221	0.673	0.755	0.605	0.018	0.004	0.059	0.556	0.591	0.601	0.389	0.399
	Common dolphin	2.754	1.139	1.347	2.751	3.431	1.695	0.939	0.507	0.085	1.006	5.315	5.876	2.237	2.357
	Bottlenose dolphin, coastal ^c	2.917	1.024	2.053	8.290	20.869	27.429	29.272	31.415	32.096	29.744	30.414	16.667	19.349	27.238
	Bottlenose dolphin, offshore ^c	1.409	0.489	0.732	2.460	6.311	8.449	9.350	9.485	8.613	8.335	9.468	5.944	5.920	8.244
	Risso's dolphin	0.015	0.002	0.003	0.031	0.029	0.008	0.006	0.006	0.006	0.013	0.074	0.115	0.026	0.032
	Long-finned pilot whale ^d	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
	Short-finned pilot whale ^d	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
Sperm whale ^b	0.004	0.002	0.001	0.007	0.010	0.005	0.003	0.000	0.000	0.000	0.003	0.004	0.003	0.003	
HF	Harbor porpoise	3.968	3.756	3.091	4.161	1.025	0.033	0.023	0.016	0.003	0.007	0.029	2.891	1.584	0.503
PPW	Gray seal ^e	4.881	3.521	2.352	2.866	4.508	0.492	0.080	0.054	0.120	0.639	1.731	4.588	2.153	1.527
	Harbor seal ^e	10.967	7.911	5.285	6.439	10.127	1.106	0.180	0.122	0.271	1.437	3.889	10.308	4.837	3.430

^a Density estimates are from habitat-based density modeling of the entire Atlantic Exclusive Economic Zone (EEZ) (Roberts et al. 2016, 2022).

^b Listed as Endangered under the ESA.

^c For bottlenose dolphins, the 3.9 km buffer was split at the 20 m isobath: coastal, <20 m; offshore >20 m.

^d Long- and short-finned pilot whale densities are the annual pilot whale guild density scaled by their relative abundances.

^e Gray and harbor seal densities are the Roberts et al. (2016, 2022) seals guild density scaled by their relative abundances.

1.2. Densities Used for Vibratory Pile Driving for Cofferdam Installation and Removal

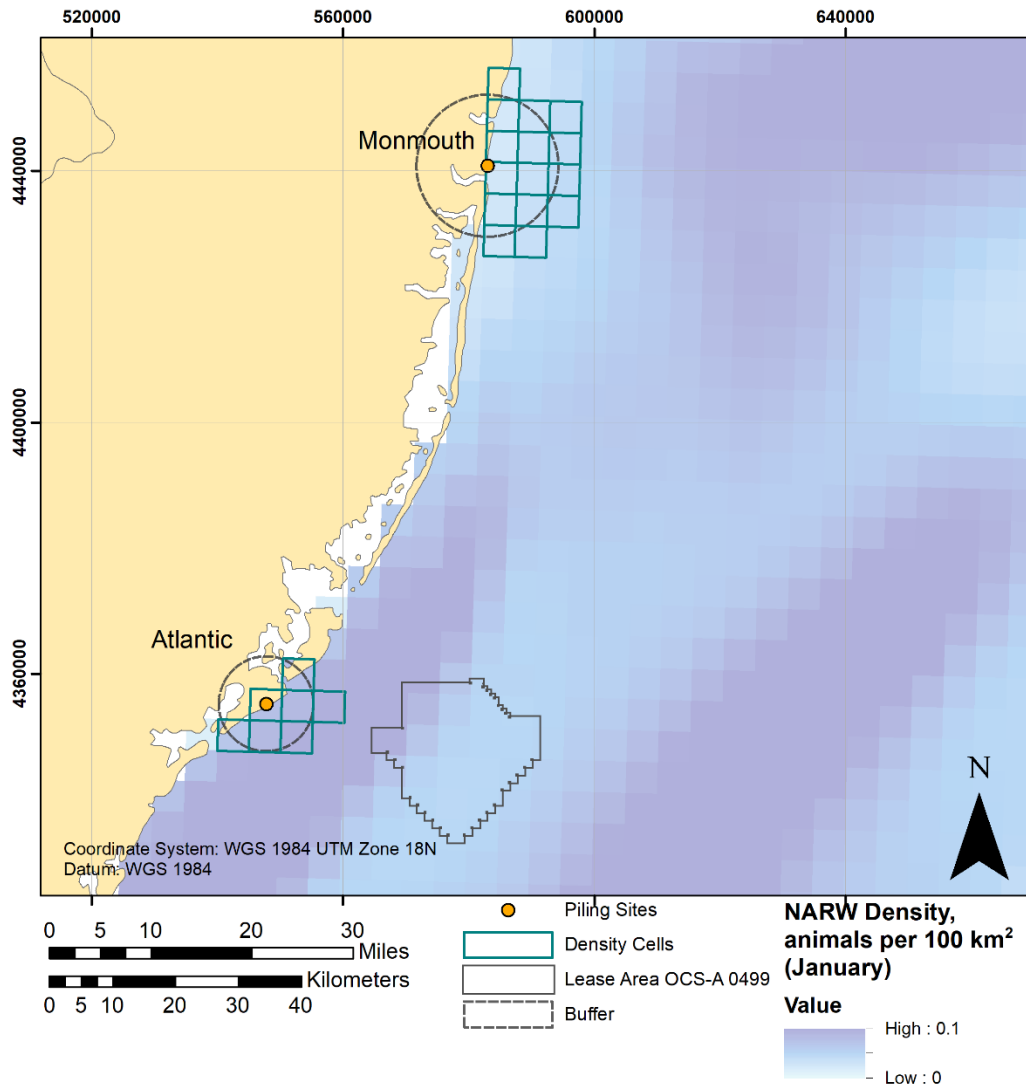


Figure 13. Marine mammal (e.g., NARW) density map showing highlighted grid cells used to calculate maximum seasonal species densities at each vibratory piling location (Roberts et al. 2016, 2022).

Table 13. Maximum annual density^a (animals per 100 km²), estimated from September to May, at each of the two vibratory piling sites.

Species		Monmouth	Atlantic
LF	Fin whale ^b	0.117	0.052
	Minke whale	0.526	0.136
	Humpback whale	0.132	0.114
	North Atlantic right whale ^b	0.035	0.092
	Sei whale ^b	0.046	0.018
MF	Atlantic spotted dolphin	0.033	0.014
	Atlantic white-sided dolphin	0.206	0.051
	Common dolphin	2.058	0.524
	Bottlenose dolphin, coastal ^c	27.795	146.614
	Bottlenose dolphin, offshore ^c	22.530	0.000
	Risso's dolphin	0.020	0.002
	Long-finned pilot whale ^d	0.000	0.000
	Short-finned pilot whale ^d	0.000	0.000
Sperm whale ^b	0.008	0.002	
HF	Harbor porpoise	2.768	0.821
PPW	Gray seal ^e	4.477	9.029
	Harbor seal ^e	10.059	20.287

^a Density estimates are from habitat-based density modeling of the entire Atlantic Exclusive Economic Zone (EEZ) (Roberts et al. 2016, 2022).

^b Listed as Endangered under the ESA.

^c For bottlenose dolphins, the impact area was split at the 20 m isobath: coastal, <20 m; offshore >20 m.

^d Long- and short-finned pilot whale densities are the Roberts et al. (2016, 2022) annual pilot whale guild density scaled by species relative abundances.

^e Gray and harbor seal densities are the Roberts et al. (2016, 2022) seal guild density scaled by species relative abundances.

1.3. Densities Used for HRG Survey Analysis

Table 14. Maximum monthly densities^a used to estimate Level B exposures from HRG surveys.

Species		Maximum monthly density ^a (animals/100 km ²)
LF	Fin whale ^b	0.114
	Minke whale	0.401
	Humpback whale	0.090
	North Atlantic right whale ^b	0.056
	Sei whale ^b	0.031
MF	Atlantic spotted dolphin	0.033
	Atlantic white-sided dolphin	0.278
	Common dolphin	1.473
	Bottlenose dolphin (coastal and offshore) ^c	36.269
	Risso's dolphin	0.017
	Pilot whale, long-finned ^d	0.004
	Pilot whale, short-finned ^d	0.003
Sperm whale ^b	0.005	
HF	Harbor porpoise	2.506
PPW	Gray seal ^e	4.319
	Harbor seal ^e	9.704

^a Density is from Roberts et al. (2016, 2022) calculated for the entire HRG survey area.

^b Listed as Endangered under the ESA.

^c Bottlenose dolphin density is for the species as a whole, not delineated by stocks.

^d The density estimate provided by Roberts et al. (2016, 2022) for the pilot whale guild was scaled by the relative abundance of the two species.

^e The density estimate provided by Roberts et al. (2016, 2022) for the seals guild was scaled by the relative abundance of the two species.

2. Exposure Estimates

2.1. Exposure Estimates – Impact Pile Driving

2.1.1. Full Buildout

Table 24. Construction Schedule 2, Year 1 – Full Buildout: The mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 2 assumes all WTGs and the met tower are installed on jacket foundations each with four 5-m pin piles and OSSs are installed on jacket foundations each with twenty-four 5-m pin piles.

Species	Injury									Behavior							
	L_E				L_{pk}					L_p^a				L_p^b			
	Attenuation (dB) ^c									Attenuation (dB) ^c							
	0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15	
LF	Fin whale ^d	13.07	7.41	4.39	1.91	0.02	0.01	0	0	19.64	14.09	11.76	8.16	17.33	11.48	8.79	6.04
	Minke whale	145.96	58.88	21.69	3.91	0.12	<0.01	0	0	329.48	236.71	192.68	128.80	235.99	165.34	133.96	94.99
	Humpback whale	15.40	7.69	3.93	1.39	0.02	<0.01	0	0	24.96	16.57	12.88	8.21	19.60	13.02	10.14	6.87
	North Atlantic right whale ^d (migrating)	1.73	0.71	0.35	0.08	<0.01	0	0	0	3.67	2.39	1.88	1.11	8.31	6.24	5.16	3.88
	Sei whale ^d	1.70	0.96	0.57	0.24	<0.01	<0.01	0	0	2.55	1.83	1.53	1.05	2.25	1.49	1.14	0.78
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.20	0.10	0.01	0	0	0	0	0	394.17	270.77	223.80	146.87	218.83	152.51	110.35	68.49
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	25.76	11.09	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	1200.96	107.34	0	0	947.94	485.74	302.03	137.70
	Bottlenose dolphin, offshore	8.59	0	0	0	0	0	0	0	7795.37	5250.10	4143.37	2480.34	4280.61	2895.09	2054.19	1269.46
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	14.14	9.88	8.25	5.66	8.18	5.72	4.22	2.69
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	77.25	42.75	23.78	5.94	7.91	2.45	0.61	0.22	133.01	92.07	74.94	50.11	470.05	369.06	308.70	242.36
PPW	Gray seal	51.60	14.93	2.86	0.02	0.23	0	0	0	281.70	173.65	139.09	89.04	205.05	130.00	100.64	60.72
	Harbor seal	124.06	35.26	10.19	1.00	0.98	0.02	0	0	654.54	412.67	314.63	197.81	471.81	302.25	229.98	142.88

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table 25. Construction Schedule 2, Year 2 – Full Buildout: The mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 2 assumes all WTGs and the met tower are installed on jacket foundations each with four 5-m pin piles and OSSs are installed on jacket foundations each with twenty-four 5-m pin piles.

Species	Injury								Behavior								
	L_E				L_{pk}				L_p^a				L_p^b				
	Attenuation (dB) ^c								Attenuation (dB) ^c								
	0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15	
LF	Fin whale ^d	10.24	5.82	3.46	1.51	0.02	<0.01	0	0	15.38	11.03	9.20	6.41	13.57	9.00	6.88	4.74
	Minke whale	107.83	43.81	16.27	2.97	0.10	<0.01	0	0	242.38	174.21	141.72	95.10	173.67	121.73	98.53	70.02
	Humpback whale	11.77	5.89	3.02	1.08	0.02	<0.01	0	0	19.04	12.65	9.82	6.28	14.95	9.93	7.73	5.25
	North Atlantic right whale ^d (migrating)	1.21	0.50	0.24	0.05	<0.01	0	0	0	2.56	1.66	1.31	0.77	5.78	4.34	3.59	2.70
	Sei whale ^d	1.21	0.69	0.41	0.18	<0.01	<0.01	0	0	1.82	1.31	1.09	0.76	1.61	1.07	0.82	0.56
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.15	0.08	0.01	0	0	0	0	0	302.06	207.64	171.37	112.91	167.81	116.91	84.74	52.64
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	19.52	8.41	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	993.20	97.45	0	0	786.04	400.97	250.17	114.08
	Bottlenose dolphin, offshore	7.24	0	0	0	0	0	0	0	6428.45	4331.19	3416.59	2050.28	3530.66	2388.91	1696.19	1049.49
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	10.35	7.24	6.03	4.15	5.99	4.19	3.09	1.97
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	40.51	22.44	12.52	3.17	4.16	1.30	0.33	0.12	69.67	48.24	39.23	26.30	246.01	193.18	161.62	126.90
PPW	Gray seal	35.15	10.26	2.00	0.02	0.16	0	0	0	191.33	117.98	94.34	60.59	139.23	88.26	68.34	41.30
	Harbor seal	84.58	24.21	7.03	0.68	0.66	0.02	0	0	444.49	280.32	213.40	134.64	320.39	205.22	156.16	97.11

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table 26. Construction Schedule 2, Years 1 and 2 combined – Full Buildout: The mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 2 assumes all WTGs and the met tower are installed on jacket foundations each with four 5-m pin piles and OSSs are installed on jacket foundations each with twenty-four 5-m pin piles.

