



Marine Mammal Monitoring and Mitigation Plan

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Maryland Offshore Wind Project

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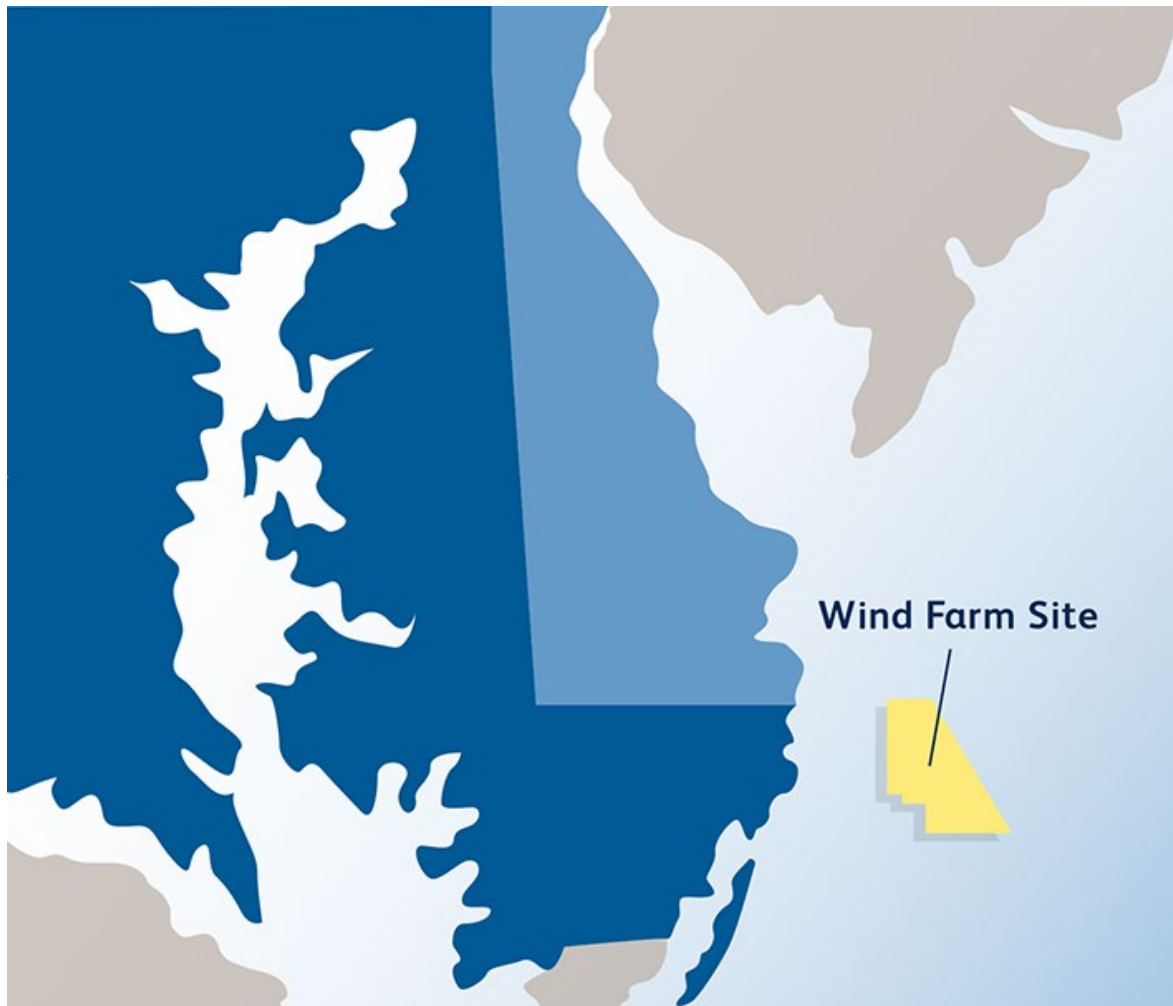


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1.0 Introduction

The Marine Mammal Monitoring and Mitigation Plan (the Plan) addresses the high resolution geophysical (HRG) survey, construction, and operations and maintenance (O&M) activities within US Wind, Inc.'s (US Wind) Maryland Offshore Wind Project (the Project) located within the area described in Bureau of Ocean Energy Management (BOEM) Lease OCS-A 0490 (the Lease) and associated export cables. This area will collectively be referred to as the Project area herein.

1.1 Purpose

The purpose of the Plan is to describe the monitoring and mitigation procedures US Wind will implement for the protection of marine mammals. Marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA; 16 U.S.C. § 1361 et seq.) and the Endangered Species Act (ESA; 16 U.S.C. § 1531 et seq.). The Plan provides the basis for mitigation measures provided in Section 11.0 (Mitigation Measures to Protect Marine Mammals and Their Habitat) and the monitoring measures summarized in Section 13.0 within US Wind's Letter of Authorization (LOA) for the Maryland Offshore Wind Project.

The Plan describes visual and passive acoustic methods of monitoring to be implemented to identify marine mammals and trigger mitigation measures related to specific activities. Mitigation measures included in the Plan are in some cases preventative, such as sound attenuation and seasonal restrictions, to avoid impacts whether or not marine mammals have been observed. The Plan also includes project-wide vessel strike avoidance measures and procedures to avoid direct injury to marine mammals.

