Addendum to the
Natura Impact Statement

NISA
North Irish Sea Array

Volume 2: Appendices

Appendix A10
Marine Mammal Mitigation Protocol

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Appendix:

Marine Mammal Mitigation Protocol

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Appendices

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Appendix E – ADD evidence base

1. Introduction

North Irish Sea Array Windfarm Ltd (hereafter referred to as 'the Developer') has been considering the Request for Further Information (RFI) issued by An Bord Pleanála (now An Coimisiún Pleanála) as well as the third party submissions received following public consultation. At An Coimisiún Pleanála's behest, the Developer has also continued to consult with stakeholders in respect of the 2024 planning application throughout 2024-2026.

The Developer has refined elements of the design to respond to the third-party submissions, the continued public and stakeholder consultation and the RFI. Amendments are therefore required to Appendix 14.4 Marine Mammal Mitigation Protocol (MMMP) of the 2024 Environmental Impact Assessment (EIAR). Full details of consultation undertaken can be found in Appendix A.1.2 in the Addendum to the EIAR.

For the purposes of clarity, this document shall be read in conjunction with Appendix 14.4 Marine Mammal Mitigation Protocol (MMMP) submitted as part of the 2024 EIAR.

Any cross reference to a chapter, section, table, image, figure or appendix within this document is to another location within the Addendum to the EIAR unless explicitly stated otherwise. Any cross reference to anything included in the 2024 EIAR will be clearly labelled as such.

Text in bold is only used throughout this document to indicate where changes are required, and what is subsequently driving them. Text in italics is text from a section of the 2024 EIAR which is deleted, or quotations from other documents (as explicitly stated). Replacement text is in normal font.

Only tables which have been updated from the 2024 EIAR, or entirely new tables, have been included in the Addendum to the EIAR. These can be identified by the "A" prefix in the caption. Any changes within the updated table, in comparison to tables within the 2024 EIAR, are indicated by grey shading in the relevant cell, column or row, as necessary.

The sections relevant to Appendix A14.5 in the RFI are included below.

RFI Section	RFI	Relevance to Chapter
10 (a) (ii)	The applicant must also consider and draw on the best available technology and thresholds, including as applied in other EU jurisdictions (e.g. Germany; Belgium; Netherlands; Denmark), to identify and provide for suitable noise abatement to reduce the level and extent of potential noise impacts arising from the proposed development. Examples include the German 160 dB re 1 µPa²s SEL_{ss} and 190 dB re 1 µPa SPL_{peak} thresholds that must not be exceeded at a distance of 750m from a piling site; or the frequency	Further information is provided in Appendix E in relation to the best available evidence of the deterrence capabilities of ADDs. It should be noted that due to the design refinements made to the proposed development, removal of monopiles as a foundation option for Project Option 1 and Project Option 2 means that impact piling

	weighted SEL_{cum} PTS thresholds (e.g. harbour porpoise 155 dB re 1µPa^{2}s) that must not be exceeded for a fleeing animal with a starting distance of 200m in Denmark.	is no longer required for wind turbine (WTG) or Offshore Substation Platform (OSP) installation (Refer to Appendix A5.1 Design Refinements).
10 (c)	Further to point a) above, there is a lack of clarity and certainty in the submitted documentation as to whether Acoustic Deterrent Devices (ADD) and Noise Abatement Systems (NAS) will be used, with wording varying across the documentation between 'may' be used and 'will' be used. There is also uncertainty in terms of the efficacy of the mitigation measures that are proposed given proposed future re-modelling based on unknown factors which may or may not have an impact in terms of noise ranges and frequencies (Chapter 14, Table 14.45 of the 2024 EIAR). The applicant is requested to address these issues in the submitted documentation. Such information should also include a consideration of any in-combination effects with surrounding anthropogenic noise sources and estimation of individuals of each species that are likely to be affected. The applicant is requested to address these areas of uncertainty.	Further clarity with regards to the use of Acoustic Detterant Devices (ADDs) and Noise Abatement System (NAS) is provided in this Appendix (A14.5), specifically within Appendix C and D. It should be noted that due to the design refinements, removal of monopiles as a foundation option for Project Option 1 and Project Option 2 means that impact piling is no longer required for WTG or OSP installation. The use of suction buckets to install WTG jackets for Project Option 1 and Project Option 2 means the use of NAS and ADDs is no longer required for WTG installation. This also applies to the OSP, which will be installed with jacket foundations with suction buckets or drilled pin piles.
10 (i)	Chapter 14 of the EIAR and Appendix 14.1 Underwater Noise Modelling Report considers underwater construction noise impacts. The applicant is requested to clarify whether Ultra-short Baseline (USBL) positioning systems will be used during pre-construction surveys. If so, the applicant is requested to include these systems in the assessment.	Additional information regarding USBL has been included in this Appendix A14.5.
10 (o)	The applicant is requested to update the Marine Mammal Mitigation Protocol (MMMP) (Appendix 14.4 of EIAR and Appendix 10 of NIS) to include reference	Please see the TTS Position Statement provided in Appendix A14.4: Temporary Threshold Shift Position Statement, which details