Species	Injury									Behavior							
	L_E				L_{pk}					L_p^a				L_p^b			
	Attenuation (dB) ^c									Attenuation (dB) ^c							
	0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15	
LF	Fin whale ^d	23.30	13.23	7.85	3.43	0.04	0.02	0	0	35.02	25.12	20.96	14.57	30.90	20.48	15.67	10.78
	Minke whale	253.79	102.69	37.97	6.88	0.22	<0.01	0	0	571.86	410.92	334.40	223.91	409.66	287.07	232.49	165.01
	Humpback whale	27.17	13.58	6.95	2.47	0.04	<0.01	0	0	44.00	29.22	22.70	14.50	34.54	22.95	17.87	12.13
	North Atlantic right whale ^d (migrating)	2.94	1.20	0.59	0.13	<0.01	0	0	0	6.23	4.05	3.18	1.88	14.08	10.58	8.76	6.58
	Sei whale ^d	2.91	1.64	0.97	0.42	<0.01	<0.01	0	0	4.37	3.14	2.62	1.81	3.86	2.55	1.96	1.34
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.35	0.18	0.02	0	0	0	0	0	696.23	478.41	395.17	259.78	386.63	269.42	195.09	121.13
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	45.28	19.50	1.35	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	2194.15	204.79	0	0	1733.98	886.71	552.19	251.78
	Bottlenose dolphin, offshore	15.83	0	0	0	0	0	0	0	14223.82	9581.29	7559.96	4530.62	7811.27	5284.00	3750.38	2318.95
	Risso's dolphin	0.02	<0.01	<0.01	0	0.01	0	0	0	24.48	17.12	14.28	9.81	14.18	9.91	7.30	4.66
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	117.76	65.19	36.30	9.11	12.07	3.75	0.94	0.34	202.68	140.31	114.17	76.41	716.06	562.24	470.32	369.25
PPW	Gray seal	86.76	25.19	4.87	0.04	0.39	0	0	0	473.02	291.63	233.43	149.63	344.28	218.26	168.98	102.02
	Harbor seal	208.64	59.47	17.21	1.68	1.64	0.04	0	0	1099.03	692.99	528.03	332.45	792.20	507.47	386.13	239.99

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

2.1.2. Project 1 Plus Overlap

Table 27. Construction Schedule 2, Year 1 – Project 1 plus Overlap: The mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 2 assumes all WTGs and the met tower are installed on jacket foundations each with four 5-m pin piles and OSSs are installed on jacket foundations each with twenty-four 5-m pin piles.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	13.07	7.41	4.39	1.91	0.02	0.01	0	0	19.64	14.09	11.76	8.16	17.33	11.48	8.79	6.04
	Minke whale	145.96	58.88	21.69	3.91	0.12	<0.01	0	0	329.48	236.71	192.68	128.80	235.99	165.34	133.96	94.99
	Humpback whale	15.40	7.69	3.93	1.39	0.02	<0.01	0	0	24.96	16.57	12.88	8.21	19.60	13.02	10.14	6.87
	North Atlantic right whale ^d (migrating)	1.73	0.71	0.35	0.08	<0.01	0	0	0	3.67	2.39	1.88	1.11	8.31	6.24	5.16	3.88
	Sei whale ^d	1.70	0.96	0.57	0.24	<0.01	<0.01	0	0	2.55	1.83	1.53	1.05	2.25	1.49	1.14	0.78
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.20	0.10	0.01	0	0	0	0	0	394.17	270.77	223.80	146.87	218.83	152.51	110.35	68.49
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	25.76	11.09	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	1200.96	107.34	0	0	947.94	485.74	302.03	137.70
	Bottlenose dolphin, offshore	8.59	0	0	0	0	0	0	0	7795.37	5250.10	4143.37	2480.34	4280.61	2895.09	2054.19	1269.46
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	14.14	9.88	8.25	5.66	8.18	5.72	4.22	2.69
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	77.25	42.75	23.78	5.94	7.91	2.45	0.61	0.22	133.01	92.07	74.94	50.11	470.05	369.06	308.70	242.36
PPW	Gray seal	51.60	14.93	2.86	0.02	0.23	0	0	0	281.70	173.65	139.09	89.04	205.05	130.00	100.64	60.72
	Harbor seal	124.06	35.26	10.19	1.00	0.98	0.02	0	0	654.54	412.67	314.63	197.81	471.81	302.25	229.98	142.88

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

2.1.3. Project 2 Plus Overlap

Table 28. Construction Schedule 2, Year 1 – Project 2 plus Overlap: The mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 2 assumes all WTGs and the met tower are installed on jacket foundations each with four 5-m pin piles and OSSs are installed on jacket foundations each with twenty-four 5-m pin piles.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	0.72	0.41	0.24	0.10	<0.01	<0.01	0	0	1.09	0.78	0.65	0.45	0.96	0.63	0.49	0.33
	Minke whale	1.16	0.46	0.16	0.03	<0.01	0	0	0	2.65	1.90	1.55	1.03	1.90	1.33	1.08	0.76
	Humpback whale	1.81	0.90	0.46	0.16	<0.01	0	0	0	2.95	1.96	1.53	0.96	2.32	1.54	1.20	0.81
	North Atlantic right whale ^d (migrating)	0.40	0.16	0.08	0.02	<0.01	0	0	0	0.85	0.55	0.43	0.25	1.92	1.44	1.19	0.90
	Sei whale ^d	0.38	0.21	0.13	0.05	<0.01	<0.01	0	0	0.57	0.41	0.34	0.23	0.50	0.33	0.26	0.17
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	<0.01	0	0	0	0	0	0	38.62	26.47	21.98	14.24	21.39	14.92	10.74	6.64
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	5.26	2.26	0	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	54.59	2.60	0	0	42.54	22.27	13.63	6.20
	Bottlenose dolphin, offshore	0.37	0	0	0	0	0	0	0	378.78	254.63	201.39	119.17	207.81	140.27	99.20	60.95
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	4.47	3.12	2.61	1.78	2.58	1.81	1.33	0.85
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
HF	Harbor porpoise (sensitive)	17.64	9.75	5.40	1.33	1.80	0.55	0.14	0.05	30.41	21.04	17.14	11.43	107.56	84.43	70.61	55.43
PPW	Gray seal	8.66	2.46	0.45	0	0.04	0	0	0	47.57	29.31	23.56	14.98	34.65	21.97	17.00	10.23
	Harbor seal	20.78	5.82	1.66	0.17	0.17	0	0	0	110.57	69.67	53.29	33.26	79.71	51.08	38.86	24.09

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table 29. Construction Schedule 2, Year 2 – Project 2 plus Overlap: The mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 2 assumes all WTGs and the met tower are installed on jacket foundations each with four 5-m pin piles and OSSs are installed on jacket foundations each with twenty-four 5-m pin piles.

Species	Injury								Behavior								
	L_E				L_{pk}				L_p^a				L_p^b				
	Attenuation (dB) ^c								Attenuation (dB) ^c								
	0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15	
LF	Fin whale ^d	10.24	5.82	3.46	1.51	0.02	<0.01	0	0	15.38	11.03	9.20	6.41	13.57	9.00	6.88	4.74
	Minke whale	107.83	43.81	16.27	2.97	0.10	<0.01	0	0	242.38	174.21	141.72	95.10	173.67	121.73	98.53	70.02
	Humpback whale	11.77	5.89	3.02	1.08	0.02	<0.01	0	0	19.04	12.65	9.82	6.28	14.95	9.93	7.73	5.25
	North Atlantic right whale ^d (migrating)	1.21	0.50	0.24	0.05	<0.01	0	0	0	2.56	1.66	1.31	0.77	5.78	4.34	3.59	2.70
	Sei whale ^d	1.21	0.69	0.41	0.18	<0.01	<0.01	0	0	1.82	1.31	1.09	0.76	1.61	1.07	0.82	0.56
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.15	0.08	0.01	0	0	0	0	0	302.06	207.64	171.37	112.91	167.81	116.91	84.74	52.64
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	19.52	8.41	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	993.20	97.45	0	0	786.04	400.97	250.17	114.08
	Bottlenose dolphin, offshore	7.24	0	0	0	0	0	0	0	6428.45	4331.19	3416.59	2050.28	3530.66	2388.91	1696.19	1049.49
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	10.35	7.24	6.03	4.15	5.99	4.19	3.09	1.97
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	40.51	22.44	12.52	3.17	4.16	1.30	0.33	0.12	69.67	48.24	39.23	26.30	246.01	193.18	161.62	126.90
PPW	Gray seal	35.15	10.26	2.00	0.02	0.16	0	0	0	191.33	117.98	94.34	60.59	139.23	88.26	68.34	41.30
	Harbor seal	84.58	24.21	7.03	0.68	0.66	0.02	0	0	444.49	280.32	213.40	134.64	320.39	205.22	156.16	97.11

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table 30. Construction Schedule 2, Years 1 and 2 combined – Project 2 plus Overlap: The mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 2 assumes all WTGs and the met tower are installed on jacket foundations each with four 5-m pin piles and OSSs are installed on jacket foundations each with twenty-four 5-m pin piles.

Species	Injury								Behavior								
	L_E				L_{pk}				L_p^a				L_p^b				
	Attenuation (dB) ^c								Attenuation (dB) ^c								
	0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15	
LF	Fin whale ^d	10.96	6.23	3.70	1.62	0.02	<0.01	0	0	16.47	11.82	9.86	6.86	14.53	9.63	7.37	5.07
	Minke whale	108.99	44.27	16.44	3.00	0.10	<0.01	0	0	245.03	176.11	143.27	96.13	175.57	123.05	99.60	70.78
	Humpback whale	13.58	6.79	3.47	1.23	0.02	<0.01	0	0	21.99	14.60	11.35	7.25	17.27	11.47	8.93	6.06
	North Atlantic right whale ^d (migrating)	1.60	0.66	0.32	0.07	<0.01	0	0	0	3.41	2.21	1.74	1.03	7.70	5.78	4.79	3.60
	Sei whale ^d	1.59	0.90	0.53	0.23	<0.01	<0.01	0	0	2.39	1.72	1.44	0.99	2.11	1.40	1.07	0.73
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.17	0.09	0.01	0	0	0	0	0	340.68	234.11	193.35	127.15	189.20	131.84	95.48	59.29
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	24.78	10.66	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	1047.78	100.05	0	0	828.58	423.24	263.79	120.29
	Bottlenose dolphin, offshore	7.61	0	0	0	0	0	0	0	6807.23	4585.82	3617.98	2169.45	3738.47	2529.17	1795.39	1110.44
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	14.81	10.36	8.64	5.93	8.58	6.00	4.42	2.82
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	58.15	32.19	17.93	4.50	5.96	1.85	0.47	0.17	100.08	69.28	56.37	37.73	353.56	277.62	232.23	182.33
PPW	Gray seal	43.81	12.72	2.46	0.02	0.20	0	0	0	238.90	147.29	117.90	75.57	173.88	110.23	85.34	51.52
	Harbor seal	105.36	30.03	8.69	0.85	0.83	0.02	0	0	555.06	349.99	266.69	167.89	400.10	256.30	195.02	121.20

^a NOAA (2005).

^b Wood et al. (2012).

^c Listed as Endangered under the ESA.

^d Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

2.2. Exposure Estimates – Vibratory Pile Driving for Cofferdam Installation and Removal

Table 31. Vibratory pile driving for cofferdam installation and removal, injury: maximum estimated exposures above the injury acoustic criteria from cofferdam installation and removal during Years 1 and 2. The vibratory sheet pile driving activities are expected to occur during a single year at each location.

Species		Year 1 (Atlantic)	Year 2 (Monmouth)	Maximum total exposures
LF	Fin whale ^a	<0.01	<0.01	<0.01
	Minke whale	<0.01	<0.01	<0.01
	Humpback whale	<0.01	<0.01	<0.01
	North Atlantic right whale ^a	<0.01	<0.01	<0.01
	Sei whale ^a	<0.01	<0.01	<0.01
MF	Atlantic spotted dolphin	0	0	0
	Atlantic white-sided dolphin	0	0	0
	Common dolphin	0	0	0
	Bottlenose dolphin, coastal	0	0	0
	Bottlenose dolphin, offshore	0	0	0
	Risso's dolphin	0	0	0
	Pilot whale, long-finned	0	0	0
	Pilot whale, short-finned	0	0	0
Sperm whale ^a	0	0	0	
HF	Harbor porpoise	0.09	0.28	0.37
PPW	Gray seal	<0.01	<0.01	<0.01
	Harbor seal	<0.01	<0.01	0.01

^a Listed as Endangered under the ESA.