The Plan may be modified to reflect conditions imposed by BOEM, National Oceanic and Atmospheric Administration (NOAA Fisheries), or other agencies.

1.2 Definitions

The following terms are used within the Plan as defined below.

- Level A: Any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock.
- Level B: Any act of pursuit, torment, or annoyance that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.
- Clearance zone: The area surrounding the Project activity that must be clear of any marine mammals before the start of said activity. The size of the clearance zone will depend on the activity, marine mammal species, and permit conditions.
- Monitoring zone: Applicable to the areas surrounding the project site that need to be monitored, at all times, for the presence of protected species prior to entering the designated mitigation zones. Monitoring observations will extend to the furthest observable distances.

- Shutdown zone: The area surrounding the source that if marine mammal species are observed within this zone species-specific mitigation measures as defined in the Plan, including, immediate shutdown as appropriate, would occur during all project activity. The size will depend on the activity and marine mammal species and defined using source modelling.
- Protected Species Observer (PSO): Individuals with a current NOAA Fisheries approval letter appropriate to the tier required for the activity indicating they are trained as a PSO. Additional training may include current offshore survival at sea training certifications, and the use of various visual monitoring equipment.
- Lead PSO: Individual responsible overseeing the for communication between the PSO team both onboard and onshore and the vessel team. The Lead PSO will also ensure that all PSOs monitor the NOAA Fisheries systems for the presence of North Atlantic right whales (NARWs) as required.

2.0 Maryland Offshore Wind Project Area

The Plan includes Project activities within the US Wind Lease area, vessel transit routes, and the onshore and offshore export cables (Figure 2-1). The Project area includes activities in both state and federal waters.

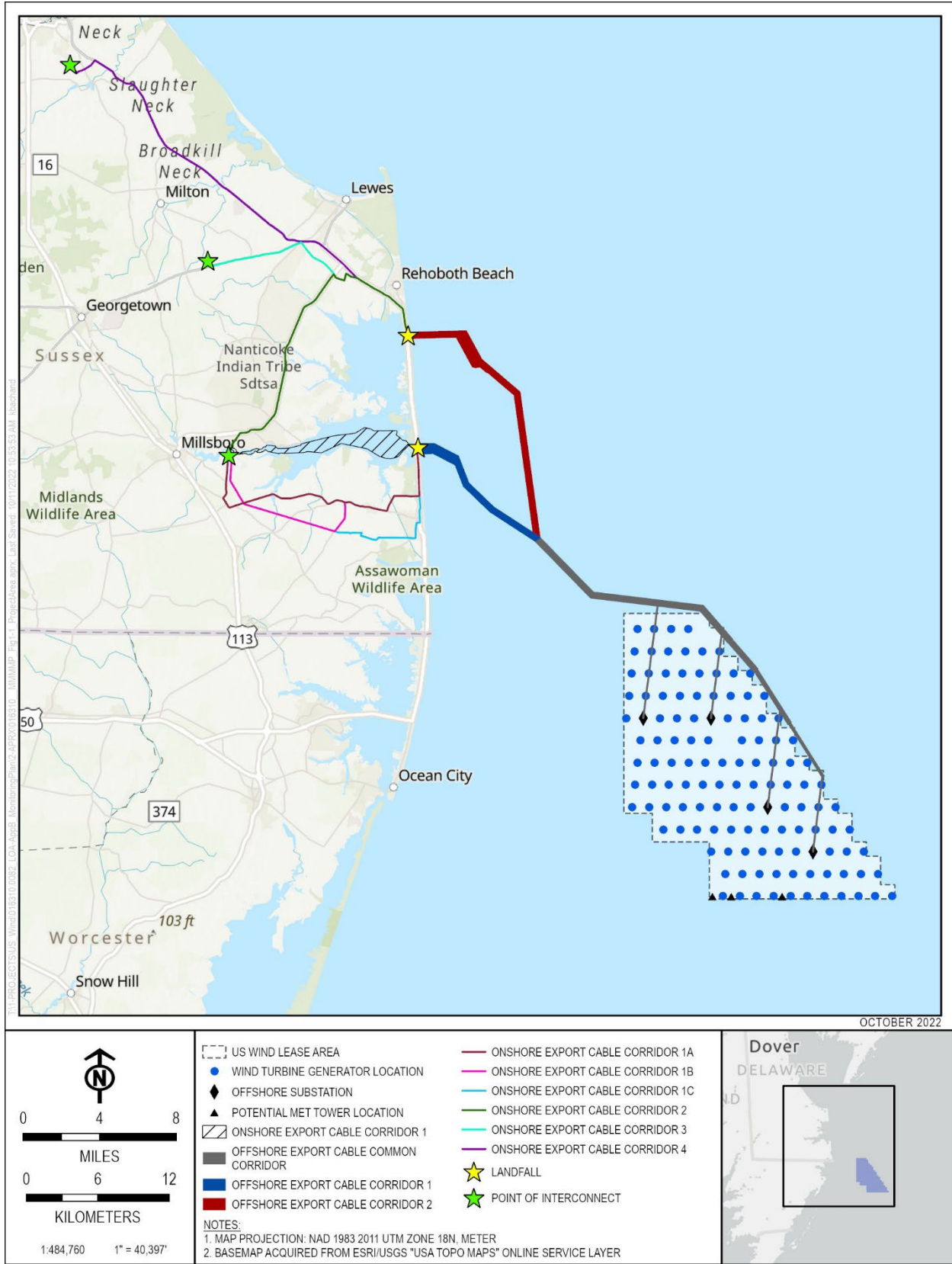


Figure 2-1. US Wind Project Area

3.0 Vessel Strike Avoidance

Marine mammals may be injured or killed if struck by a vessel, particularly large vessels traveling at speeds greater than 10 knots (NOAA Fisheries 2022).