	to temporary threshold shift (TTS), as this may constitute injury under Irish legislation and guidance.	why the Developer does not consider TTS using the current TTS-onset threshold to be auditory injury. As such, TTS is not considered in this Appendix A14.5.
10 (p)	The MMMP states the development will follow standard DAHG (2014) guidelines, however it describes the use of Passive Acoustic Monitoring (PAM) as a form of mitigation under hours of darkness. The guidelines state: 'Pile driving activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible'. The following text is also noted: 'Once an appropriate and effective Ramp-Up Procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 1,000m radial distance of the sound source, i.e., within the Monitored Zone'. According to standard practice, there is no requirement for piling to stop once daylight fades, however if there is a break in pile driving sound output for a period greater than 10 minutes (e.g. due to equipment failure, shut-down or location change), the piling must not resume until daylight hours. Although the proposed development will be able to employ PAM to aid in identifying the presence of cetaceans, to begin before daybreak would constitute a deviation from the DAHG (2014) Guidance. As per DAHG (2014) Guidance, PAM may be used as a supplementary mitigation tool to optimise marine mammal detection, but not as a primary mitigation tool. The applicant is requested to clarify the relevant mitigation measures to be utilised.	This Appendix A14.5 complies with DAHG (2014) guidance. Due to design refinements to the proposed development, removal of monopiles as a foundation option for Project Option 1 and Project Option 2 means that impact piling is no longer required for WTG or OSS installation. As stated in the 2024 MMMP, MMOs will reticule binoculars to estimate distance thus following JNCC methodology. For geophysical surveys, the primary mitigation method used is visual monitoring of the mitigation zone prior to operations commencing as per DAHG (2014). This may be supplemented by PAM, but PAM will not be used as the primary mitigation method. This is because PAM cannot replace an MMO during low visibility conditions or at night but can be used alongside an MMO in good visibility conditions. DAHG guidance does not cover UXO clearance, however this MMMP contains specific UXO mitigation methodology, informed by JNCC (2025).

	It is requested that all elements of the MMMP comply with NPWS (2014) Guidance including: soft start times, delay durations, mitigation zone sizes, and mandatory ramp-up procedures, and defined reporting requirements. Furthermore the use of distance estimation formula should follow the same approach suggested for distance estimation by the Joint Nature Conservation Committee (JNCC) (refer to Marine Mammal Observer Association article on the subject of distance estimation using reticular binoculars for further explanation) and use standard trigonometric equations for calculation.	

1.1 Project Background

There are no changes to this section. Refer to Section 1.1 of the 2024 MMMP.

1.2 Purpose of the Marine Mammal Mitigation Protocol (MMMP)

Following design refinements, the proposed development now excludes monopiles and includes for jacket foundations with suction buckets (hereafter referred to as 'SBJs') for the WTGs and jacket foundations with either suction buckets or drilled pin piles for the OSP. Consequently, piling is no longer included in the construction strategy. Therefore, mitigation measures for pile driving have been removed from the MMMP. Section 1.2 of the 2024 MMMP shall be deleted and replaced with the following:

This Marine Mammal Mitigation Protocol (MMMP) has been prepared for the Developer to support the Environmental Impact Assessment Report (EIAR) and the Natura Impact Statement (NIS) for the Proposed Development.

As highlighted in the EIAR chapter (Chapter 14: Marine Mammal Ecology), and the NIS, , the proposed development identified potential impacts on marine mammals (e.g. cetaceans and seals). Therefore, the purpose of the MMMP is to present mitigation measures to seek to minimise risk of Permanent Threshold Shift (PTS) arising in marine mammals from underwater noise resulting from activities relating to the proposed development. The activities identified as requiring mitigation measures, are:

- Geophysical surveys; and
- Unexploded Ordnance (UXO) clearance.

It is noted that other activities are unlikely to result in PTS to marine mammals. For example, the PTS impact range for drilling, trenching, rock placement and cable laying is <50m for all marine mammal species. While underwater noise modelling has not been conducted for SBJ installation, a review has been undertaken in Appendix A14.1: Underwater Noise Assessment. The expected PTS impacted ranges are negligible, since SBJ installation noise "*barely exceeds background levels*" (Weilgard 2023). For these

activities, it is expected that the presence of the construction vessels will deter marine mammals from the immediate area such that no animals are expected to be at risk of PTS.

The primary aim of this MMMP is to detail measures which are committed to by the Developer to reduce the risk of PTS in hearing of marine mammals. The MMMP is intended to reduce the risk of auditory injury to a negligible level. This MMMP complies with 'Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters' provided by the Department of Arts, Heritage and the Gaeltacht (DAHG 2014). The relevant wildlife groups responsible for marine mammal underwater noise of DAHG are now found within the Department of National Parks and Wildlife Service (NPWS). Whilst the primary purpose of the MMMP is to mitigate PTS in marine mammals, the measures outlined herein will also reduce the risk of Temporary Threshold Shift (TTS) and reduce disturbance ranges for marine mammals, and may also provide secondary mitigation to other marine species.

There are no further changes to this section. Refer to Section 1.2 of the 2024 MMMP.

2. Description of the Project

The key change required in this section is due to the revision of the foundation types for Project Option 1 and Project Option 2. In the 2024 EIAR and MMMP, WTG monopile foundations and OSP monopile and jacket foundations with pin piles were considered. Following further design refinement in response to the RFI, WTGs are now proposed with suction bucket foundations, and OSPs with jacket foundations installed with either pin piles or suction bucket foundations. Therefore, mitigation measures for pile driving have been removed from the MMMP.

The Developer notes that there was an administrative error resulting in incorrect numbering of the sub-sections of Section 2 of the 2024 MMMP. The section numbering has been amended in this report. Any reference to these sections in the 2024 EIAR maintains the original numbering. Section 1.3 of the 2024 MMMP shall be deleted and replaced with the following:

2.1 Scenarios Considered

2.1.1 Project Design Options and Impact Pile Driving

Following further design refinement in response to the RFI, WTGs are now proposed with SBJ foundations, and OSPs with jacket foundations and suction buckets or drilled pin piles. Therefore, mitigation measures for pile driving have been removed from the MMMP.

2.1.2 Geophysical surveys

A series of pre-construction surveys will be undertaken in the array area and along the export cable corridor (ECC). Geophysical surveys will utilise towed equipment and noise-producing surveys planned include side scan sonar (SSS), sub bottom profiler (SBP), multibeam echosounder (MBES), ultra-short baseline (USBL) and magnetometer. It should be noted that, geotechnical surveys are not specifically

included in the consent application under the EIAR and the Developer is able to carry out these works under a Maritime Usage Licence (MUL).

2.1.3 UXO clearance

A detailed geophysical survey has been carried out which allowed the baseline for pUXO target detection. This baseline will be used to update the UXO risk assessment for construction activities. Irrespective of this, a detailed UXO survey will be completed prior to construction. The type, size (net explosive quantities (NEQ)) and number of possible detonations and duration of UXO clearance operations is not known at this stage. Therefore, an illustrative assessment was presented in the EIAR, using a range of UXO charge sizes from 25kg to 525kg.