Table 32. Vibratory pile driving for cofferdam installation and removal, behavior: maximum estimated exposures above the behavioral acoustic criterion from cofferdam installation and removal during Years 1 and 2. The vibratory sheet pile driving activities are expected to occur during a single year at each location.

Species		Year 1 (Atlantic)	Year 2 (Monmouth)	Maximum total exposures
LF	Fin whale ^a	0.65	4.14	4.79
	Minke whale	1.70	18.66	20.36
	Humpback whale	1.43	4.70	6.13
	North Atlantic right whale ^a	1.15	1.23	2.38
	Sei whale ^a	0.23	1.62	1.85
MF	Atlantic spotted dolphin	0.17	1.16	1.33
	Atlantic white-sided dolphin	0.63	7.31	7.94
	Common dolphin	6.56	73.01	79.58
	Bottlenose dolphin, coastal	1835.52	607.13	2442.65
	Bottlenose dolphin, offshore	0.00	307.29	307.29
	Risso's dolphin	0.02	0.70	0.72
	Pilot whale, long-finned	0.00	<0.01	0.01
	Pilot whale, short-finned	0.00	<0.01	<0.01
Sperm whale ^a	0.02	0.28	0.30	
HF	Harbor porpoise	10.28	98.23	108.51
PPW	Gray seal	113.04	158.86	271.91
	Harbor seal	253.98	356.92	610.90

^a Listed as Endangered under the ESA.

2.3. Exposure Estimates – HRG Surveys

Table 33. Maximum yearly and maximum total estimated exposures above the behavioral acoustic criterion from HRG surveys.

Species		Maximum yearly exposures	Maximum total exposures for all 5 years of surveys
LF	Fin whale ^a	2	10
	Minke whale	4	20
	Humpback whale	1	5
	North Atlantic right whale ^a	1	5
	Sei whale ^a	1	5
MF	Atlantic spotted dolphin	1	5
	Atlantic white-sided dolphin	3	15
	Common dolphin	14	70
	Bottlenose dolphin, coastal ^b	113	565
	Bottlenose dolphin, offshore ^b	225	1125
	Risso's dolphin	1	5
	Pilot whale, long-finned	1	5
	Pilot whale, short-finned	1	5
Sperm whale ^a	1	5	
HF	Harbor porpoise	24	120
PPW	Gray seal	41	205
	Harbor seal	91	455

^a Listed as Endangered under the ESA.

^b Assumes 33 % of bottlenose dolphins are from the coastal stock because ~33 % of the survey area is in waters ≤ 20 m deep.

3. Take Estimates

3.1. Take Estimates – Impact Pile Driving

3.1.1. Full Buildout

Table 34. Level A and Level B take estimates for impact pile driving – Full Buildout.

Species	Stock size	ITA Request Year 2 ^e			ITA request Year 3			Total			
		Level A	Level B	Max. % ^d	Level A	Level B	Max. %	Level A	Level B	Max. %	
LF	Fin whale ^a	6,802	5	12	0.25	4	10	0.21	8	21	0.43
	Minke whale	21,968	22	193	0.98	17	142	0.72	38	335	1.70
	Humpback whale	1,396	4	13	1.22	4	10	1.00	7	23	2.15
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	4	1.18	0	8	2.37
	Sei whale ^{a,b}	6,292	1	3	0.06	1	3	0.06	1	6	0.11
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	100	0.25	0	200	0.50
	Atlantic white-sided dolphin	93,233	1	224	0.24	1	172	0.19	1	396	0.43
	Common dolphin ^c	172,974	0	193	0.11	0	157	0.09	0	349	0.20
	Bottlenose dolphin, coastal ^b	6,639	0	14	0.21	0	14	0.21	0	28	0.42
	Bottlenose dolphin, offshore	62,851	0	4144	6.59	0	3417	5.44	0	7560	12.03
	Risso's dolphin ^b	35,215	1	30	0.09	1	30	0.09	1	60	0.17
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	20	0.05	0	40	0.10
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	6	0.02	0	12	0.04
Sperm whale ^{a,b}	4,349	0	2	0.05	0	2	0.05	0	4	0.09	
HF	Harbor porpoise	95,543	24	75	0.10	13	40	0.06	37	115	0.16
PPW	Gray seal	27,300	3	140	0.52	2	95	0.36	5	234	0.88
	Harbor seal	61,336	11	315	0.53	8	214	0.36	18	529	0.89

^a Listed as Endangered under the ESA.

^b Level B take estimate rounded up to one average group size for yearly take and to two average group sizes for total take estimates.

^c Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^e Pile driving activities are planned to occur during Year 2 and Year 3 (expected to be 2026 and 2027) of the 5-year period of the ITA request. Thus, ITA request Year 2 and Year 3 in take tables are equivalent to Construction Schedule Year 1 and Year 2 for impact pile driving activities.

3.1.2. Project 1 Plus Overlap

Table 35. Level A and Level B take estimates for impact pile driving – Project 1 plus Overlap.

Species	Stock size	ITA request Year 2 ^e			ITA request Year 3			Total			
		Level A	Level B	Max. % ^d	Level A	Level B	Max. %	Level A	Level B	Max. %	
LF	Fin whale ^a	6,802	5	12	0.25	0	0	0.00	5	12	0.25
	Minke whale	21,968	22	193	0.98	0	0	0.00	22	193	0.98
	Humpback whale	1,396	4	13	1.22	0	0	0.00	4	13	1.22
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	0	0.00	0	4	1.18
	Sei whale ^{a,b}	6,292	1	3	0.06	0	0	0.00	1	3	0.06
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	0	0.00	0	100	0.25
	Atlantic white-sided dolphin	93,233	1	224	0.24	0	0	0.00	1	224	0.24
	Common dolphin ^c	172,974	0	193	0.11	0	0	0.00	0	193	0.11
	Bottlenose dolphin, coastal ^b	6,639	0	14	0.21	0	0	0.00	0	14	0.21
	Bottlenose dolphin, offshore	62,851	0	4144	6.59	0	0	0.00	0	4144	6.59
	Risso's dolphin ^b	35,215	1	30	0.09	0	0	0.00	1	30	0.09
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	0	0.00	0	20	0.05
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	0	0.00	0	6	0.02
	Sperm whale ^{a,b}	4,349	0	2	0.05	0	0	0.00	0	2	0.05
HF	Harbor porpoise	95,543	24	75	0.10	0	0	0.00	24	75	0.10
PPW	Gray seal	27,300	3	140	0.52	0	0	0.00	3	140	0.52
	Harbor seal	61,336	11	315	0.53	0	0	0.00	11	315	0.53

^a Listed as Endangered under the ESA.

^b Take estimate rounded up to one average group size for ITA request Year 2 and total Level B take estimates.

^c Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^e Pile driving activities are planned to occur during Year 2 and Year 3 (expected to be 2026 and 2027) of the 5-year period of the ITA request. Thus, ITA request Year 2 and Year 3 in take tables are equivalent to Construction Schedule Year 1 and Year 2 for impact pile driving activities. Project 1 is expected to be installed completely during ITA request Year 2 (Construction Schedule Year 1), therefore there is no take requested for Project 1 plus Overlap for ITA request Year 3.

3.1.3. Project 2 Plus Overlap

Table 36. Level A and Level B take estimates for impact pile driving – Project 2 plus Overlap.

Species	Stock size	ITA request Year 2 ^e			ITA request Year 3			Total			
		Level A	Level B	Max. % ^d	Level A	Level B	Max. %	Level A	Level B	Max. %	
LF	Fin whale ^{a,b}	6,802	1	2	0.04	4	10	0.21	4	10	0.21
	Minke whale	21,968	1	2	0.01	17	142	0.72	17	144	0.73
	Humpback whale	1,396	1	2	0.21	4	10	1.00	4	12	1.15
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	4	1.18	0	8	2.37
	Sei whale ^{a,b}	6,292	1	3	0.06	1	3	0.06	1	6	0.11
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	100	0.25	0	200	0.50
	Atlantic white-sided dolphin	93,233	0	22	0.02	1	172	0.19	1	194	0.21
	Common dolphin ^c	172,974	0	10	0.01	0	157	0.09	0	166	0.10
	Bottlenose dolphin, coastal ^b	6,639	0	14	0.21	0	14	0.21	0	28	0.42
	Bottlenose dolphin, offshore	62,851	0	202	0.32	0	3417	5.44	0	3618	5.76
	Risso's dolphin ^b	35,215	1	30	0.09	1	30	0.09	1	60	0.17
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	20	0.05	0	40	0.10
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	6	0.02	0	12	0.04
	Sperm whale ^{a,b}	4,349	0	2	0.05	0	2	0.05	0	4	0.09
HF	Harbor porpoise	95,543	6	18	0.03	13	40	0.06	18	57	0.08
PPW	Gray seal	27,300	1	24	0.09	2	95	0.36	3	118	0.44
	Harbor seal	61,336	2	54	0.09	8	214	0.36	9	267	0.45

^a Listed as Endangered under the ESA.

^b Level B take estimates rounded up to one average group size for yearly takes and to two average group sizes for total take estimates. For fin whales Level B take was only rounded up to one group size for Year 2.

^c Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^e Pile driving activities are planned to occur during Year 2 and Year 3 (expected to be 2026 and 2027) of the 5-year period of the ITA request. Thus, ITA request Year 2 and Year 3 in take tables are equivalent to Construction Schedule Year 1 and Year 2 for impact pile driving activities.

3.2. Take Estimates – Vibratory Pile Driving for Cofferdam Installation and Removal

Table 37. Yearly and total Level B take estimates for vibratory pile driving from cofferdam installation and removal.

Species		ITA request Year 1 ^d (Atlantic)	ITA request Year 2 (Monmouth)	Total
LF	Fin whale ^a	2 ^b	5	6 ^b
	Minke whale	2	19	21
	Humpback whale	2	5	7
	North Atlantic right whale ^a	4 ^b	4 ^b	8 ^b
	Sei whale ^a	3 ^b	3 ^b	5 ^b
MF	Atlantic spotted dolphin	100 ^b	100 ^b	200 ^b
	Atlantic white-sided dolphin	22 ^b	22 ^b	43 ^b
	Common dolphin ^c	19	74	93
	Bottlenose dolphin, coastal	1836	608	2444
	Bottlenose dolphin, offshore	0	308	308
	Risso's dolphin	30 ^b	30 ^b	60 ^b
	Long-finned pilot whale	20 ^b	20 ^b	40 ^b
	Short-finned pilot whale	6 ^b	6 ^b	12 ^b
	Sperm whale ^a	2 ^b	2 ^b	4 ^b
HF	Harbor porpoise	11	99	109
PPW	Gray seal	114	159	272
	Harbor seal	254	357	611

^a Listed as Endangered under the ESA.

^b Level B take request increased to one average group size, which is not a whole number so is rounded up to an integer; total is the average group size multiplied by 2 and then rounded up to a whole number.

^c The take estimate for common dolphins for Year 1 is the average daily sighting rate from site characterization surveys multiplied by the number of survey days, which is then rounded up to a whole number. For Year 2 and for the 2 years combined, the estimated exposures were higher than the sighting rate so the exposure estimates were used as a conservative estimate. The exposure estimates provided in the previous section are not whole numbers so they were rounded up to a whole number.

^d Cofferdam installation/removal is planned to occur during ITA request Year 1 and Year 2 (expected to be 2025 and 2026) of the 5-year period of the ITA request.

3.3. Take Estimates – HRG Surveys

3.3.1. Full Buildout

Table 38. Maximum yearly and maximum total Level B takes calculated for HRG surveys.

	Species	Maximum yearly Level B takes	Maximum total Level B takes
LF	Fin whale ^a	2	10
	Minke whale	4	20
	Humpback whale	1	5
	North Atlantic right whale ^a	1	5
	Sei whale ^{a,b}	2	10
MF	Atlantic spotted dolphin ^c	100	500
	Atlantic white-sided dolphin	3	15
	Common dolphin ^d	93	465
	Bottlenose dolphin, coastal	113	565
	Bottlenose dolphin, offshore	225	1125
	Risso's dolphin ^c	30	150
	Pilot whale, long-finned ^c	20	100
	Pilot whale, short-finned ^c	6	30
	Sperm whale ^a	1	5
HF	Harbor porpoise	24	120
PPW	Gray seal	41	205
	Harbor seal	91	455

^a Listed as Endangered under the ESA.

^b Take estimate for sei whales based on a 2020 sighting of 2 animals during site characterization surveys.

^c Take estimates for these species were rounded up to one group size.

^d Take estimate for common dolphins uses the daily sighting rate from site characterization surveys multiplied by the number of survey days.

3.3.2. Project 1

Table 39. Maximum yearly and maximum total Level B takes for HRG surveys – Project 1.