Vessel operators and crews engaged in all Project activity (i.e., installation of Project components, monitoring vessels, operations and maintenance vessels, crew transport vessels, etc.) will abide by all applicable regulations and US Wind's vessel strike avoidance measures to protect marine mammals from vessel strike. Vessel operators and crew will maintain a vigilant watch for marine mammals, and slow down or stop their vessel to avoid striking these protected species. Vessel operators and crew will be briefed during vessel mobilization and crew changes regarding US Wind's vessel strike avoidance procedures specified below. Vessel strike avoidance measures will be in effect during all activities, except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk.

- Vessels 19.8 meters (65 feet) in length or greater would operate at speeds of 10 knots or less in NARW Special Management Areas (SMAs). Additionally, all vessels would operate at speed of 10 knots or less in Right Whale Slow Zones, identical to Dynamic Management Areas (DMAs), to protect visually or acoustically detected NARW. US Wind will incorporate the proposed revision to the NARW vessel speed rule¹ for vessels 10.6-19.8 meters (35-65 feet) in length upon implementation.
- All vessels would maintain a minimum separation distance of 500 meters (1,640 feet) or greater from any sighted NARW. If a NARW is sighted within this separation distance while underway, the vessel would steer a course away from the whale at 10 knots (18.5 kilometers/hour) or less until the 500 meters (1,640 feet) minimum separation distance has been established. If a NARW is sighted within 100 meters (328 feet) of an underway vessel, the vessel operator would immediately reduce speed and promptly shift the engine to neutral. If the vessel is stationary, the operator would not engage engines until the North Atlantic right whale has moved beyond 100 meters (328 feet).
- All vessels would maintain a separation distance of 100 meters (328 feet) or greater from any sighted non-delphinid cetacean other than the NARW. If a non-delphinid cetacean is sighted within 100 meters (328 feet) of an underway vessel, the vessel operator would immediately reduce speed and promptly shift the engine to neutral. The vessel operator would not engage the engines until the non-delphinid cetacean has moved beyond 100 meters (328 feet). If a vessel is stationary, the operator would not engage engines until the non-delphinid cetacean has moved beyond 100 meters (328 feet).
- All vessels would maintain a separation distance of 50 meters (164 feet) or greater from any sighted delphinid cetacean or pinniped, except if the mammal approaches the vessel. If a delphinid cetacean or pinniped approaches an underway vessel, the vessel would avoid excessive speed or abrupt changes in direction to avoid injury to these organisms. Additionally, vessels underway may not divert to approach any delphinid cetacean or pinniped.
- All vessels would reduce speed to less than or equal to 10 knots when mother/calf pairs, pods, or large assemblages of ESA-listed marine mammals are observed.

¹ On August 1, 2022, NMFS published proposed amendments to the North Atlantic right whale vessel strike reduction rule (87 FR 46921). As of this writing the proposed amendments have not been finalized.

- All vessels would monitor for marine mammal species both visually and acoustically during all Project activities. Zone size would depend on the species. This is discussed further in the following section.

4.0 Time of Year Restrictions

Project activities during particular times of the year may pose elevated risk due to the increased likelihood of the presence of the North Atlantic right whale. Seasonal restrictions on pile driving in the Lease area and speed reductions would be implemented. US Wind will implement the following time-of-year restrictions during Project activities. Additional seasonal restrictions may be imposed by other regulatory agencies.

- Vessels would follow all speed restrictions set forth by NOAA Fisheries for the protection of any NARW in the Project area. These include the NARW SMA and any DMAs or Right Whale Slow Zones active during Project activities.
- Pile driving would occur only between May and November of any construction year.

5.0 Visual Monitoring

Visual monitoring methods have been effectively employed by US Wind and others to detect the presence of marine mammals and identify species. Visual monitoring would be employed during specified project activities. The intent is for visual monitoring to be coupled with acoustic monitoring to trigger mitigation measures for the protection of marine mammals and other protected species.

5.1 Protected Species Observers

PSOs will be NOAA Fisheries-approved and will be provided all required monitoring equipment (see Section 5.1.1) and data logs for recording purposes (see Section 5.1.2). All PSOs will receive project-specific operations and safety training prior to the start of Project activities.

PSO observations will be conducted in accordance with the following:

- The PSO duties will include:
 - Visually monitoring 360° as far as the eye can see, including the clearance and/or shutdown zone around the vessel at all times for the presence of marine mammals and all other protected species.
 - Informing the captain, or designated personnel, if a protected species is heading toward or enters the clearance and/or shutdown zone around the sound-producing activity so as to minimize or reduce the chance of injuring a protected species.
 - Summarizing daily monitoring effort and submitting data forms to the appropriate staff or database.
- A sufficient number of PSOs will operate in shifts to effectively monitor and visually clear the clearance and shutdown zones as required.