There are no further changes to this section. Refer to Section 1.3 of the 2024 MMMP.

3. Summary of Relevant Marine Mammal Species

In accordance with RFI 1 (b), further data was analysed and included within Appendix A14.2: Marine Mammal Baseline Characterisation that has been considered in this Appendix revision however, the conclusions in relation to the relevant marine mammal species remain the same, and therefore there are no changes to this section. Refer to Section 2 of the 2024 MMMP.

4. Noise and Vibration Impacts

The key change required in this section is due to the revision of the foundation types for Project Option 1 and Project Option 2. In the 2024 EIAR, WTG monopile foundations and OSP monopile and jacket foundations with pin piles were considered. Following further design refinement in response to the RFI, WTGs are now proposed with suction bucket foundations, and OSPs with jacket foundations installed with either pin piles or suction bucket foundations. Therefore, mitigation measures for pile driving have been removed from the MMMP. The section 3 of the 2024 MMMP shall be deleted and replaced with the following:

Installation of offshore windfarms involve multiple activities that can have direct and indirect impacts on marine fauna. This MMMP details measures to reduce the risk of PTS in hearing, where the hearing sensitivity is reduced after noise exposure, with no hearing recovery in the impacted frequencies. PTS can occur instantaneously or cumulatively (i.e. exposed to the sound source over an extended period). The level of injury depends on the duration, frequency and intensity of the sound source and received level.

Noise exposure criteria are typically represented by dual exposure metrics, including the frequency-weighted cumulative sound exposure level (SEL_{cum}; expressed in decibels (dB) re 1µPa^2s; where both the received level and duration of exposure are accounted for) and the unweighted zero to peak sound pressure level (SPL_{peak}; expressed in dB re 1µPa in water). The ranges relating to SPL_{peak} indicate the distance from the sound source to which an animal can experience instantaneous injury.

As noted in section 1.2, underwater noise and vibration resulting from the following activities are considered here:

- Geophysical surveys; and
- UXO clearance.

Sound waves can propagate in various manners depending on the nature of the sound, the position of the sound source in relation to the water column, bathymetry, and seawater properties. As sound travels through water, it experiences sound attenuation (where sound waves lose amplitude and intensity due to energy loss through a medium). This phenomenon affects high frequency sounds to a greater degree than lower frequencies. Therefore, the risk of auditory injury is reduced with increasing distance from the source.

If an individual is within the SPL_{peak} impact range, they risk immediate onset of a PTS in hearing. If an individual starts fleeing from within the SEL_{cum} impact range at the start of the noise generating activity, then they will accumulate sufficient threshold shift as they flee away from the source to reach the PTS onset level. To limit this risk, the proposed development will follow standard DAHG (2014) guidelines.

Noise modelling has been undertaken by Subacoustech Environmental to assess the potential impacts on marine mammals as a result of UXO clearance within the array area (Appendix A14.1: Underwater Noise Assessment of the EIAR and Appendix A13 of the NIS). Impact ranges for marine mammals were calculated using the NMFS (2024) impulsive criteria. There was no underwater noise modelling undertaken to quantitatively assess injury ranges given the small and non-site-specific impact ranges expected.

There are no further changes to this section. Refer to Section 3 of the 2024 MMMP.

5. Pilling Mitigation Methodology

The change required in this section is in response to the refinement of the foundation installation types for Project Option 1 and Project Option 2 (refer to Appendix A5.1) with WTG jacket foundations being installed with suction buckets and OSP jacket foundations being installed with either drilled pin piles or suction buckets. Therefore, mitigation measures for pile driving and subsequently section 4 of the 2024 MMMP have been removed from the MMMP.

6. Geophysical Survey Mitigation Methodology

6.1 Introduction

In response to RFI Section 10 (i), the only change to this section is the addition of a USBL to the geophysical survey equipment.

Geophysical surveys are non-intrusive and will utilise towed equipment such as SSS, SBP, MBES, USBL and magnetometers to gather detailed information on the bathymetry, seabed sediments, geology, and anthropogenic features (e.g., existing seabed infrastructure, UXO that exist across the array area and ECC).

There are no further changes to this section. Refer to Section 5.1 of the 2024 MMMP.

6.2 Summary of Risk of PTS

In response to RFI 10 (i), the key change to this section is the addition of a USBL to the geophysical survey equipment and publication of updated PTS-onset thresholds and hearing ranges (NMFS 2024). The section 5.2 of the 2024 MMMP shall be deleted and replaced with the following:

6.2.1 SSS and MBES

JNCC (2017) do not advise that mitigation to avoid injury from use of MBES is necessary in shallow (<200m) waters where the MBES used are of high frequencies (as they are planned to be for the proposed development). EPS Guidance (JNCC et al., 2010) for use of SSS states that *"this type of survey is of a short-term nature and results in a negligible risk of an injury or disturbance offence (under the Regulations)."* An equivalent conclusion was reached by DECC (2011). Furthermore, a recent comprehensive assessment of the characteristics of acoustic survey sources proposed that MBES and SSS should be considered de minimis in terms of being unlikely to result in PTS to marine mammals or behavioural disturbance under the 160dB re 1µPa (rms) threshold adopted in the United States (Ruppel et al., 2022). Therefore, the risk of injury from MBES and SSS to all marine mammals is concluded to be negligible.

6.2.2 SBP

For minke whale, seals and dolphins, the source levels of SBP equipment are below the PTS-onset thresholds. As such, there is no risk of PTS onset to minke whale and any dolphin or seal species from the use of this equipment and the magnitude of impact is assessed as negligible.

For harbour porpoise, the predicted SBP source levels exceed the PTS-onset threshold and as such, the use of this equipment has the potential to cause PTS. However, results for SBPs have indicated that PTS onset is likely to occur within a small area directly around the source, with one study estimating that PTS could arise between 17–23 m from the use of this equipment at source levels of 267dB re 1µPa (SPL_{peak}) (BEIS, 2020).