	Species	Maximum yearly Level B takes	Maximum total Level B takes
LF	Fin whale ^a	1	5
	Minke whale	2	10
	Humpback whale	1	5
	North Atlantic right whale ^a	1	5
	Sei whale ^a	1	5
MF	Atlantic spotted dolphin ^b	1	5
	Atlantic white-sided dolphin	2	10
	Common dolphin ^c	7	35
	Bottlenose dolphin, coastal	57	285
	Bottlenose dolphin, offshore	113	565
	Risso's dolphin ^b	1	5
	Pilot whale, long-finned ^b	1	5
	Pilot whale, short-finned ^b	1	5
	Sperm whale ^a	1	5
HF	Harbor porpoise	12	60
PPW	Gray seal	21	105
	Harbor seal	46	230

^a Listed as Endangered under the ESA.

^b Take estimates for these species were rounded up to one group size before splitting into Project 1 and Project 2.

^c Take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of survey days.

3.3.3. Project 2

Table 40. Maximum yearly and maximum total Level B takes for HRG surveys – Project 2.

	Species	Maximum yearly Level B takes	Maximum total Level B takes
LF	Fin whale ^a	1	5
	Minke whale	2	10
	Humpback whale	0	0
	North Atlantic right whale ^a	0	0
	Sei whale ^a	0	0
MF	Atlantic spotted dolphin ^b	0	0
	Atlantic white-sided dolphin	1	5
	Common dolphin ^c	7	35
	Bottlenose dolphin, coastal	56	280
	Bottlenose dolphin, offshore	112	560
	Risso's dolphin ^b	0	0
	Pilot whale, long-finned ^b	0	0
	Pilot whale, short-finned ^b	0	0
	Sperm whale ^a	0	0
HF	Harbor porpoise	12	60
PPW	Gray seal	20	100
	Harbor seal	45	225

^a Listed as Endangered under the ESA.

^b Take estimates for these species were rounded up to one group size before splitting into Project 1 and Project 2.

^c Take estimate for common dolphins uses the daily sighting rate from site characterization surveys multiplied by the number of survey days.

4. Number of Takes Requested – All Activities

4.1. Full Buildout

Table 41. Requested Level A and Level B takes by year for all activities conducted during construction of Atlantic Shores – Full Buildout.

Species	Stock size	ITA request Year 1 ^g			ITA request Year 2			ITA request Year 3			ITA request Year 4			ITA request Year 5			
		Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	
LF	Fin whale ^{b,e}	6,802	0	4	0.06	5	19	0.35	4	12	0.24	0	2	0.03	0	2	0.03
	Minke whale	21,968	0	6	0.03	22	216	1.08	17	146	0.74	0	4	0.02	0	4	0.02
	Humpback whale	1,396	0	3	0.21	4	19	1.65	4	11	1.07	0	1	0.07	0	1	0.07
	North Atlantic right whale ^{b,c,e}	338	0	5	1.48	0	9	2.66	0	5	1.48	0	1	0.30	0	1	0.30
	Sei whale ^{b,c,e}	6,292	0	5	0.08	1	8	0.14	1	5	0.10	0	2	0.03	0	2	0.03
MF	Atlantic spotted dolphin ^{c,d,e}	39,921	0	200	0.50	0	300	0.75	0	200	0.50	0	100	0.25	0	100	0.25
	Atlantic white-sided dolphin ^e	93,233	0	25	0.03	1	249	0.27	1	175	0.19	0	3	0.00	0	3	0.00
	Common dolphin ^f	172,974	0	112	0.06	0	360	0.21	0	250	0.14	0	93	0.05	0	93	0.05
	Bottlenose dolphin, coastal ^c	6,639	0	1949	29.36	0	735	11.07	0	127	1.91	0	113	1.70	0	113	1.70
	Bottlenose dolphin, offshore	62,851	0	225	0.36	0	4677	7.44	0	3642	5.79	0	225	0.36	0	225	0.36
	Risso's dolphin ^{c,d,e}	35,215	0	60	0.17	1	90	0.26	1	60	0.17	0	30	0.09	0	30	0.09
	Long-finned pilot whale ^{c,d,e}	39,215	0	40	0.10	0	60	0.15	0	40	0.10	0	20	0.05	0	20	0.05
	Short-finned pilot whale ^{c,d,e}	28,924	0	12	0.04	0	18	0.06	0	12	0.04	0	6	0.02	0	6	0.02
	Sperm whale ^{b,c,e}	4,349	0	3	0.07	0	5	0.11	0	3	0.07	0	1	0.02	0	1	0.02
HF	Harbor porpoise	95,543	0	35	0.04	24	198	0.23	13	64	0.08	0	24	0.03	0	24	0.03
PPW	Gray seal	27,300	0	155	0.57	3	340	1.26	2	136	0.51	0	41	0.15	0	41	0.15
	Harbor seal	61,336	0	345	0.56	11	763	1.26	8	305	0.51	0	91	0.15	0	91	0.15

^a Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken annually, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^b Listed as Endangered under the ESA.

^c Level B take estimate for impact pile driving rounded up to one average group size; impact pile driving scheduled to occur during Year 2 and Year 3.

^d Level B take estimate for HRG surveys rounded up to one group size; HRG surveys occur during all 5 years.

^e Level B take estimate for cofferdam vibratory piling rounded up to one group size; cofferdam installation scheduled to occur during Year 1 and Year 2.

^f Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of HRG survey or pile driving days.

^g Years 1–5 are expected to be in 2025–2029.

Table 42. Summary of total Level A and Level B takes for all activities conducted during construction of Atlantic Shores – Full Buildout.

	Species	Stock size	5 Year total		
			Level A	Level B	Max. % ^a
LF	Fin whale ^{b,e}	6,802	8	38	0.68
	Minke whale	21,968	38	376	1.88
	Humpback whale	1,396	7	35	3.01
	North Atlantic right whale ^{b,c,e}	338	0	21	6.21
	Sei whale ^{b,c,e}	6,292	1	22	0.37
MF	Atlantic spotted dolphin ^{c,d,e}	39,921	0	900	2.25
	Atlantic white-sided dolphin ^e	93,233	1	455	0.49
	Common dolphin ^f	172,974	0	907	0.52
	Bottlenose dolphin, coastal ^c	6,639	0	3037	45.74
	Bottlenose dolphin, offshore	62,851	0	8993	14.31
	Risso's dolphin ^{c,d,e}	35,215	1	270	0.77
	Long-finned pilot whale ^{c,d,e}	39,215	0	180	0.46
	Short-finned pilot whale ^{c,d,e}	28,924	0	54	0.19
Sperm whale ^{b,c,e}	4,349	0	13	0.30	
HF	Harbor porpoise	95,543	37	345	0.40
PPW	Gray seal	27,300	5	712	2.63
	Harbor seal	61,336	18	1595	2.63

^a Max percent is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken over the 5-year duration of the LOA, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^b Listed as Endangered under the ESA.

^c Total Level B take estimate for impact pile driving rounded up to two average group sizes.

^d Level B take estimate for HRG surveys rounded up to one group size per year; HRG surveys occur during all 5 years.

^e Level B take estimate for cofferdam vibratory piling rounded up to two group sizes, except for fin whale, which was only rounded up in Year 1.

^f Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of HRG survey or pile driving days.

4.2. Project 1 Plus Overlap

Table 43. Requested Level A and Level B takes by year for all activities conducted during construction of Atlantic Shores – Project 1 plus Overlap.

Species	Stock size	ITA request Year 1 ^g			ITA request Year 2			ITA request Year 3			ITA request Year 4			ITA request Year 5			
		Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	
LF	Fin whale ^b	6,802	0	3	0.04	5	13	0.26	0	1	0.01	0	1	0.01	0	1	0.01
	Minke whale	21,968	0	4	0.02	22	195	0.99	0	2	0.01	0	2	0.01	0	2	0.01
	Humpback whale	1,396	0	3	0.21	4	14	1.29	0	1	0.07	0	1	0.07	0	1	0.07
	North Atlantic right whale ^{b,c,e}	338	0	5	1.48	0	5	1.48	0	1	0.30	0	1	0.30	0	1	0.30
	Sei whale ^{b,c,e}	6,292	0	4	0.06	1	4	0.08	0	1	0.02	0	1	0.02	0	1	0.02
MF	Atlantic spotted dolphin ^{c,d,e}	39,921	0	150	0.38	0	150	0.38	0	50	0.13	0	50	0.13	0	50	0.13
	Atlantic white-sided dolphin ^e	93,233	0	24	0.03	1	226	0.24	0	2	0.00	0	2	0.00	0	2	0.00
	Common dolphin ^f	172,974	0	66	0.04	0	240	0.14	0	47	0.03	0	47	0.03	0	47	0.03
	Bottlenose dolphin, coastal ^c	6,639	0	1893	28.51	0	71	1.07	0	57	0.86	0	57	0.86	0	57	0.86
	Bottlenose dolphin, offshore	62,851	0	113	0.18	0	4257	6.77	0	113	0.18	0	113	0.18	0	113	0.18
	Risso's dolphin ^{c,d,e}	35,215	0	45	0.13	1	45	0.13	0	15	0.04	0	15	0.04	0	15	0.04
	Long-finned pilot whale ^{c,d,e}	39,215	0	30	0.08	0	30	0.08	0	10	0.03	0	10	0.03	0	10	0.03
	Short-finned pilot whale ^{c,d,e}	28,924	0	9	0.03	0	9	0.03	0	3	0.01	0	3	0.01	0	3	0.01
	Sperm whale ^{b,c,e}	4,349	0	3	0.07	0	3	0.07	0	1	0.02	0	1	0.02	0	1	0.02
HF	Harbor porpoise	95,543	0	23	0.02	24	87	0.12	0	12	0.01	0	12	0.01	0	12	0.01
PPW	Gray seal	27,300	0	135	0.49	3	161	0.60	0	21	0.08	0	21	0.08	0	21	0.08
	Harbor seal	61,336	0	300	0.49	11	361	0.61	0	46	0.07	0	46	0.07	0	46	0.07

^a Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken annually, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^b Listed as Endangered under the ESA.

^c Level B take estimate for impact pile driving rounded up to one average group size; impact pile driving scheduled to occur during Year 2 only.

^d Level B take estimate for HRG surveys rounded up to one group size; HRG surveys occur during all 5 years.

^e Level B take estimate for cofferdam vibratory piling rounded up to one group size; cofferdam installation assumed to occur during Year 1.

^f Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of HRG survey or pile driving days.

^g Years 1–5 are expected to be in 2025–2029.

Table 44. Summary of total Level A and Level B takes for all activities conducted during construction of Atlantic Shores – Project 1 plus Overlap.

	Species	Stock size	5-year total		
			Level A	Level B	Max. % ^a
LF	Fin whale ^b	6,802	5	19	0.35
	Minke whale	21,968	22	205	1.03
	Humpback whale	1,396	4	20	1.72
	North Atlantic right whale ^{b,c,e}	338	0	13	3.85
	Sei whale ^{b,c,e}	6,292	1	11	0.19
MF	Atlantic spotted dolphin ^{c,d,e}	39,921	0	450	1.13
	Atlantic white-sided dolphin ^e	93,233	1	256	0.28
	Common dolphin ^f	172,974	0	447	0.26
	Bottlenose dolphin, coastal ^c	6,639	0	2135	32.16
	Bottlenose dolphin, offshore	62,851	0	4709	7.49
	Risso's dolphin ^{c,d,e}	35,215	1	135	0.39
	Long-finned pilot whale ^{c,d,e}	39,215	0	90	0.23
	Short-finned pilot whale ^{c,d,e}	28,924	0	27	0.09
Sperm whale ^{b,c,e}	4,349	0	9	0.21	
HF	Harbor porpoise	95,543	24	146	0.18
PPW	Gray seal	27,300	3	359	1.33
	Harbor seal	61,336	11	799	1.32

^a Max percent is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken over the 5-year duration of the LOA, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^b Listed as Endangered under the ESA.

^c Total Level B take estimate for impact pile driving rounded up to one average group size.

^d Level B take estimate for HRG surveys rounded up to one group size per year; HRG surveys occur during all 5 years.

^e Level B take estimate for cofferdam vibratory piling rounded up to one group size; cofferdam installation/removal to occur during Year 1.

^f Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of HRG survey or pile driving days.

4.3. Project 2 Plus Overlap

Table 45. Requested Level A and Level B takes by year for all activities conducted during construction of Atlantic Shores – Project 2 plus Overlap.