- A team of four to six Protected Species Observers (PSOs) supplied by a third-party PSO Provider will be on board each vessel that will be conducting daylight only survey operations to undertake visual watches, implement mitigation, and conduct data collection and reporting during Geophysical Operations.
- A team of two to three PSOs supplied by a third-party PSO Provider will be on board each vessel that will be conducting daylight only survey operations to undertake visual watches, implement mitigation and conduct data collection and reporting.
- A team of six to eight dual role PAM Operators / PSO supplied by a third-party PSO Provider will be on board the construction vessel and the secondary support vessel that will be conducting daylight only construction operations (impact piling of foundations) to undertake visual and acoustic watches, implement mitigation and conduct data collection and reporting. Each PSO will only perform one duty (visual observing or PAM) at a given time.
- During pile driving at least two PSOs would be on duty on the foundation installation vessel.
- The watch schedule for PSO will follow the guidelines in the National Standards for a Protected Species Observer and Data Management Program. No individual PSO will conduct more than 4 consecutive hours on watch as a visual observer. Break times of no less than 2 hours will be allowed before a PSO begins another visual monitoring watch rotation. This will reduce eye fatigue. No PSO will be assigned a combined watch schedule of more than 12 hours in a 24-hour period.
- A Lead PSO will be designated during every shift. The Lead PSO will be responsible for:
 - Communication with the vessel team, the PSO onshore support team (contractor support team for on duty PSOs) and US Wind compliance personnel. The Lead PSO will communicate with the vessel, survey and/or installation equipment operators in the event that mitigation measures must be implemented.
 - Monitoring the NOAA Fisheries North Atlantic Right Whale Reporting Systems for the presence of right whales. This includes checking the Early Warning System, Sighting Advisory System, and the Mandatory Ship Reporting System.

5.1.1 Equipment

5.1.1.1 PSO Visual Aids

For daytime operations, visual observers will use binoculars with a minimum of 8x or 10x magnification, reticule binoculars that allow for range estimations to be made, and an SLR camera with a zoom lens. All PSOs would be NOAA Fisheries-approved and therefore are trained in the use of the supplied visual monitoring equipment, including performing regular

calibration tests of the reticule binoculars to ensure estimated distances to protected species detected visually is done correctly.

The PSO(s) on duty will also monitor the clearance zone with big eye binoculars (25/40x) from a pedestal-mounted on the deck of the most appropriate vantage point that provides for optimal observation, PSO safety, and safe operation of the vessel. Big eye binoculars have an expected range of 5 – 10 km with environmental condition considerations and species types and groups.

Nighttime operations are only relevant for 24-hour HRG survey operations, if needed. US Wind has not proposed nighttime HRG surveys or pile driving. For nighttime operations, visual observers will use high performance night vision goggles, (i.e., PVS-7 Generation 3 Pinnacle). Observers will also use Nivisys Thermal Acquisition Clip-on System, in addition to handheld infrared light-emitting diode spotlights. Due to the potential for reflectivity from bridge windows that could interfere with the use of the night vision optics, PSOs will be required to make nighttime observations from a platform with no visual barriers.

Standard techniques will be used to calibrate the visual observation equipment. This will include observations of known objects at set distances and under various lighting conditions. This calibration will be performed during mobilization and periodically throughout Project activities.

Technology for visual monitoring is advancing rapidly. Should new equipment become available during the duration of the LOA, US Wind would submit the equipment specifications and plans for use to NOAA Fisheries for review and concurrence that it is as protective or an improvement to equipment described in the Plan.

5.1.2 Recording

PSOs documentation throughout Project operations would be consistent with data required for PSO data in Appendix B to Addendum C of the Lease, pending confirmation by NOAA Fisheries and BOEM. Where applicable, a notation will be included regarding the type(s) of equipment in use during the observations.

5.1.3 Reporting

US Wind will notify NOAA Fisheries prior to commencement of pile driving activities for each of the construction campaigns and will notify NOAA Fisheries at the conclusion of pile driving activities for each construction campaign.

US Wind will provide NOAA Fisheries with an annual report on April 1 every calendar year following the commencement of Project construction and installation activities. A final report will be provided 90 days following the conclusion of Project activities.

PSO reports will include a summary of the raw data pertaining to Project activities, PSO sighting data, any incident reports, and an estimate of the number of listed marine mammals observed and/or taken during the Project activities for the preceding year.

US Wind will ensure that any sightings of injured or dead marine mammals are reported to BOEM, NOAA Fisheries, and the NOAA Fisheries Greater Atlantic (Northeast) Region’s Stranding Hotline (866-755-6622 or current). Sightings will be reported within 24 hours, regardless of whether the injury or death was caused by a vessel. In addition, if the injury or death was caused by a collision with a US Wind vessel, US Wind will notify BOEM and NOAA Fisheries within 24 hours of the strike.

Any sighting of a NARW will be reported to NOAA Fisheries within 24 hours of the observation and reported on the WhaleAlert application.

6.0 Acoustic Monitoring

6.1 Passive Acoustic Monitoring

US Wind anticipates using Passive Acoustic Monitoring (PAM) during Project construction and installation activities which would be conducted by PAM Operators using equipment that can detect all known species in the region using one or a combination of the technologies in Table 6-1.

Specifications of the PAM equipment to be used will be provided to NOAA Fisheries for review prior to the start of Project activities. A list of potential real-time PAM technologies that could be deployed to monitor pile driving activities is provided in Table 6-1. A combination of these technologies will be employed to create a sufficient monitoring field around the installation sites.