6.2.3 USBL

For minke whale, seals and dolphins, the source level of USBL equipment is below the PTS-onset thresholds. As such, there is no risk of PTS onset to minke whale and any dolphin or seal species from the use of this equipment and the magnitude of impact is assessed as negligible.

For harbour porpoise, the predicted USBL source levels exceed the PTS-onset threshold and as such, the use of this equipment has the potential to cause PTS. A recent sound source verification exercise in the Danish North Sea reported measured noise levels from several active acoustic sources at sampling stations with closest points of approach of 0m, 100m and between 500m and 2km (Pace et al. 2021). In the study, Pace et al. (2021) reported noise levels for a USBL operating at 25-40kHz attached to a SSS operating at a dual 300/600kHz frequency, the latter being above the recording capabilities of the noise loggers used. The effective source level was estimated as 184dB re 1µPa^2 @1m (SPL_{rms}). At 100m distance, broadband received levels in the 20-30kHz band were 147.9dB re 1µPa^2 (SPL_{rms}). The USBL appeared omnidirectional

with an estimated transmission loss of c.15logR. When the USBL was active, the combined source was detectable above background noise at the maximum recording distance of 2km; however, at a distance of c. 1km from the source, broadband received levels were ≤140dB re 1µPa^2 (SPL_{peak}), ≤130dB re 1µPa^2 (SPL_{peak}), and application of VHF cetacean (harbour porpoise) frequency weighting indicated noise levels of <120dB re 1µPa^2 (SPL_{peak}, VHF frequency-weighted). These results illustrate no potential for instantaneous PTS-onset from the USBL source tested. While there is potential for the USBL to be operated at a theoretical source level which exceeds the minimum threshold for instantaneous injury in harbour porpoise by up to 2dB, such noise levels are unlikely to be realised. The noise levels from the USBL are expected to rapidly attenuate with distance from the source, even when assuming an omnidirectional source.

There are no further changes to this section. Refer to Section 5.2 of the 2024 MMMP.

6.3 Mitigation Zone

In response to RFI Section 10 (i), the key change to this section is the addition of a USBL to the geophysical survey equipment. The section 6.3 of the 2024 MMMP shall be deleted and replaced with the following:

The mitigation zone is dependent on the specification/type of equipment and impact range of injury for the most sensitive marine mammal and the location of the survey. Based on the assessment, the maximum range for injury (PTS onset) from SBP and USBL is significantly smaller than the 500m mitigation zone advised within DAHG (2014) guidance (for acoustic surveying: multibeam, single beam, side-scan sonar & sub-bottom profiler surveys), and thus a 500m mitigation zone is more than sufficient.

There are no further changes to this section. Refer to Section 56.3 of the 2024 MMMP.

6.4 Pre-watch Monitoring

6.4.1 Marine Mammal Observers (MMO)

There are no changes to this section. Refer to Section 5.4.1 of the 2024 MMMP.

6.4.2 Passive Acoustic Monitoring (PAM)

There are no changes to this section. Refer to Section 5.4.2 of the 2024 MMMP.

6.5 Soft-Start Procedure

There are no changes to this section. Refer to Section 5.5 of the 2024 MMMP.

6.6 Delay of Operations

There are no changes to this section. Refer to Section 5.6 of the 2024 MMMP.

6.7 Breaks in Operations

There are no changes to this section. Refer to Section 5.7 of the 2024 MMMP.

6.8 Line Changes

There are no changes to this section. Refer to Section 5.8 of the 2024 MMMP.

6.9 Data Collection and Reporting

There are no changes to this section. Refer to Section 5.9 of the 2024 MMMP.

6.10 Communications

There are no changes to this section. Refer to Section 5.10 of the 2024 MMMP.

7. UXO Mitigation Methodology

7.1 Introduction

The only change required to this section is the deletion of a typo. Therefore, the following sentence at the end of Section 6.1 will be deleted and will not be replaced:

A summary of mitigation measures included in this section is presented in Appendix 3.

There are no further changes to this section. Refer to Section 6.1 of the 2024 MMMP.

7.2 Summary of PTS Risk

In response to RFI Section 10 (g), the key changes for this section are the replacement of the Southall et al. (2019) auditory injury thresholds and hearing ranges used in the 2024 EIAR with the more up to date NMFS (2024) auditory thresholds and hearing ranges. The section 6.2 of the 2024 MMMP shall be deleted and replaced with the following:

Table A7-1 summarises the impact ranges for the marine mammals for low-order UXO clearance and for the highest charge weight considered for high-order UXO clearance. The Developer has committed to the use of NAS (e.g., bubble curtain or similar) in the unlikely event that high-order UXO clearance is required.

Additionally, to reduce in-combination impacts on the Rockabill and Dalkey Island SAC, the Developer has committed not to carry out any high-order detonations at the same time that Codling Wind Park undertakes high-order detonations within its ECC.

Table A7-1 shows the potential PTS impact radius for harbour porpoise (VHF) of up to 990m for low-order clearance and up to 4.6km for high-order clearance of a 525kg UXO with at-source noise reduction (e.g., bubble curtain). For all other marine mammal species, the maximum predicted PTS impact range is 130m for low-order clearance and 950m for high-order clearance of a 525kg UXO with at source noise reduction e.g. bubble curtain.

Table A7-1 Summary of the auditory injury (PTS-onset) impact ranges for UXO detonation using the impulsive, weighted SEL_{ss} and unweighted SPL_{peak} noise criteria from NMFS (2024) for marine mammals (at-source noise reduction, for example bubble curtain) (Replaces Table 6-1 in the 2024 MMMP).