Species	Stock size	ITA request Year 1 ^g			ITA request Year 2			ITA request Year 3			ITA request Year 4			ITA request Year 5			
		Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	Level A	Level B	Max % ^a	
LF	Fin whale ^{b,c}	6,802	0	1	0.01	1	8	0.13	4	11	0.22	0	1	0.01	0	1	0.01
	Minke whale	21,968	0	2	0.01	1	23	0.11	17	144	0.73	0	2	0.01	0	2	0.01
	Humpback whale	1,396	0	0	0.00	1	7	0.57	4	10	1.00	0	0	0.00	0	0	0.00
	North Atlantic right whale ^{b,c,e}	338	0	0	0.00	0	8	2.37	0	4	1.18	0	0	0.00	0	0	0.00
	Sei whale ^{b,c,e}	6,292	0	1	0.02	1	7	0.13	1	4	0.08	0	1	0.02	0	1	0.02
MF	Atlantic spotted dolphin ^{c,d,e}	39,921	0	50	0.13	0	250	0.63	0	150	0.38	0	50	0.13	0	50	0.13
	Atlantic white-sided dolphin ^e	93,233	0	1	0.00	0	45	0.05	1	173	0.19	0	1	0.00	0	1	0.00
	Common dolphin ^f	172,974	0	46	0.03	0	130	0.08	0	203	0.12	0	46	0.03	0	46	0.03
	Bottlenose dolphin, coastal ^c	6,639	0	56	0.84	0	678	10.21	0	70	1.05	0	56	0.84	0	56	0.84
	Bottlenose dolphin, offshore	62,851	0	112	0.18	0	622	0.99	0	3529	5.61	0	112	0.18	0	112	0.18
	Risso's dolphin ^{c,d,e}	35,215	0	15	0.04	1	75	0.22	1	45	0.13	0	15	0.04	0	15	0.04
	Long-finned pilot whale ^{c,d,e}	39,215	0	10	0.03	0	50	0.13	0	30	0.08	0	10	0.03	0	10	0.03
	Short-finned pilot whale ^{c,d,e}	28,924	0	3	0.01	0	15	0.05	0	9	0.03	0	3	0.01	0	3	0.01
	Sperm whale ^{b,c,e}	4,349	0	0	0.00	0	4	0.09	0	2	0.05	0	0	0.00	0	0	0.00
HF	Harbor porpoise	95,543	0	12	0.01	6	129	0.14	13	52	0.07	0	12	0.01	0	12	0.01
PPW	Gray seal	27,300	0	20	0.07	1	203	0.75	2	115	0.43	0	20	0.07	0	20	0.07
	Harbor seal	61,336	0	45	0.07	2	456	0.75	8	259	0.44	0	45	0.07	0	45	0.07

^a Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken annually, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^b Listed as Endangered under the ESA.

^c Level B take estimate for impact pile driving rounded up to one average group size; impact pile driving scheduled to occur during Year 2 and Year 3.

^d Level B take estimate for HRG surveys rounded up to one group size; HRG surveys occur during all 5 years.

^e Level B take estimate for cofferdam vibratory piling rounded up to one group size; cofferdam installation/removal to occur during Year 2.

^f Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of HRG survey or pile driving days.

^g Years 1–5 are expected to be in 2025–2029.

Table 46. Summary of total Level A and Level B takes for all activities conducted during construction of Atlantic Shores – Project 2 plus Overlap.

	Species	Stock size	5-year total		
			Level A	Level B	Max % ^a
LF	Fin whale ^b	6,802	4	20	0.35
	Minke whale	21,968	17	173	0.86
	Humpback whale	1,396	4	17	1.50
	North Atlantic right whale ^b	338	0	12	3.55
	Sei whale ^b	6,292	1	14	0.24
MF	Atlantic spotted dolphin ^d	39,921	0	550	1.38
	Atlantic white-sided dolphin	93,233	1	221	0.24
	Common dolphin ^f	172,974	0	470	0.27
	Bottlenose dolphin, coastal	6,639	0	916	13.80
	Bottlenose dolphin, offshore	62,851	0	4486	7.14
	Risso's dolphin ^d	35,215	1	165	0.47
	Long-finned pilot whale ^d	39,215	0	110	0.28
	Short-finned pilot whale ^d	28,924	0	33	0.11
	Sperm whale ^b	4,349	0	6	0.14
HF	Harbor porpoise	95,543	18	216	0.24
PPW	Gray seal	27,300	3	377	1.39
	Harbor seal	61,336	9	849	1.40

^a Max percent is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken over the 5-year duration of the LOA, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

^b Listed as Endangered under the ESA.

^c Level B take estimate for impact pile driving rounded up to one average group size.

^d Level B take estimate for HRG surveys rounded up to one group size.

^e Level B take estimate for cofferdam vibratory piling rounded up to one group size; cofferdam installation/removal to occur during Year 2.

^f Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of HRG survey or pile driving days.

5. Alternate Take Estimates for Impact Pile Driving Using Construction Schedules 1 and 3

5.1. Full Buildout

5.1.1. Alternate Exposure Estimates – Impact Pile Driving

Table A-3. Construction Schedule 1, year 1 – Full Buildout: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	7.41	4.54	2.80	1.22	0.07	<0.01	0	0	14.07	10.21	8.23	6.47	12.38	8.41	6.52	4.76
	Minke whale	74.25	29.02	10.07	1.99	0.12	<0.01	0	0	218.56	165.81	135.38	106.75	162.05	118.59	94.31	72.17
	Humpback whale	7.41	4.14	2.20	0.78	0.05	<0.01	0	0	15.33	10.81	8.33	6.15	12.08	8.46	6.49	4.73
	North Atlantic right whale ^d (migrating)	0.76	0.31	0.14	0.03	<0.01	<0.01	<0.01	<0.01	2.24	1.60	1.24	0.94	4.24	3.32	2.76	2.19
	Sei whale ^d	0.92	0.56	0.35	0.15	<0.01	<0.01	0	0	1.78	1.29	1.04	0.82	1.57	1.06	0.83	0.61
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	0.01	0.01	0	0	0	0	0	270.23	199.25	159.94	123.45	115.64	79.14	59.20	37.35
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	11.69	3.08	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	832.48	414.14	50.32	0	368.44	174.40	107.56	51.18
	Bottlenose dolphin, offshore	1.76	0	0	0	2.28	0	0	0	5484.72	3998.03	3100.73	2200.33	2291.63	1490.49	1061.63	686.44
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	9.42	6.91	5.58	4.27	4.04	2.78	2.10	1.34
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	15.81	5.17	1.38	0.37	8.82	3.84	1.93	0.44	84.18	61.55	49.85	37.91	220.33	165.97	135.39	102.93
PPW	Gray seal	11.35	2.79	0.52	0.23	0.44	0	0	0	201.20	134.89	98.42	73.49	125.68	79.79	60.16	41.00
	Harbor seal	34.64	6.24	1.29	0.06	2.38	0.49	0	0	471.01	312.01	235.51	176.27	292.12	187.87	142.24	97.28

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-4. Construction Schedule 1, year 2 – Full Buildout: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species	Injury								Behavior								
	L_E				L_{pk}				L_p^a				L_p^b				
	Attenuation (dB) ^c								Attenuation (dB) ^c								
	0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15	
LF	Fin whale ^d	5.97	3.66	2.26	0.99	0.05	<0.01	0	0	11.18	8.11	6.53	5.13	9.84	6.68	5.17	3.78
	Minke whale	57.17	22.71	8.06	1.61	0.10	<0.01	0	0	164.01	124.11	101.23	79.52	121.43	88.69	70.51	53.90
	Humpback whale	5.87	3.27	1.74	0.62	0.04	<0.01	0	0	11.93	8.39	6.46	4.76	9.40	6.57	5.04	3.67
	North Atlantic right whale ^d (migrating)	0.55	0.22	0.11	0.03	<0.01	<0.01	<0.01	<0.01	1.59	1.13	0.87	0.66	3.03	2.37	1.97	1.56
	Sei whale ^d	0.67	0.41	0.25	0.11	<0.01	<0.01	0	0	1.29	0.94	0.75	0.59	1.13	0.77	0.60	0.44
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	0.01	0.01	0	0	0	0	0	210.78	154.97	124.34	95.66	91.81	62.88	47.06	29.71
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	9.20	2.54	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	697.16	343.93	40.43	0	320.47	150.84	93.93	44.58
	Bottlenose dolphin, offshore	1.76	0	0	0	1.83	0	0	0	4573.44	3326.01	2579.55	1825.49	1933.89	1261.28	899.35	581.44
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	6.98	5.11	4.12	3.15	3.03	2.08	1.57	1.01
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	9.07	3.21	1.06	0.32	4.62	2.01	1.00	0.23	44.68	32.62	26.39	20.06	118.22	89.26	72.93	55.55
PPW	Gray seal	8.48	2.21	0.45	0.16	0.30	0	0	0	137.98	92.30	67.38	50.29	86.63	54.98	41.51	28.23
	Harbor seal	25.32	4.97	1.13	0.06	1.59	0.33	0	0	322.87	213.62	160.97	120.36	201.31	129.42	98.02	66.89

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-5. Construction Schedule 1, years 1 and 2 combined – Full Buildout: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	13.38	8.20	5.06	2.22	0.13	<0.01	0	0	25.25	18.32	14.76	11.60	22.21	15.09	11.69	8.54
	Minke whale	131.42	51.72	18.13	3.60	0.22	<0.01	0	0	382.56	289.91	236.61	186.27	283.48	207.28	164.82	126.06
	Humpback whale	13.28	7.40	3.93	1.40	0.09	0.02	0	0	27.26	19.20	14.79	10.91	21.48	15.03	11.54	8.39
	North Atlantic right whale ^d (migrating)	1.31	0.53	0.25	0.06	<0.01	<0.01	<0.01	<0.01	3.83	2.74	2.11	1.61	7.28	5.69	4.72	3.75
	Sei whale ^d	1.59	0.97	0.60	0.26	0.02	<0.01	0	0	3.07	2.23	1.80	1.41	2.70	1.83	1.43	1.04
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.04	0.02	0.02	0	0	0	0	0	481.01	354.22	284.27	219.12	207.45	142.02	106.26	67.06
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	20.89	5.62	1.35	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	1529.64	758.06	90.75	0	688.91	325.24	201.49	95.76
	Bottlenose dolphin, offshore	3.52	0	0	0	4.10	0	0	0	10058.16	7324.04	5680.28	4025.82	4225.52	2751.77	1960.99	1267.89
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	16.39	12.02	9.70	7.42	7.08	4.86	3.67	2.34
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	24.89	8.38	2.45	0.69	13.44	5.84	2.93	0.67	128.86	94.18	76.24	57.97	338.56	255.23	208.32	158.48
PPW	Gray seal	19.84	5.00	0.97	0.39	0.75	0	0	0	339.18	227.19	165.80	123.78	212.32	134.77	101.67	69.23
	Harbor seal	59.96	11.21	2.42	0.12	3.97	0.82	0	0	793.88	525.63	396.48	296.64	493.43	317.29	240.26	164.17

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-6. Construction Schedule 3, year 1 – Full Buildout: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species	Injury								Behavior								
	L_E				L_{pk}				L_p^a				L_p^b				
	Attenuation (dB) ^c								Attenuation (dB) ^c								
	0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15	
LF	Fin whale ^d	13.01	7.72	4.67	2.03	0.11	0.01	0	0	23.53	17.53	14.36	11.35	20.31	13.92	10.93	8.11
	Minke whale	127.66	48.74	16.20	3.41	0.56	0.02	0	0	371.22	285.86	235.02	186.49	273.38	202.07	161.54	123.99
	Humpback whale	11.96	6.42	3.40	1.21	0.10	0.02	<0.01	<0.01	24.27	17.14	13.32	9.94	18.88	13.21	10.23	7.52
	North Atlantic right whale ^d (migrating)	1.24	0.52	0.24	0.06	<0.01	<0.01	<0.01	<0.01	3.57	2.56	2.00	1.50	6.61	5.19	4.36	3.47
	Sei whale ^d	1.44	0.86	0.52	0.22	0.01	<0.01	0	0	2.70	2.00	1.64	1.29	2.34	1.60	1.26	0.93
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	0.01	0.01	0	0	0	0	0	412.93	309.91	251.58	195.61	175.95	121.34	90.81	57.22
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	18.28	4.72	0.99	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	1459.21	745.16	80.00	0	654.84	321.84	195.58	96.95
	Bottlenose dolphin, offshore	3.52	0	0	0	2.48	1.62	1.62	0	9354.05	6799.51	5330.67	3920.78	3956.25	2666.46	1907.97	1196.28
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	14.12	10.53	8.58	6.69	6.16	4.28	3.25	2.11
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	25.79	7.38	2.11	0.54	13.74	5.54	2.55	0.68	136.99	101.33	81.88	62.80	336.58	256.56	210.94	163.28
PPW	Gray seal	17.15	3.64	0.60	0.21	1.01	0.09	0	0	322.34	217.39	161.06	118.79	196.20	126.68	96.20	65.28
	Harbor seal	53.73	9.70	1.91	0.28	4.19	0.82	0	0	751.38	502.70	378.76	279.21	456.17	296.70	224.52	153.13

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

5.1.2. Alternate Take Estimates - Impact Pile Driving

Table A-7. Level A and Level B Take estimates for impact pile driving – Construction Schedule 1, Full Buildout.