The PAM system would be in operation in accordance with the pre-piling clearance timing. Deployment of the PAM system would be around the perimeter of the clearance zone prior to pile driving and sufficient to create an acoustic monitoring field around the installation sites.

Table 6-1. Select Real-Time PAM Technologies

Tools	Pros	Cons
Dip/drop hydrophones	<ul style="list-style-type: none"> Localized area of measurement Hear sounds as recorded 	<ul style="list-style-type: none"> Possibly noise from vessel Can only detect acoustically active individuals Cannot identify individuals
Autonomous gliders	<ul style="list-style-type: none"> Automated and potentially real-time data processing Cover a large geographic area Store data or allow for real-time monitoring Less noisy than towed equipment 	<ul style="list-style-type: none"> Expensive Can only detect acoustically active individuals Cannot identify individuals
Towed arrays/hydrophones	<ul style="list-style-type: none"> Cover a large geographic area Easy to deploy and manage during monitoring 	<ul style="list-style-type: none"> Noise from towing vessel Can only detect acoustically active individuals Cannot identify individuals
Real-time buoys	<ul style="list-style-type: none"> View data immediately upon collection 	<ul style="list-style-type: none"> Stationary monitoring location

Tools	Pros	Cons
		<ul style="list-style-type: none"> • Maintenance costs • Can only detect acoustically active individuals • Cannot identify individuals

* Data adapted from Northeast Fisheries Science Center 2022; Haver et al. 2020; Verfuss et al. 2018; Browning et al. 2017.

PAM operators would monitor hydrophone signals both visually (screen display of sound analysis software) and aurally (using headphones). PAM technicians may be located onshore and/or on a separate vessel than the installation vessel.

7.0 HRG Survey Mitigation Measures

The following mitigation measures will be implemented during HRG surveys. At all times, the PSO team will maintain a minimum of 500 m during HRG operations.

7.1 Monitoring and Shutdown Zone Implementation and Clearance

US Wind will employ a 500-meter clearance zone for all ESA-listed species and a 200-meter clearance zone for non-ESA-listed marine mammals and sea turtles. US Wind will employ a 500-meter (1,640-foot) shutdown zone for NARW and unidentified whales and a 100-meter (328-foot) shutdown zone for all other ESA-listed species to include marine mammals and sea turtles during HRG survey activities. These zones completely encompass the area ensounded to the Level B harassment thresholds for all marine mammals. The greatest distance to the Level B threshold is 32.2 meters (105.6 feet) for the Geo-spark 2000 medium penetration sub-bottom profiler (Table 7-1).

Prior to the initiation of ramp-up procedures (see Section 6.2) for HRG survey activities, the shutdown zone will be assessed to be clear of marine mammals for 60 minutes by PSOs.

Table 7-1. Distances to Level B Threshold (160 dB_{rms} re 1 µPa)

HRG System	Representative Survey Equipment	Distance to Threshold (m) ^a
USBL	Sonardyne Mini Ranger 2 USBL	49.0 ^b
	SBL Wideband Mini Transponder	13.9
	USBL Wideband Nano Transponder	14.5
Shallow-penetration SBP	Innomar SES 2000 Std	0.5
Medium-penetration SBP	Applied Acoustics S Boomer	22.7
	Geo-spark 2000	32.2

^a Calculated using the Associated Level B Harassment Isopleth Calculator (NOAA Fisheries 2020).

^b Following guidance received from NOAA Fisheries, the distance to the Level B threshold for the Sonardyne Mini Ranger 2 USBL was not used for considerations of take. NOAA Fisheries guidance indicated that due to the characteristics and usage of the sound sources, boomers and sparkers are the primary acoustic sources for HRG surveys.

7.2 Ramp Up Procedures

When technically feasible, a "ramp-up" of the electromechanical survey equipment will occur at the start or re-start of HRG survey activities. These procedures will be employed to allow marine mammals in the vicinity of survey activities to vacate the area prior to the generation of maximum sound source levels due to equipment use. Ramp-up will begin with the power of the smallest acoustic equipment for the HRG survey at its lowest power output. When technically possible, power output will then be gradually turned up and other acoustic sources added in such a way that the source level would increase in steps not exceeding 6 dB per 5-minute period. If a marine mammal enters the shutdown zone during ramp-up, this procedure will be delayed until the animal exits the shutdown zone or no further sightings are reported for 15 minutes for small odontocetes and pinniped and 30 minutes for all other species.

7.3 Shutdown and Power-down Procedures

An immediate shutdown of the HRG survey equipment will occur if a non-delphinoid cetacean is sighted at or within the shutdown zone. The vessel operator will comply immediately with such a call by the Lead PSO. Any disagreement or discussion between the Lead PSO and vessel operator will occur only after shut-down. Subsequent restart of the electromechanical survey equipment may only occur following clearance of the shutdown zone (see Section 6.1) and implementation of ramp-up procedures (see Section 6.2).

If a delphinoid cetacean or pinniped is sighted at or within the shutdown zone, HRG survey equipment will be powered down to the lowest power output that is technically feasible. The vessel operator will comply immediately with such a call by the lead PSO, with any disagreement or discussion occurring only after power-down. Subsequent power up of the electromechanical survey equipment will use the ramp-up provisions and may occur after (1) the shutdown zone is clear of delphinoid cetaceans and pinnipeds or (2) a determination by the lead PSO after a minimum of 10 minutes of observation that the delphinoid cetacean or pinniped is approaching the vessel or towed equipment at a speed and vector that indicates voluntary approach to bow-ride or chase towed equipment.