NMFS (2024)	PTS (weighted SEL_{ss})				PTS (unweighted SPL_{peak})			
	LF 183dB	HF 193dB	VHF 159Db	PCW 183dB	LF 222dB	HF 230dB	VHF 202dB	PCW 223dB
Low order (0.25 kg)	130 m	< 50 m	170 m	< 50 m	130 m	60 m	**990 m**	110 m
25 kg +donor + at-source noise reduction	210 m	< 50 m	260 m	< 50 m	210 m	100 m	**1.6 km**	190 m
55 kg +donor + at-source noise reduction	310 m	< 50 m	360 m	70 m	280 m	120 m	**2.1 km**	250 m
120 kg +donor + at-source noise reduction	460 m	< 50 m	490 m	100 m	360 m	160 m	**2.8 km**	330 m
240 kg +donor + at-source noise reduction	640 m	< 50 m	630 m	130 m	460 m	200 m	**3.5 km**	410 m
525 kg +donor + at-source noise reduction	950 m	< 50 m	820 m	190 m	600 m	260 m	**4.6 km**	540 m

7.3 Acoustic Deterrent Device (ADD)

In response to RFI Section 10 (a) (i), the key change for this section is the commitment from the Developer to use Noise Abatement Systems (NAS) (e.g. bubble curtain or similar) during any high-order UXO clearance. The section 6.4 of the 2024 MMMP shall be deleted and replaced with the following:

Pre-clearance ADD deployment is not necessary for low-order clearance as the maximum injury range of 990m can be effectively monitored by MMO and PAM within the 1km mitigation zone thus reducing the risk of injury to negligible.

If high-order clearance is required, the predicted PTS impact ranges for harbour porpoise exceed the 1km mitigation zone even with the use of at-source noise reduction (e.g. bubble curtain). Therefore, an ADD will be operated for a pre-determined length of time, concurrent to the pre-detonation search, to deter marine

mammals to a greater distance prior to any detonation. For the site specific UXO clearance activities, it will be necessary to operate the ADD for different durations according to the UXO disposal method used, UXO/charge size, and associated predicted impact ranges.

Activation of the ADD should overlap with the pre-clearance watch which will be extended to allow a 30minute search prior to the ADD being switched on. If a delay in detonation is required due to an animal being present within the mitigation zone and the ADD is being used, the ADD should remain active for the duration of the delay; however, if the delay is expected to be greater than one hour, the MMO should switch the ADD off to reduce unnecessary noise being emitted into the marine environment. If the ADD is switched off, it must be re-activated for the full duration required prior to the rescheduled detonation.

There are no further changes to this section. Refer to Section 6.4 of the 2024 MMMP.

7.4 Mitigation Zone and Pre-watch Monitoring

There are no changes to this section. Refer to Section 6.3 of the 2024 MMMP.

7.5 Noise Abatement

In response to RFI Section 10 (a) (i), the key change for this section is due to the commitment from the Developer to a NAS (e.g. bubble curtain or similar) for any high-order UXO clearance. The section 6.5 of the 2024 MMMP shall be deleted and replaced with the following:

The Developer has committed to a NAS (e.g. bubble curtain or similar) in the unlikely event that high-order UXO clearance is required.

There are no further changes to this section. Refer to Section 6.5 of the 2024 MMMP.

7.6 Technical Delays in operation

There are no changes to this section. Refer to Section 6.6 of the 2024 MMMP.

7.7 Post-detonation Search

There are no changes to this section. Refer to Section 6.7 of the 2024 MMMP.

7.8 Data Collection and Reporting

There are no changes to this section. Refer to Section 6.8 of the 2024 MMMP.

7.9 Communications

There are no changes to this section. Refer to Section 6.9 of the 2024 MMMP.

8. References

The following references are added to Section 7;

Bellmann, M., A. May, T. Wendt, S. Gerlach, P. Remmers, and J. Brinkmann. 2020. Underwater noise during percussive pile driving: Influencing factors on pile-driving noise and technical possibilities to comply with noise mitigation values. itap GmbH, Oldenburg.

Benhemma-Le Gall, A., P. Thompson, N. Merchant, and I. Graham. 2023. Vessel noise prior to pile driving at offshore windfarm sites deters harbour porpoises from potential injury zones. Environmental Impact Assessment Review 103:107271.

Brandt, M. J., C. Hoeschle, A. Diederichs, K. Betke, R. Matuschek, S. Witte, and G. Nehls. 2013b. Far-reaching effects of a seal scarer on harbour porpoises, *Phocoena phocoena*. Aquatic Conservation-Marine and Freshwater Ecosystems **23**:222-232.

Kastelein, R. A., S. Van de Voorde, and N. Jennings. 2018. Swimming Speed of a Harbor Porpoise (*Phocoena phocoena*) During Playbacks of Offshore Pile Driving Sounds. Aquatic Mammals 44:92-99.

NMFS. 2024. Update to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0): Underwater and In Air Criteria for Onset of Auditory Injury and Temporary Threshold Shifts.

Pace, F., C. Robinson, C. E. Lumsden, and S. B. Martin. 2021. Underwater Sound Sources Characterisation Study: Energy Island, Denmark. Document 02539, Version 2.1. Technical report by JASCO Applied Sciences for Fugro Netherlands Marine B.V.:152.

Phillips, B., A. Roberts, L. Buckland, S. Canning, A. Goulding, S. Mendes, A. Prior, R. De Silva, S. Stephenson, and T. McGarry. 2025. Evidence base for application of Acoustic Deterrent Devices (ADDs) as marine mammal mitigation (Version 5). JNCC Report 615. JNCC, Peterborough. ISSN 0963-8091.