Species	Stock size	ITA request Year 2			ITA request Year 3			Total			
		Level A	Level B	Max. % ^d	Level A	Level B	Max. %	Level A	Level B	Max. %	
LF	Fin whale ^a	6,802	3	9	0.18	3	7	0.15	6	15	0.31
	Minke whale	21,968	11	136	0.67	9	102	0.51	19	237	1.17
	Humpback whale	1,396	3	9	0.86	2	7	0.64	4	15	1.36
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	4	1.18	0	8	2.37
	Sei whale ^{a,b}	6,292	1	3	0.06	1	3	0.06	1	6	0.11
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	100	0.25	0	200	0.50
	Atlantic white-sided dolphin	93,233	1	160	0.17	1	125	0.14	1	285	0.31
	Common dolphin ^c	172,974	0	193	0.11	0	157	0.09	0	349	0.20
	Bottlenose dolphin, coastal	6,639	0	51	0.77	0	41	0.62	0	91	1.37
	Bottlenose dolphin, offshore	62,851	0	3101	4.93	0	2580	4.10	0	5681	9.04
	Risso's dolphin ^b	35,215	1	30	0.09	1	30	0.09	1	60	0.17
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	20	0.05	0	40	0.10
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	6	0.02	0	12	0.04
	Sperm whale ^{a,b}	4,349	0	2	0.05	0	2	0.05	0	4	0.09
HF	Harbor porpoise	95,543	2	50	0.05	2	27	0.03	3	77	0.08
PPW	Gray seal	27,300	1	99	0.37	1	68	0.25	1	166	0.61
	Harbor seal	61,336	2	236	0.39	2	161	0.27	3	397	0.65

^a Listed as Endangered under the ESA.

^b Level B take estimate rounded up to one average group size for yearly take and to two average group sizes for total take estimates.

^c Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

Table A-8. Level A and Level B Take estimates for impact pile driving – Construction Schedule 3, Full Buildout.

	Species	Stock size	ITA request Year 2			Total		
			Level A	Level B	Max. % ^d	Level A	Level B	Max. %
LF	Fin whale ^a	6,802	5	15	0.29	5	15	0.29
	Minke whale	21,968	17	236	1.15	17	236	1.15
	Humpback whale	1,396	4	14	1.29	4	14	1.29
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	4	1.18
	Sei whale ^{a,b}	6,292	1	3	0.06	1	3	0.06
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	100	0.25
	Atlantic white-sided dolphin	93,233	1	252	0.27	1	252	0.27
	Common dolphin ^c	172,974	0	228	0.13	0	228	0.13
	Bottlenose dolphin, coastal	6,639	0	80	1.21	0	80	1.21
	Bottlenose dolphin, offshore	62,851	2	5331	8.49	2	5331	8.49
	Risso's dolphin ^b	35,215	1	30	0.09	1	30	0.09
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	20	0.05
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	6	0.02
	Sperm whale ^{a,b}	4,349	0	2	0.05	0	2	0.05
HF	Harbor porpoise	95,543	3	82	0.09	3	82	0.09
PPW	Gray seal	27,300	1	162	0.60	1	162	0.60
	Harbor seal	61,336	2	379	0.62	2	379	0.62

^a Listed as Endangered under the ESA.

^b Level B take estimate rounded up to one average group size for yearly and total take estimates.

^c Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

5.2. Project 1 Plus Overlap

5.2.1. Alternate Exposure Estimates – Impact Pile Driving

Table A-11. Construction Schedule 1, year 1 – Project 1 plus Overlap: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	7.41	4.54	2.80	1.22	0.07	<0.01	0	0	14.07	10.21	8.23	6.47	12.38	8.41	6.52	4.76
	Minke whale	74.25	29.02	10.07	1.99	0.12	<0.01	0	0	218.56	165.81	135.38	106.75	162.05	118.59	94.31	72.17
	Humpback whale	7.41	4.14	2.20	0.78	0.05	<0.01	0	0	15.33	10.81	8.33	6.15	12.08	8.46	6.49	4.73
	North Atlantic right whale ^d (migrating)	0.76	0.31	0.14	0.03	<0.01	<0.01	<0.01	<0.01	2.24	1.60	1.24	0.94	4.24	3.32	2.76	2.19
	Sei whale ^d	0.92	0.56	0.35	0.15	<0.01	<0.01	0	0	1.78	1.29	1.04	0.82	1.57	1.06	0.83	0.61
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	0.01	0.01	0	0	0	0	0	270.23	199.25	159.94	123.45	115.64	79.14	59.20	37.35
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	11.69	3.08	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	832.48	414.14	50.32	0	368.44	174.40	107.56	51.18
	Bottlenose dolphin, offshore	1.76	0	0	0	2.28	0	0	0	5484.72	3998.03	3100.73	2200.33	2291.63	1490.49	1061.63	686.44
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	9.42	6.91	5.58	4.27	4.04	2.78	2.10	1.34
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	15.81	5.17	1.38	0.37	8.82	3.84	1.93	0.44	84.18	61.55	49.85	37.91	220.33	165.97	135.39	102.93
PPW	Gray seal	11.35	2.79	0.52	0.23	0.44	0	0	0	201.20	134.89	98.42	73.49	125.68	79.79	60.16	41.00
	Harbor seal	34.64	6.24	1.29	0.06	2.38	0.49	0	0	471.01	312.01	235.51	176.27	292.12	187.87	142.24	97.28

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-12. Construction Schedule 1, year 2 – Project 1 plus Overlap: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day. No exposures are attributed to Project 1 during year 2 because buildout of Project 1 is completed during year 1 of this schedule.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Humpback whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	North Atlantic right whale ^d (migrating)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sei whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bottlenose dolphin, offshore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HF	Harbor porpoise (sensitive)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PPW	Gray seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harbor seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-13. Construction Schedule 1, years 1 and 2 combined – Project 1 plus Overlap: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	7.41	4.54	2.80	1.22	0.07	<0.01	0	0	14.07	10.21	8.23	6.47	12.38	8.41	6.52	4.76
	Minke whale	74.25	29.02	10.07	1.99	0.12	<0.01	0	0	218.56	165.81	135.38	106.75	162.05	118.59	94.31	72.17
	Humpback whale	7.41	4.14	2.20	0.78	0.05	<0.01	0	0	15.33	10.81	8.33	6.15	12.08	8.46	6.49	4.73
	North Atlantic right whale ^d (migrating)	0.76	0.31	0.14	0.03	<0.01	<0.01	<0.01	<0.01	2.24	1.60	1.24	0.94	4.24	3.32	2.76	2.19
	Sei whale ^d	0.92	0.56	0.35	0.15	<0.01	<0.01	0	0	1.78	1.29	1.04	0.82	1.57	1.06	0.83	0.61
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	0.01	0.01	0	0	0	0	0	270.23	199.25	159.94	123.45	115.64	79.14	59.20	37.35
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	11.69	3.08	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	832.48	414.14	50.32	0	368.44	174.40	107.56	51.18
	Bottlenose dolphin, offshore	1.76	0	0	0	2.28	0	0	0	5484.72	3998.03	3100.73	2200.33	2291.63	1490.49	1061.63	686.44
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	9.42	6.91	5.58	4.27	4.04	2.78	2.10	1.34
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	15.81	5.17	1.38	0.37	8.82	3.84	1.93	0.44	84.18	61.55	49.85	37.91	220.33	165.97	135.39	102.93
PPW	Gray seal	11.35	2.79	0.52	0.23	0.44	0	0	0	201.20	134.89	98.42	73.49	125.68	79.79	60.16	41.00
	Harbor seal	34.64	6.24	1.29	0.06	2.38	0.49	0	0	471.01	312.01	235.51	176.27	292.12	187.87	142.24	97.28

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-14. Construction Schedule 3, year 1 – Project 1 plus Overlap: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species	Injury								Behavior								
	L_E				L_{pk}				L_p^a				L_p^b				
	Attenuation (dB) ^c								Attenuation (dB) ^c								
	0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15	
LF	Fin whale ^d	9.14	5.42	3.28	1.43	0.08	<0.01	0	0	16.57	12.34	10.11	7.99	14.30	9.81	7.70	5.71
	Minke whale	112.30	42.85	14.23	2.99	0.48	0.02	0	0	327.21	251.95	207.12	164.38	241.03	178.15	142.40	109.31
	Humpback whale	7.39	3.96	2.10	0.75	0.06	<0.01	<0.01	<0.01	14.82	10.45	8.12	6.06	11.52	8.05	6.24	4.58
	North Atlantic right whale ^d (migrating)	0.70	0.29	0.13	0.03	<0.01	<0.01	<0.01	<0.01	2.00	1.43	1.12	0.84	3.69	2.90	2.44	1.94
	Sei whale ^d	0.91	0.54	0.33	0.14	<0.01	<0.01	0	0	1.69	1.25	1.02	0.81	1.46	1.00	0.79	0.58
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	0.01	0.01	0	0	0	0	0	281.73	211.10	171.42	132.96	121.99	84.21	63.05	39.75
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	12.92	3.42	0.81	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	758.59	388.98	42.66	0	333.28	164.36	99.34	49.34
	Bottlenose dolphin, offshore	1.75	0	0	0	1.40	0.86	0.86	0	5067.93	3688.24	2890.97	2127.78	2130.65	1433.67	1025.29	643.04
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	6.97	5.20	4.24	3.31	3.05	2.13	1.61	1.05
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	20.95	5.84	1.64	0.41	11.20	4.48	2.03	0.55	112.11	83.04	67.10	51.51	273.05	208.40	171.49	133.01
PPW	Gray seal	12.62	2.70	0.45	0.15	0.74	0.07	0	0	235.44	158.76	117.66	86.75	143.30	92.56	70.31	47.69
	Harbor seal	39.48	7.20	1.44	0.21	3.06	0.60	0	0	548.73	367.15	276.57	203.80	333.18	216.74	164.02	111.83

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

5.2.2. Alternate Take Estimates - Impact Pile Driving

Table A-15. Level A and Level B Take estimates for impact pile driving – Construction Schedule 1, Project 1 plus Overlap.

Species	Stock size	ITA request Year 2			ITA request Year 3			Total			
		Level A	Level B	Max. % ^d	Level A	Level B	Max. %	Level A	Level B	Max. %	
LF	Fin whale ^a	6,802	3	9	0.18	0	0	0.00	3	9	0.18
	Minke whale	21,968	11	136	0.67	0	0	0.00	11	136	0.67
	Humpback whale	1,396	3	9	0.86	0	0	0.00	3	9	0.86
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	0	0.00	0	4	1.18
	Sei whale ^{a,b}	6,292	1	3	0.06	0	0	0.00	1	3	0.06
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	0	0.00	0	100	0.25
	Atlantic white-sided dolphin	93,233	1	160	0.17	0	0	0.00	1	160	0.17
	Common dolphin ^c	172,974	0	193	0.11	0	0	0.00	0	193	0.11
	Bottlenose dolphin, coastal	6,639	0	51	0.77	0	0	0.00	0	51	0.77
	Bottlenose dolphin, offshore	62,851	0	3101	4.93	0	0	0.00	0	3101	4.93
	Risso's dolphin ^b	35,215	1	30	0.09	0	0	0.00	1	30	0.09
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	0	0.00	0	20	0.05
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	0	0.00	0	6	0.02
	Sperm whale ^{a,b}	4,349	0	2	0.05	0	0	0.00	0	2	0.05
HF	Harbor porpoise	95,543	2	50	0.05	0	0	0.00	2	50	0.05
PPW	Gray seal	27,300	1	99	0.37	0	0	0.00	1	99	0.37
	Harbor seal	61,336	2	236	0.39	0	0	0.00	2	236	0.39

^a Listed as Endangered under the ESA.

^b Year 2 and total Level B take estimates rounded up to one average group size. Project 1 is expected to be installed completely during Year 2.

^c Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

Table A-16. Level A and Level B Take estimates for impact pile driving – Construction Schedule 3, Project 1 plus Overlap.

	Species	Stock size	ITA request Year 2			Total		
			Level A	Level B	Max. % ^d	Level A	Level B	Max. %
LF	Fin whale ^a	6,802	4	11	0.22	4	11	0.22
	Minke whale	21,968	15	208	1.02	15	208	1.02
	Humpback whale	1,396	3	9	0.86	3	9	0.86
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	4	1.18
	Sei whale ^{a,b}	6,292	1	3	0.06	1	3	0.06
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	100	0.25
	Atlantic white-sided dolphin	93,233	1	172	0.19	1	172	0.19
	Common dolphin ^c	172,974	0	128	0.07	0	128	0.07
	Bottlenose dolphin, coastal	6,639	0	43	0.65	0	43	0.65
	Bottlenose dolphin, offshore	62,851	1	2891	4.60	1	2891	4.60
	Risso's dolphin ^b	35,215	1	30	0.09	1	30	0.09
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	20	0.05
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	6	0.02
	Sperm whale ^{a,b}	4,349	0	2	0.05	0	2	0.05
HF	Harbor porpoise	95,543	3	68	0.07	3	68	0.07
PPW	Gray seal	27,300	1	118	0.44	1	118	0.44
	Harbor seal	61,336	2	277	0.45	2	277	0.45

^a Listed as Endangered under the ESA.