For *Delphinus*, *Stenella*, *Lagenorhynchus*, and *Turiops* (small delphinid genera that are known to bow-ride), the shutdown requirement would be waived. If there is uncertainty regarding the identification of the marine mammal species as one of these exempt species, the PSOs on duty would use their best professional judgement in calling for a shutdown. Shutdown would still be implemented for other delphinids that enter the shutdown zone that are not part of the exempt genera.

If the HRG sound sources shut down for reasons other than encroachment into the shutdown zone by a non-delphinoid cetacean, including reasons such as mechanical or electronic failure, for a period of greater than 30 minutes, restart of the HRG survey equipment will proceed following ramp-up procedures after clearance of the shutdown zone. If the shutdown is less than 20 minutes in duration, the HRG equipment may be restarted as soon as practicable at its operational level as long as visual surveys were continued throughout the silent period and the shutdown zone remained clear of marine mammals. If visual surveys were not continued during a pause of 30 minutes or less, restart of the HRG survey equipment will proceed following ramp-up procedures after clearance of the shutdown zone.

8.0 Mitigation for Foundation Installation using Pile Driving

Mitigation measures for pile driving entail establishment of clearance zones and shutdown zones for the pile driving activity generally using modeled maximum distances based on site conditions, maximum pile diameter and hammer size. The clearance and shutdown zones would be monitored by visual and passive acoustic monitoring methods to confirm marine mammals are not present prior to the start of pile driving and are not within the PTS threshold distances. When the zones are clear and pile driving commences, reduced hammer energy or “soft start” would be used, and should a marine mammal enter an shutdown zone shutdown of the pile driving would be implemented to the extent practicable. This section describes US Wind’s pile driving sound mitigation measures in more detail.

8.1 Monopile Clearance and Shutdown Zones

Monopile installation will be the most frequent foundation installation activity during any of the three construction campaigns. US Wind would establish the clearance zone based on the range to the behavioral threshold for marine mammals (Table 8-1). Shutdown zones would be based on the largest of the PTS regulatory thresholds (Table 8-2). See Sections 8.3 and 8.5 for measures to be taken should a marine mammal enter a clearance or shutdown zone.

Table 8-1. Ranges to behavioral thresholds (Level B) for marine mammals with a 10 dB sound reduction level.¹

Animal Group	Threshold	Range (m)
Marine Mammals	160 dB (L_{rms})	5,250

Calculated using NOAA 2005.

¹ 95th percentile. Modelled for the installation of a single 11-m monopile modeled a May sound velocity profile.

Table 8-2. Ranges to PTS regulatory threshold levels (Level A) for marine mammals with a 10 dB sound reduction level.¹

Marine Mammal Hearing Group	Threshold	Range (m)
Low Frequency Cetaceans	183 dB ($L_{E,LF,24h}$)	2,900
	219 dB ($L_{pk,0-pk,flat}$)	<50
Mid-frequency Cetaceans	185 dB ($L_{E,MF,24h}$)	0
	230 dB ($L_{pk,0-pk,flat}$)	<50
High Frequency Cetaceans	155 dB ($L_{E,HF,24h}$)	250
	202 dB ($L_{pk,0-pk,flat}$)	200
Pinnipeds in Water	185 dB ($L_{E,PW,24h}$)	100
	218 dB ($L_{pk,0-pk,flat}$)	<50

Marine Mammal Hearing Group	Threshold	Range (m)
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Calculated using NMFS 2018.

¹ 95th percentile. Modelled for two hours of pile driving of an 11-m monopile in May.

Clearance and shutdown zones for monopile foundation pile driving are provided in Table 8-3. Distances would be measured from the pile driving location.

Table 8-3 Distances from Monopile Installation for Clearance and Shutdown

Marine Mammal Hearing Group	Clearance Zone	Shutdown Zone
Low Frequency Cetaceans	5,250 m	2,900 m
Mid-frequency Cetaceans		<50 m
High Frequency Cetaceans		250 m
Pinnipeds in Water		100 m

8.2 Skirt Pile Clearance and Shutdown Zones

At most two OSS would be installed in one year as part of the second construction campaign. A maximum of 4 skirt piles for each OSS could be installed in a single day. The maximum PTS regulatory threshold modeled (Table 8-4) based on the cumulative nature of the source level and the potential concentration of driving four piles in one day is therefore greater than the maximum distance to the behavioral threshold (Table 8-5). US Wind would establish the clearance zone at the PTS regulatory threshold prior to driving the first pile. The shutdown zone for low frequency cetaceans would expand by over the course of a single day such that the maximum distance would equate to the Level A maximum threshold for the fourth pile.

Table 8-4. Ranges to PTS regulatory threshold levels (Level A) for marine mammals with a 10 dB sound reduction level.¹

Marine Mammal Hearing Group	Threshold	Range (m)
Low Frequency Cetaceans	183 dB ($L_{E,LF,24h}$)	1,400
	219 dB ($L_{pk,0-pk,flat}$)	<50
Mid-frequency Cetaceans	185 dB ($L_{E,MF,24h}$)	0
	230 dB ($L_{pk,0-pk,flat}$)	<50
High Frequency Cetaceans	155 dB ($L_{E,HF,24h}$)	100
	202 dB ($L_{pk,0-pk,flat}$)	<50

Marine Mammal Hearing Group	Threshold	Range (m)
Pinnipeds in Water	185 dB ($L_{E,PW,24h}$)	50
	218 dB ($L_{pk,0-pk,flat}$)	<50

Calculated using NMFS 2018.