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Appendix A: Pile driving mitigation procedure summary

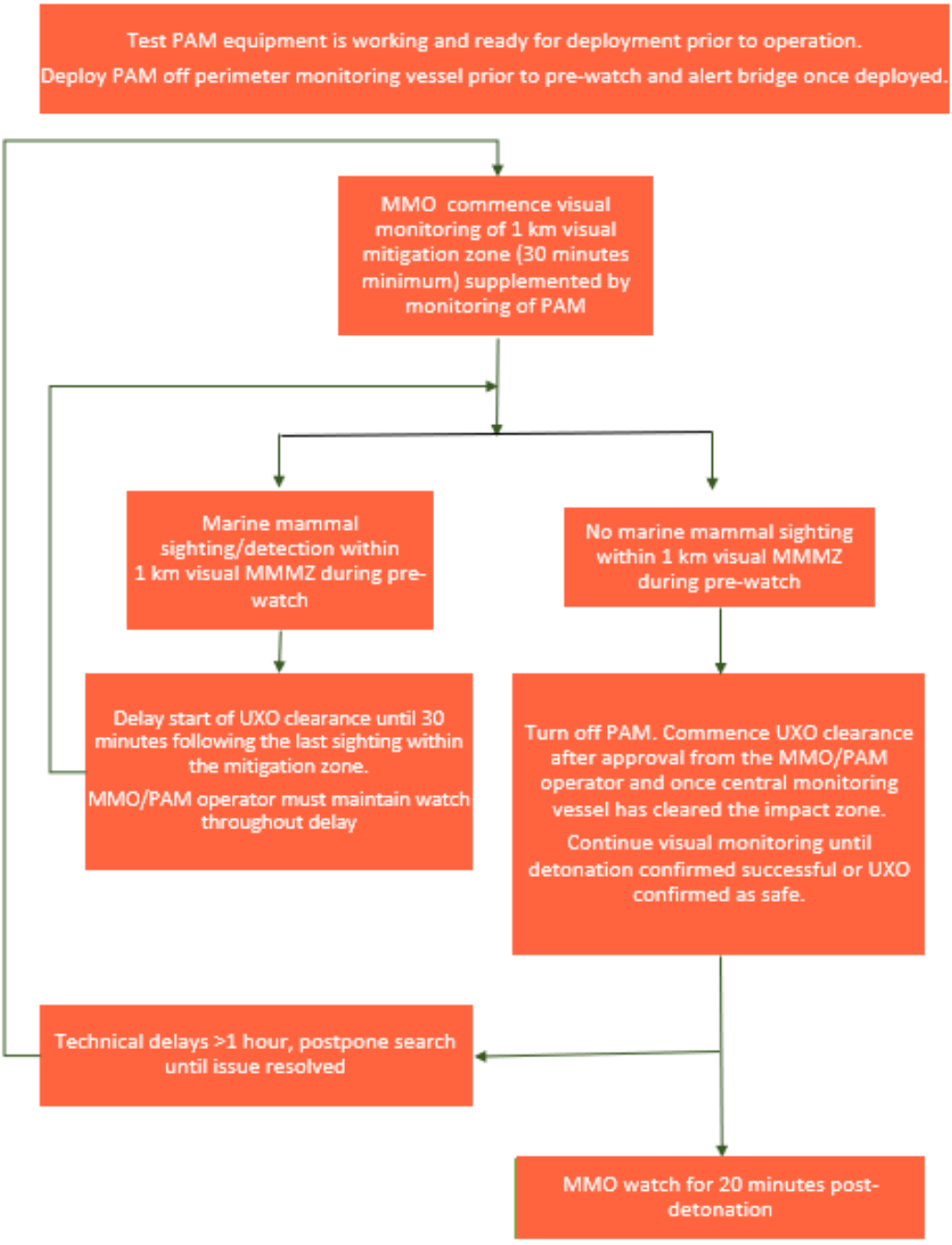
The change required in this section is in response to the refinement of the foundation installation types for Project Option 1 and Project Option 2 (refer to Appendix A5.1) with WTG jacket foundations being installed with suction buckets and OSP jacket foundations being installed with either drilled pin piles or suction buckets. Therefore, pile driving has been removed from the 2024 MMMP and Appendix A of the 2024 MMMP can be disregarded.

Appendix B: Geophysical survey mitigation procedure summary (replaces Appendix B in the 2024 MMMP)

There are no changes to this section. Refer to Appendix B of the 2024 MMMP.

Appendix C: Low-Order UXO mitigation procedure summary (replaces Appendix C in the 2024 MMMP)

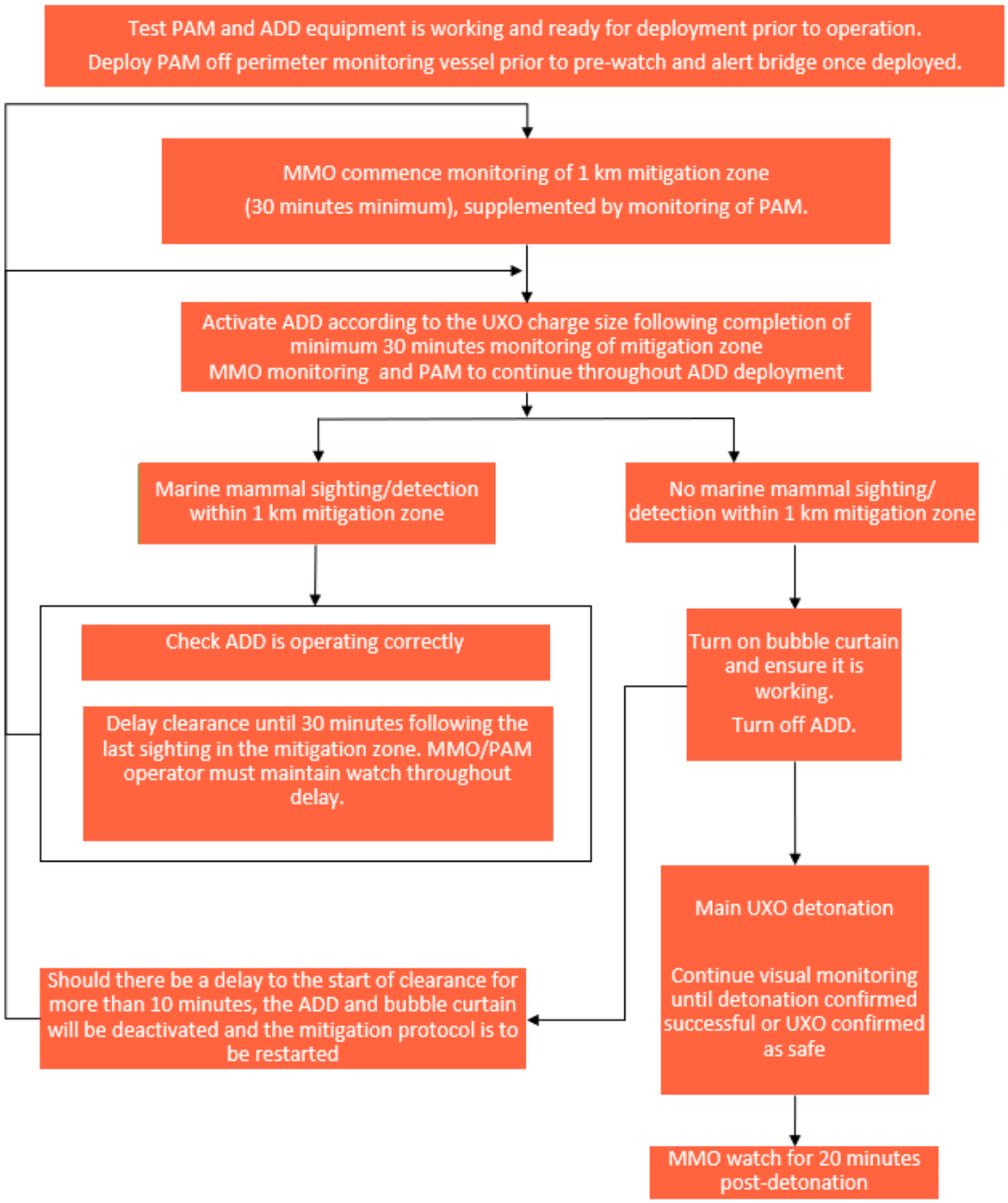
In response to RFI Section 10 (c) and 10 (p), Appendix C in the 2024 MMMP shall be updated. As a result of the low-order method, ADD deployment is no longer required for low-order clearance as the maximum injury range of 990m can be effectively monitored by MMO and PAM within the 1km mitigation zone. Therefore, Appendix C of the 2024 MMMP shall be deleted and replaced with Appendix C.