^b Yearly and total Level B take estimates rounded up to one average group size.

^c Take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

5.3. Project 2 Plus Overlap

5.3.1. Alternate Exposure Estimates – Impact Pile Driving

Table A-19. Construction Schedule 1, year 1 – Project 2 plus Overlap: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	0.37	0.23	0.14	0.06	<0.01	0	0	0	0.74	0.54	0.43	0.34	0.65	0.44	0.34	0.25
	Minke whale	0.52	0.19	0.06	0.01	<0.01	0	0	0	1.66	1.27	1.04	0.83	1.24	0.91	0.72	0.56
	Humpback whale	0.77	0.43	0.23	0.08	<0.01	<0.01	0	0	1.70	1.21	0.93	0.69	1.34	0.95	0.73	0.53
	North Atlantic right whale ^d (migrating)	0.16	0.06	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.49	0.36	0.27	0.21	0.92	0.72	0.60	0.48
	Sei whale ^d	0.19	0.12	0.07	0.03	<0.01	0	0	0	0.39	0.28	0.23	0.18	0.34	0.23	0.18	0.13
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	24.93	18.57	14.93	11.65	9.99	6.82	5.09	3.20
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	2.10	0.46	0	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	35.55	18.45	2.60	0	12.60	6.19	3.58	1.74
	Bottlenose dolphin, offshore	0	0	0	0	0.12	0	0	0	252.52	186.22	144.42	103.87	99.13	63.52	44.97	29.10
	Risso's dolphin	0	0	0	0	0	0	0	0	2.88	2.12	1.71	1.31	1.19	0.82	0.62	0.39
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HF	Harbor porpoise (sensitive)	3.24	0.94	0.15	0.03	2.01	0.88	0.44	0.10	18.96	13.89	11.26	8.57	49.02	36.83	29.99	22.75
PPW	Gray seal	1.51	0.30	0.04	0.04	0.08	0	0	0	33.28	22.43	16.34	12.21	20.56	13.06	9.81	6.72
	Harbor seal	4.91	0.67	0.08	0	0.42	0.08	0	0	77.98	51.80	39.24	29.43	47.80	30.77	23.28	16.00

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-20. Construction Schedule 1, year 2 – Project 2 plus Overlap: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	5.97	3.66	2.26	0.99	0.05	<0.01	0	0	11.18	8.11	6.53	5.13	9.84	6.68	5.17	3.78
	Minke whale	57.17	22.71	8.06	1.61	0.10	<0.01	0	0	164.01	124.11	101.23	79.52	121.43	88.69	70.51	53.90
	Humpback whale	5.87	3.27	1.74	0.62	0.04	<0.01	0	0	11.93	8.39	6.46	4.76	9.40	6.57	5.04	3.67
	North Atlantic right whale ^d (migrating)	0.55	0.22	0.11	0.03	<0.01	<0.01	<0.01	<0.01	1.59	1.13	0.87	0.66	3.03	2.37	1.97	1.56
	Sei whale ^d	0.67	0.41	0.25	0.11	<0.01	<0.01	0	0	1.29	0.94	0.75	0.59	1.13	0.77	0.60	0.44
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	0.01	0.01	0	0	0	0	0	210.78	154.97	124.34	95.66	91.81	62.88	47.06	29.71
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	9.20	2.54	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	697.16	343.93	40.43	0	320.47	150.84	93.93	44.58
	Bottlenose dolphin, offshore	1.76	0	0	0	1.83	0	0	0	4573.44	3326.01	2579.55	1825.49	1933.89	1261.28	899.35	581.44
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	6.98	5.11	4.12	3.15	3.03	2.08	1.57	1.01
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	9.07	3.21	1.06	0.32	4.62	2.01	1.00	0.23	44.68	32.62	26.39	20.06	118.22	89.26	72.93	55.55
PPW	Gray seal	8.48	2.21	0.45	0.16	0.30	0	0	0	137.98	92.30	67.38	50.29	86.63	54.98	41.51	28.23
	Harbor seal	25.32	4.97	1.13	0.06	1.59	0.33	0	0	322.87	213.62	160.97	120.36	201.31	129.42	98.02	66.89

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-21. Construction Schedule 1, years 1 and 2 combined – Project 2 plus Overlap: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	6.34	3.88	2.40	1.05	0.06	<0.01	0	0	11.92	8.65	6.97	5.47	10.49	7.13	5.51	4.03
	Minke whale	57.69	22.90	8.12	1.62	0.10	<0.01	0	0	165.67	125.38	102.27	80.35	122.66	89.60	71.23	54.45
	Humpback whale	6.64	3.70	1.97	0.70	0.04	<0.01	0	0	13.63	9.60	7.40	5.45	10.74	7.51	5.77	4.20
	North Atlantic right whale ^d (migrating)	0.71	0.29	0.13	0.03	<0.01	<0.01	<0.01	<0.01	2.08	1.49	1.15	0.87	3.95	3.09	2.57	2.04
	Sei whale ^d	0.86	0.53	0.33	0.14	<0.01	<0.01	0	0	1.68	1.22	0.98	0.77	1.47	1.00	0.78	0.57
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	0.02	0.01	0.01	0	0	0	0	0	235.71	173.53	139.26	107.31	101.80	69.70	52.15	32.91
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	11.30	3.00	0.67	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	732.72	362.37	43.03	0	333.07	157.03	97.51	46.31
	Bottlenose dolphin, offshore	1.76	0	0	0	1.95	0	0	0	4825.96	3512.23	2723.97	1929.36	2033.02	1324.80	944.32	610.54
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	9.85	7.23	5.84	4.47	4.22	2.90	2.19	1.40
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	12.31	4.15	1.22	0.34	6.64	2.89	1.44	0.33	63.64	46.51	37.65	28.63	167.24	126.09	102.91	78.29
PPW	Gray seal	9.99	2.52	0.49	0.20	0.38	0	0	0	171.26	114.72	83.72	62.50	107.19	68.04	51.33	34.95
	Harbor seal	30.23	5.64	1.22	0.06	2.01	0.41	0	0	400.85	265.41	200.21	149.80	249.12	160.19	121.30	82.89

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

Table A-22. Construction Schedule 3, year 1 – Project 2 plus Overlap: Mean number of marine mammals predicted to receive sound levels above exposure criteria with sound attenuation. Construction Schedule 1 assumes all WTGs and the met tower are installed on 15 m monopile foundations at a rate of one installation per day, and all OSSs are installed on jacket foundations. OSS jacket foundations use twenty-four 5 m pin piles and pin piles are installed at a rate of 4 pin piles per day.

Species		Injury								Behavior							
		L_E				L_{pk}				L_p^a				L_p^b			
		Attenuation (dB) ^c								Attenuation (dB) ^c							
		0	6	10	15	0	6	10	15	0	6	10	15	0	6	10	15
LF	Fin whale ^d	4.05	2.40	1.45	0.63	0.03	<0.01	0	0	7.31	5.45	4.46	3.53	6.30	4.32	3.39	2.52
	Minke whale	16.00	6.13	2.05	0.44	0.08	<0.01	0	0	46.00	35.46	29.17	23.13	33.82	25.02	20.01	15.36
	Humpback whale	4.62	2.49	1.32	0.46	0.04	<0.01	<0.01	<0.01	9.55	6.76	5.25	3.93	7.43	5.21	4.03	2.97
	North Atlantic right whale ^d (migrating)	0.56	0.23	0.11	0.03	<0.01	<0.01	<0.01	<0.01	1.61	1.16	0.90	0.68	2.98	2.34	1.96	1.57
	Sei whale ^d	0.54	0.32	0.20	0.08	<0.01	<0.01	0	0	1.02	0.76	0.62	0.49	0.88	0.60	0.48	0.35
MF	Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atlantic white-sided dolphin	<0.01	<0.01	<0.01	0	0	0	0	0	131.38	98.94	80.26	62.73	54.03	37.18	27.79	17.49
	Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	5.55	1.34	0.18	0
	Bottlenose dolphin, coastal	0	0	0	0	0	0	0	0	738.40	376.44	39.96	0	334.62	164.26	100.05	49.57
	Bottlenose dolphin, offshore	1.77	0	0	0	1.18	0.80	0.80	0	4536.56	3295.82	2584.39	1901.05	1924.10	1298.28	929.25	582.35
	Risso's dolphin	<0.01	<0.01	<0.01	0	<0.01	0	0	0	7.35	5.48	4.46	3.48	3.18	2.21	1.68	1.09
	Long-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sperm whale ^d	0	0	0	0	0	0	0	0	0	0	0	0	<0.01	0	0	0
HF	Harbor porpoise (sensitive)	4.93	1.57	0.48	0.13	2.60	1.09	0.52	0.13	25.46	18.72	15.13	11.56	64.86	49.18	40.30	30.93
PPW	Gray seal	4.56	0.95	0.15	0.06	0.27	0.02	0	0	87.69	59.16	43.79	32.32	53.36	34.43	26.13	17.74
	Harbor seal	14.36	2.52	0.48	0.07	1.14	0.22	0	0	204.46	136.78	103.11	76.08	124.06	80.66	61.03	41.66

^a NOAA (2005).

^b Wood et al. (2012).

^c Different levels of broadband sound attenuation are shown for comparison; Atlantic Shores is committing to a sound level attenuation of 10 dB.

^d Listed as Endangered under the ESA.

5.3.2. Alternate Take Estimates - Impact Pile Driving

Table A-23. Level A and Level B Take estimates for impact pile driving – Construction Schedule 1, Project 2 plus overlap.

Species	Stock size	ITA request Year 2			ITA request Year 3			Total			
		Level A	Level B	Max. % ^d	Level A	Level B	Max. %	Level A	Level B	Max. %	
LF	Fin whale ^a	6,802	1	2	0.04	3	7	0.15	3	7	0.15
	Minke whale	21,968	1	2	0.01	9	102	0.51	9	103	0.51
	Humpback whale	1,396	1	2	0.21	2	7	0.64	2	8	0.72
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	4	1.18	0	8	2.37
	Sei whale ^{a,b}	6,292	1	3	0.06	1	3	0.06	1	6	0.11
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	100	0.25	0	200	0.50
	Atlantic white-sided dolphin	93,233	0	22	0.02	1	125	0.14	1	140	0.15
	Common dolphin ^c	172,974	0	10	0.01	0	157	0.09	0	166	0.10
	Bottlenose dolphin, coastal	6,639	0	14	0.21	0	41	0.62	0	44	0.66
	Bottlenose dolphin, offshore	62,851	0	145	0.23	0	2580	4.10	0	2724	4.33
	Risso's dolphin ^b	35,215	0	30	0.09	1	30	0.09	1	60	0.17
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	20	0.05	0	40	0.10
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	6	0.02	0	12	0.04
	Sperm whale ^{a,b}	4,349	0	2	0.05	0	2	0.05	0	4	0.09
HF	Harbor porpoise	95,543	1	12	0.01	2	27	0.03	2	38	0.04
PPW	Gray seal	27,300	1	17	0.07	1	68	0.25	1	84	0.31
	Harbor seal	61,336	1	40	0.07	2	161	0.27	2	201	0.33

^a Listed as Endangered under the ESA.

^b Level B take estimates rounded up to one average group size for Year 3 and to two average group sizes for total take estimates. For Year 2 take, because of the limited amount of pile driving, Level B takes for all species except minke whales, offshore bottlenose dolphins, harbor porpoise, and seals were estimated as zero. As a conservative measure, Level B takes for these species were rounded up to one average group size.

^c Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

Table A-24. Level A and Level B Take estimates for impact pile driving – Construction Schedule 3, Project 2 plus Overlap.