¹ 95th percentile. Modelled for eight hours of pile driving to install four 3-m skirt piles for the OSS jacket foundation in May.

Table 8-5. Ranges to behavioral thresholds (Level B) for marine mammals with a 10 dB sound reduction level.¹

Animal Group	Threshold	Range (m)
Marine Mammals	160 dB (L_{rms})	500

Calculated using NOAA 2005.

¹ 95th percentile. Modelled for eight hours of pile driving to install four 3-m skirt piles for the OSS jacket foundation in May.

Clearance and shutdown zones for skirt pile installation are provided in Table 8-6. Distances would be measured from the pile driving location.

Table 8-6 Distances from Skirt Pile Installation for Clearance and Shutdown

Marine Mammal Hearing Group	Clearance Zone	Shutdown Zone
Low Frequency Cetaceans	5,250 m	1,400 m
Mid-frequency Cetaceans		<50 m
High Frequency Cetaceans		100 m
Pinnipeds in Water		50 m

8.3 Pin Pile Clearance and Shutdown Zones

One Met Tower with three pin piles would be installed for the Project, which is anticipated as part of the second construction campaign. US Wind would establish the clearance zone based on the range to the behavioral threshold for marine mammals (Table 8-7). Shutdown zones would be based on the largest of the PTS regulatory thresholds (Table 8-8).

Table 8-7 Ranges to PTS regulatory threshold levels (Level A) for marine mammals with a 10 dB sound reduction level.

Marine Mammal Hearing Group	Threshold	Range (m)
Low Frequency Cetaceans	183 dB ($L_{E,LF,24h}$)	50
	219 dB ($L_{pk,0-pk,flat}$)	<50
Mid-frequency Cetaceans	185 dB ($L_{E,MF,24h}$)	0
	230 dB ($L_{pk,0-pk,flat}$)	<50
High Frequency Cetaceans	155 dB ($L_{E,HF,24h}$)	0
	202 dB ($L_{pk,0-pk,flat}$)	<50
Pinnipeds in Water	185 dB ($L_{E,PW,24h}$)	0
	218 dB ($L_{pk,0-pk,flat}$)	<50

Calculated using NMFS 2018.

¹ 95th percentile. Modelled for six hours of pile driving to install three 1.8-m pin piles for the Met Tower foundation in May.

Table 8-8 Ranges to behavioral thresholds (Level B) for marine mammals with a 10 dB sound reduction level.¹

Animal Group	Threshold	Range (m)
Marine Mammals	160 dB (L_{rms})	100

Calculated using NOAA 2005.

¹ 95th percentile. Modelled for six hours of pile driving to install three 1.8-m pin piles for the Met Tower foundation in May.

Clearance and shutdown zones for pin pile installation are provided in Table 8-9. Distances would be measured from the pile driving location.

Table 8-9 Distances from Pin Pile Installation for Clearance and Shutdown

Marine Mammal Hearing Group	Clearance Zone	Shutdown Zone
Low Frequency Cetaceans	100 m	50 m
Mid-frequency Cetaceans		<50 m
High Frequency Cetaceans		<50 m

Marine Mammal Hearing Group	Clearance Zone	Shutdown Zone
Pinnipeds in Water		<50 m

8.4 Monitoring of Clearance Zone

- Pile driving would be attempted only when sufficient visual and acoustic monitoring of the relevant clearance zone for that activity (see Sections 8.1 to 8.3) is feasible.
 - Pile driving during daylight hours only unless pile driving that has started must be completed for safety or feasibility considerations (see Section 8.6 for determination of safety and pile feasibility measures).
 - Pile driving, specifically soft-start at the commencement of driving a pile, would not be initiated within 1.5 hours of civil sunset or during conditions of low visibility when the clearance and shutdown zones cannot be effectively monitored.
- The clearance zone would be monitored for a minimum of 60 minutes and the zone must be clear for 30 minutes before beginning soft-start procedure.

8.5 Soft-Start Procedures

- Once clearance zone is confirmed clear of marine mammals, pile driving would begin with minimum hammering at low energy for no less than 30 minutes (soft-start).
- If a marine mammal is detected within the clearance zone, prior or during the soft-start procedure, pile driving would be delayed until the marine mammal exits the clearance zone or is no longer observed after 30 minutes.

8.6 Monitoring Shutdown Zone/Shutdown Procedures

- Pile driving would halt if the shutdown zones cannot be effectively monitored visually, or in the case of the minimum visibility of 2,900 m, cannot be visually and acoustically monitored.
- If a marine mammal is detected in the shutdown zone at any time during pile driving, the Lead PSO would call for an immediate shutdown of pile driving to be implemented unless it is determined not feasible due to safety or technical reasons.
 - The offshore construction manager on duty would assess the safety of crew during a shutdown, whether the pile would be structurally compromised, and whether pile driving could not successfully be completed after shutdown and the process is restarted (clearance zone monitoring and soft-start implementation). If any of these conditions may not be safely met, the offshore construction manager may call for a continuation of pile driving.
- Following a shutdown monitoring of the shutdown zone would continue and pile driving would resume after 30 minutes if the sighted animal has exited the shutdown zone or 30 minutes elapses with no marine mammal in the shutdown zone.