Appendix D: High-Order UXO mitigation procedure summary

In response to RFI Section 10 (c), the key change for this section is the commitment from the Developer to use a NAS (e.g., bubble curtain) for any high-order clearance. Therefore, Appendix C of the 2024 MMMP shall be deleted and replaced with Appendix D.

Appendix D: High-Order UXO mitigation procedure summary (replaces Appendix C in the 2024 MMMP). This procedure summary assumes the NAS is a bubble curtain (as an example). This will need to be modified for any other at-source noise reduction methods.



Appendix E: ADD evidence base

In response to RFI Section 10 (a) (ii), this section has been added to the MMMP to provide evidence on the deterrence capabilities of ADDs, to ensure their effectiveness at deterring harbour porpoise out of the PTS impact range for high-order UXO clearance activities.

In the German North Sea, an array of CPODs was used to test the effectiveness of Lofitech devices for deterring harbour porpoise (Brandt et al. 2013b). The extent of deterrence was measured by recording porpoise vocalisations up to 7.5km from the Lofitech deployment site. Ten trials were conducted, where each trial collected four hours of acoustic detections, in conjunction with an active ADD. During the 40 hours of collected data, there was a significant decline in porpoise detections. Within 750m, detections of porpoise declined by 86% when the ADD was active. Furthermore, declines in porpoise detections were significant up to 7.5km from the ADD source (Figure A0-1).

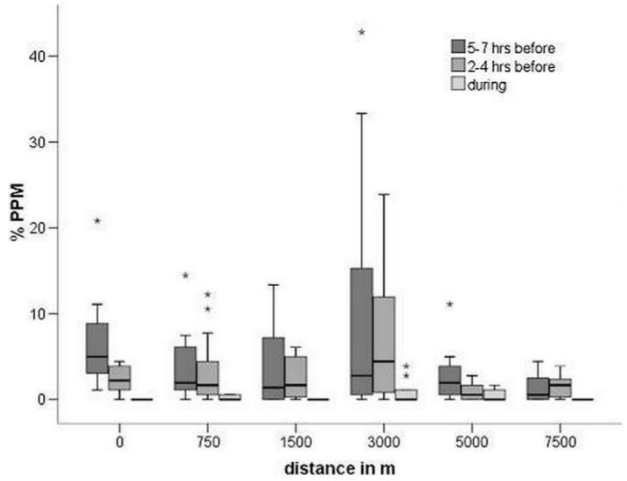


Figure A0-1 Percentage of porpoise positive minutes recorded before and during Lofitech trials at various distances (Brandt et al. 2013b).

In addition to acoustic monitoring, visual aerial surveys were conducted to identify changes in harbour porpoise presence during ADD activation. The average density fell to 0.3 porpoise/km^2 when the Lofitech device was activated, where baseline density estimates were 2.4 porpoise/km^2, over the 990km^2 study area (Figure A0-2). To determine the duration of deterrence caused by ADDs, Brandt et al. (2013b) compared harbour porpoise detections before Lofitech activation, and after the device was switched off. Porpoise detection rates were significantly lower up to six hours after devices were switched off, and after 7-9 hours, no significant difference was detected.