	Species	Stock size	ITA request Year 2			Total		
			Level A	Level B	Max. % ^d	Level A	Level B	Max. %
LF	Fin whale ^a	6,802	2	5	0.10	2	5	0.10
	Minke whale	21,968	3	30	0.15	3	30	0.15
	Humpback whale	1,396	2	6	0.57	2	6	0.57
	North Atlantic right whale ^{a,b}	338	0	4	1.18	0	4	1.18
	Sei whale ^{a,b}	6,292	1	3	0.06	1	3	0.06
MF	Atlantic spotted dolphin ^b	39,921	0	100	0.25	0	100	0.25
	Atlantic white-sided dolphin	93,233	1	81	0.09	1	81	0.09
	Common dolphin ^c	172,974	0	107	0.06	0	107	0.06
	Bottlenose dolphin, coastal	6,639	0	40	0.60	0	40	0.60
	Bottlenose dolphin, offshore	62,851	1	2585	4.11	1	2585	4.11
	Risso's dolphin ^b	35,215	1	30	0.09	1	30	0.09
	Long-finned pilot whale ^b	39,215	0	20	0.05	0	20	0.05
	Short-finned pilot whale ^b	28,924	0	6	0.02	0	6	0.02
	Sperm whale ^{a,b}	4,349	0	2	0.05	0	2	0.05
HF	Harbor porpoise	95,543	1	16	0.02	1	16	0.02
PPW	Gray seal	27,300	1	44	0.16	1	44	0.16
	Harbor seal	61,336	1	104	0.17	1	104	0.17

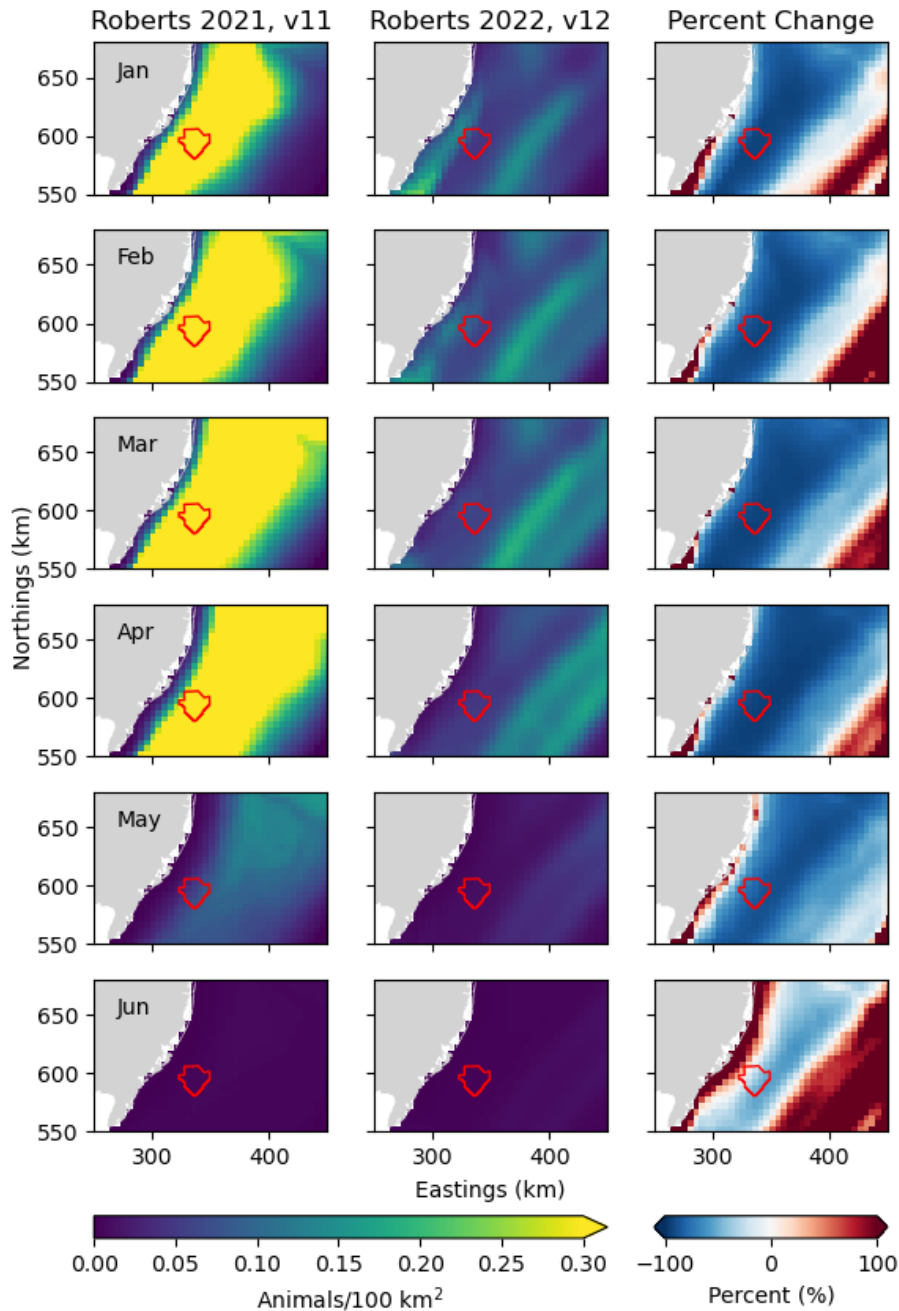
^a Listed as Endangered under the ESA.

^b Level B take estimate rounded up to one average group size for yearly take estimates.

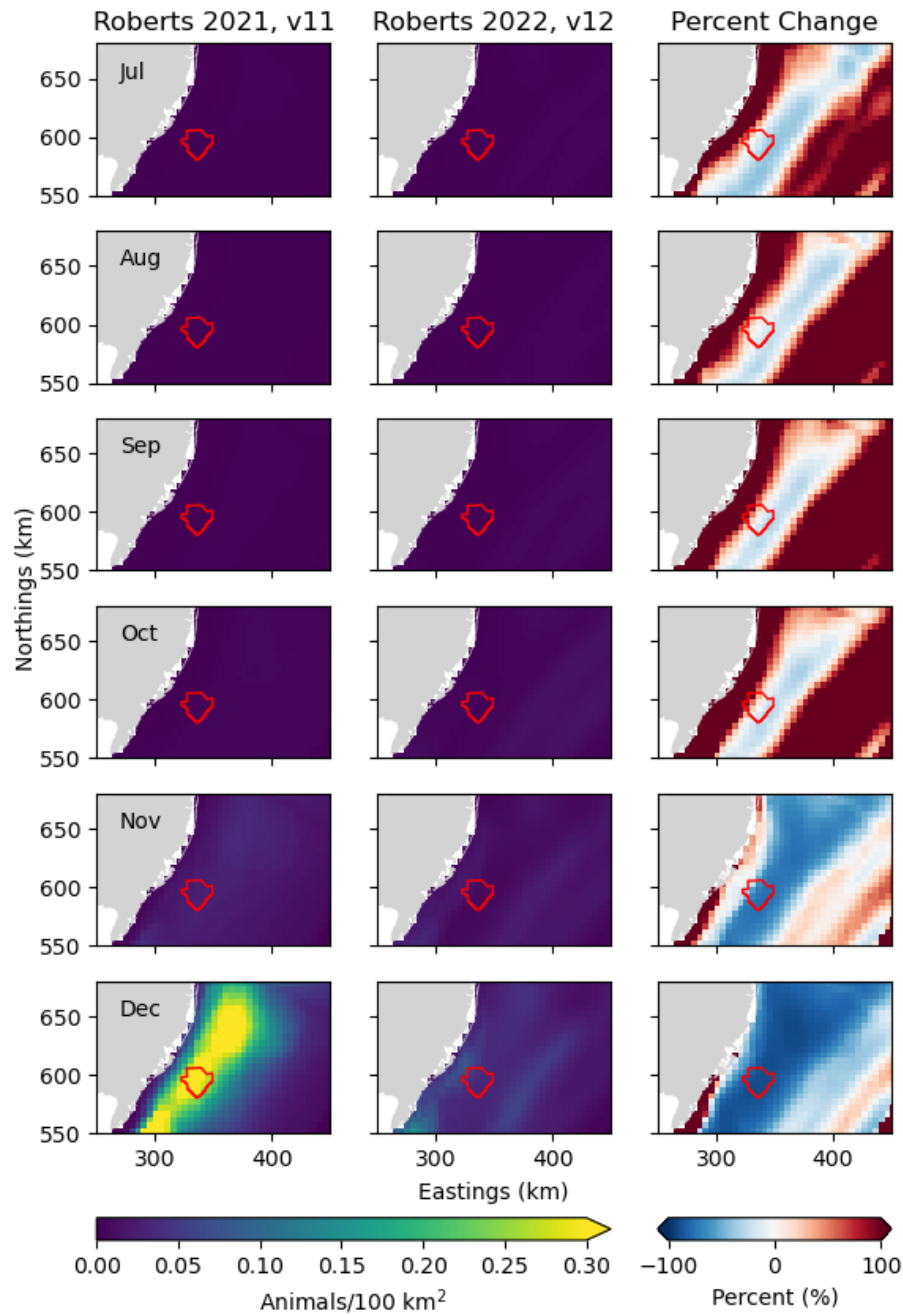
^c Level B take estimate for common dolphins is the daily sighting rate from site characterization surveys multiplied by the number of pile driving days.

^d Max % is the maximum percentage of the species' stock from NMFS 2022 draft SARs (NOAA Fisheries 2023) that could be taken, calculated as Level A take plus Level B take divided by stock size, multiplied by 100.

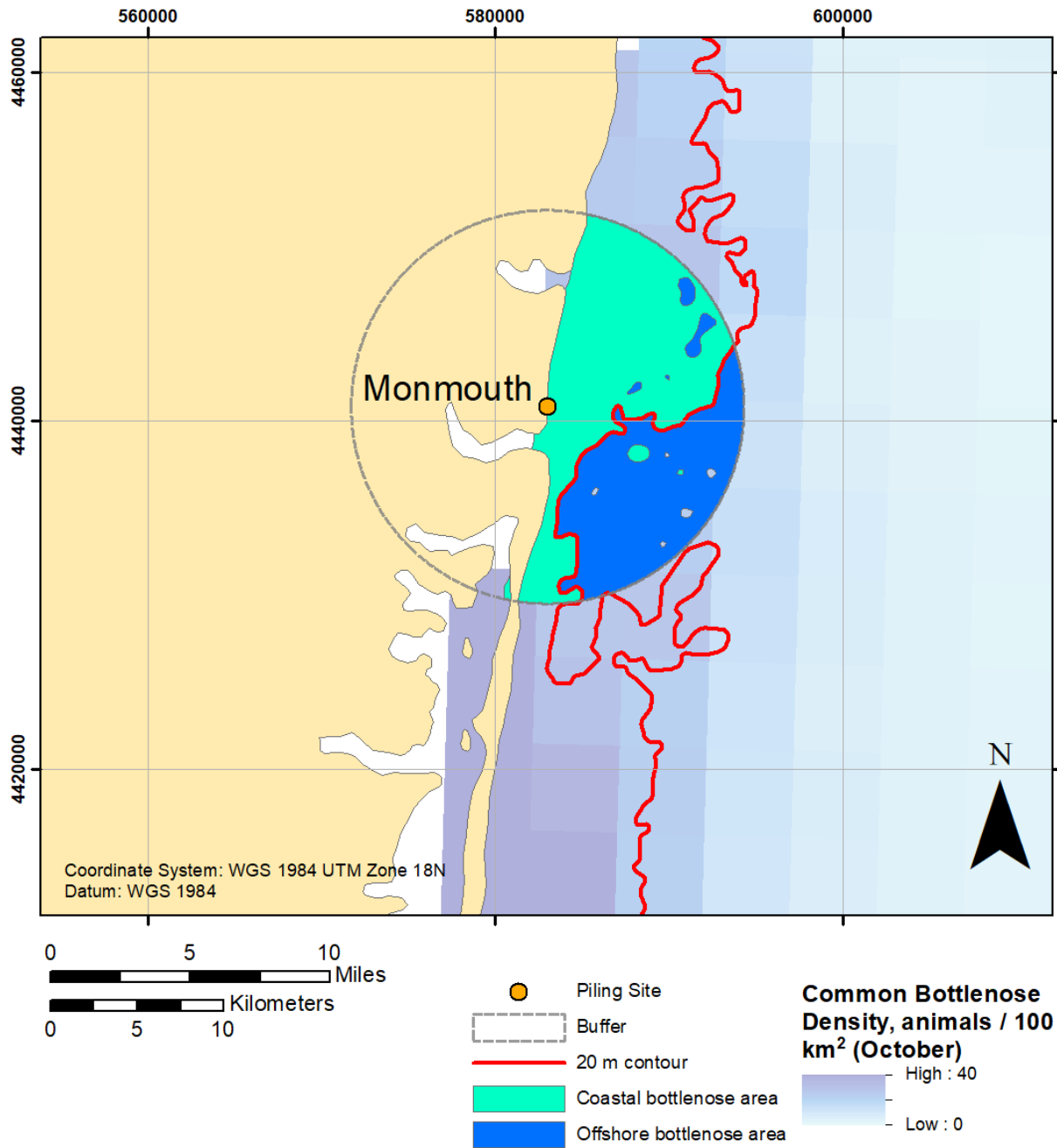
6. Supplemental Figures



Supplemental Figure 1. North Atlantic right whale (NARW) density changes, January through June. Shown are monthly densities for NARWs for January through June in the vicinity of the Atlantic Shores South lease area from the Roberts et al. (2021a, 2021b) right whale model (version 11, left panel) and the Roberts et al. (2022) right whale model (version 12, middle panel). The panel on the right shows the percent change when updating from the 2021 to the 2022 model.



Supplemental Figure 2. North Atlantic right whale (NARW) density changes, July through December. Shown are monthly densities for NARWs for July through December in the vicinity of the Atlantic Shores South lease area from the Roberts et al. (2021a, 2021b) right whale model (version 11, left panel) and the Roberts et al. (2022) right whale model (version 12, middle panel). The panel on the right shows the percent change when updating from the 2021 to the 2022 model.



Supplemental Figure 3. Map showing areas used to calculate density and the zone of influence for the coastal and offshore bottlenose dolphin stocks, used to estimate exposures for vibratory piling for cofferdam installation and removal.

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