9.0 Communication Protocols

It will be the responsibility of the PSO team to report any visual or acoustic detections via the appropriate communication channels, outlined in the following communication diagram.

At first detection of a protected species in the vessel's path, the PSO notifies the bridge of the animal's presence and distance from the vessel, in person, via VHF radio, or by phone and requests a Vessel Strike Avoidance. During the sighting, the PSO continues to monitor the protected species to continue advising the bridge as to the effectiveness of the Vessel Strike Avoidance. The vessel operator must respond to the requested mitigation if it is safe for the vessel to do so, and the PSO team will document the decision of the vessel operator.

At first detection of a protected species inside its respective shutdown zone, the PSO or PAM Operator immediately notifies the vessel board Party Chief/Project Manager via VHF radio/What's App that a shutdown of operations is required. The Party Chief/Project Manager will assess the ability to safely shutdown and communicate the decision to the PSO/PAM. During the detection, the PSO/PAM Operator will continue to monitor and record ongoing behavior of the detected animal(s). From the time that the protected species is last detected inside the shutdown zone and the proper amount of time has passed, the PSO/PAM Operator informs the vessel-board Party Chief/Project Manager that it is safe to restart operations.

It will be the responsibility of the Lead PSO to report any visual sightings of NARW as well as injured, dead, entangled protected species using the designated reporting forms. The report will immediately be sent to the RPS Project Manager, for review and submission to the regulatory agencies within the required timeframe. The vessel Captain will call USCG on channel 16 to report the detection.

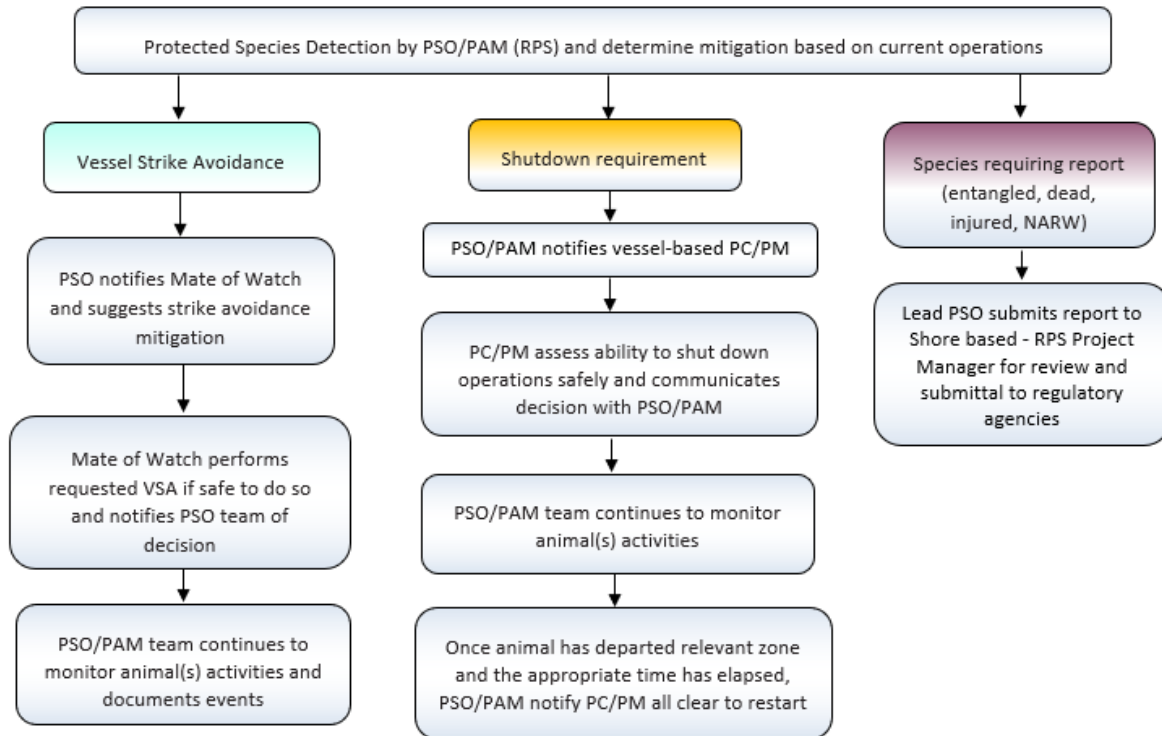


Figure 9-1. Situational communication plan for PSO/PAM Operators deployed on project vessels

10.0 Noise Mitigation Systems

Noise attenuation through deployment of near- and far-field sound attenuation technologies. Near-field sound abatement technologies could include AdBm Technologies Noise Mitigation System and using a damper between the hammer and sleeve to prolong the impact pulse. Far-field technologies could include a large double bubble curtain, deployed by a separate vessel mobilized to the installation location. Implement sound attenuation technologies such as double bubble curtains and nearfield attenuation devices to reduce underwater pile driving noise by 10 dB, with a target of 20 dB, at the source. US Wind conservatively modeled a maximum impact scenario and will require installation contractors to implement layered sound attenuation methods for at least a 12 dB reduction in underwater noise.

11.0 References

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