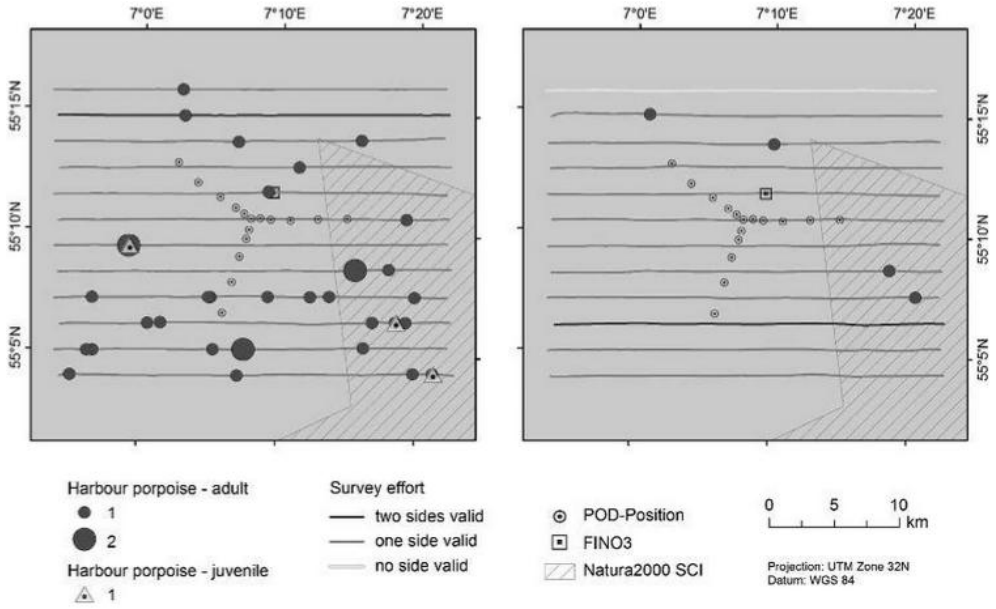


Figure A0-2 Harbour porpoise aerial sightings before (left) and during (right) Lofitech activation (Brandt et al. 2013b).

Brandt et al. (2013a) conducted further visual surveys to determine the responses of harbour porpoises to Lofitech ADDs (Figure A0-3 and Figure A0-4). In Danish waters, devices were active for four continuous hours, with seven trials in total, leading to 28hours of collected data. Sighting rates of harbour porpoise significantly declined up to 1km from the active Lofitech device, which was associated with a minimum sound level of 129dB re 1µPa RMS. Upon activation of the ADD, the mean number of porpoises detected during a scan decreased from 0.86 to 0.01. While Lofitech trials in German waters observed avoidance up to 7.5km from the device, in Danish waters avoidance was detected at a maximum of 2.4km from the ADD. However, due to differences in water depth, the sound level at the offshore German site (119dB re 1µPa) and the more coastal Danish site were comparable. Porpoise avoidance behaviour occurred immediately upon device activation, with average swim speeds recorded at 1.6m/s. Visual observations confirmed porpoises within a 1km radius of the device, on average 51minutes after the device was de-activated.

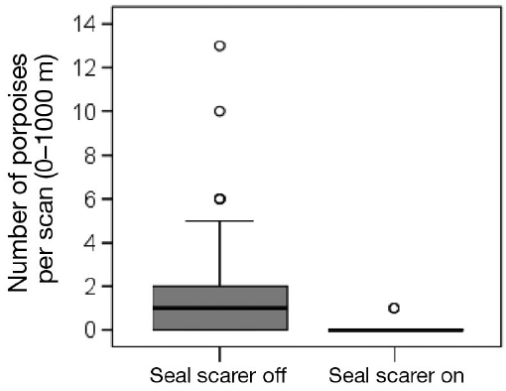


Figure A0-3 Number of harbour porpoises seen during scans when the Lofitech device was active and inactive (Brandt et al. 2013a).

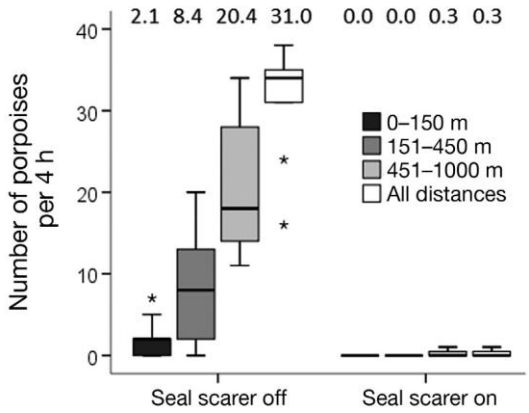


Figure A0-4 Harbour porpoises sightings rates when the Lofitech device was active and inactive over a range of distances (Brandt et al. 2013a).

ADDs were deployed (typically for 15 minutes) prior to piling to mitigate potential near-field injury impacts to harbour porpoise at the Beatrice Offshore Wind Farm, and a study of their effectiveness at this site is presented in Graham et al. (2019). They showed that there was a 50% chance of porpoise response out to 5.3km (95% CI: 3.1 – 7.8 km) from piling with prior ADD activation (Figure A0-5).

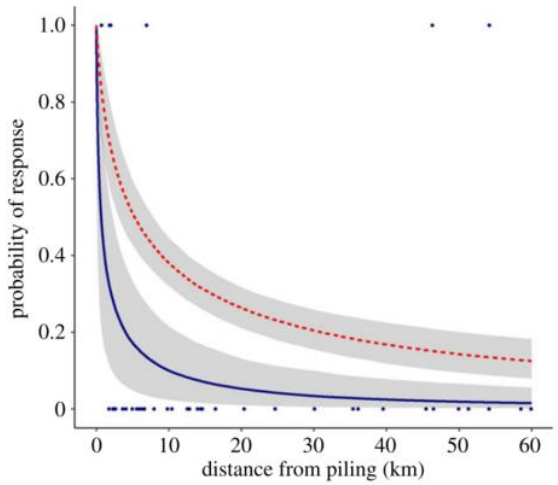


Figure A0-5 The probability of a harbour porpoise response (12 h) in relation to the partial contribution of distance from piling with (dashed red line) and without (solid navy line) the use of the ADD prior to piling (Graham et al. 2019).

The recent review of the evidence base of the application of ADDs as marine mammal mitigation (Phillips et al. 2025) states that the Lofitech seal scarer has the potential for disturbance at 7km for harbour porpoise, with a high confidence evidence score. The Ace Aquatec: Midfrequency Acoustic Startle Response Device is stated to have the potential for exclusion up to 6km for harbour porpoise, with a high confidence evidence score. The Gael Force: SeaGuard seal deterrent is stated to have the potential for deterrence up to 3.5km for harbour porpoise, with a high confidence evidence score.