MORAY OFFSHORE WINDFARM (WEST) LIMITED

Addendum to existing EPS Risk Assessment for UXO clearance (LMB Mine UXO)

Document Name: 8460005-DG0207-MWW-REP-000005

Revision: 1

Status: Final

Date: 17-07-2023

Version Control				
Revision	Date	Status	Revision Description	Distribution List
0	14-07-2023	Draft	Submission to Moray West for review	Moray West
1	17-07-2023	Final	Submission to MD-LOT	MD-LOT

Document Approval			
Prepared by:	Review by:	Approved by:	Approved by:
RHDHV	RHDHV	[Redacted] (Moray West Development Manager)	[Redacted] (Moray West Project Director)

1 Contents

Executive Summary

In order to safely undertake unexploded ordnance (UXO) clearance at the Development Site, a European Protected Species (EPS) Licence is required. An application for a licence to disturb or injure marine EPS has been applied for and issued by the Marine Directorate Licensing Operations Team (MD-LOT). This Risk Assessment (Document: 8460005-DG0207-MWW-REP-000002) was submitted in support of the EPS Licence application submitted by Moray West for UXO clearance and the use of acoustic deterrent devices (ADDs).

A Licence to Injure Marine Species and Disturb Marine Species (EPS/BS-00010265) was issued on the 30 March 2023. This licence was valid from 31 March 2023 to 31 May 2023 and through a variation (EPS/BS-00010363) now extends to 31 August 2023 and covers the clearance of up to 30 UXO using high-order or low-order (deflagration) clearance in either the Moray West Offshore Wind Farm Site or OfTI Corridor. A separate EPS Licence (EPS/BS-00010423), which is also valid until the 31 August 2023, was issued by MD-LOT on 9 June 2023 and covers the clearance by deflagration only of up to 51 UXOs.

An additional UXO (LMB Mine) of 705 kg NEQ has been identified through recent boulder clearance works by a Remotely Operated Vehicle (ROV). This UXO is located 11m from the export cables within the OfTI Corridor which overlaps with the Southern Trench Nature Conservation Marine Protected Area (NCMPA).

The identification of this additional UXO that requires clearance, has led to the potential duration of the clearance activities being extended and an increase in the maximum size of UXO that was assessed in the previous application. As such, further assessment has been undertaken to update the potential worst case effects for the for low-order clearance using deflagration taking in to account the increased UXO size and the timing and duration of the works.

A variation of the EPS Licence (EPS/BS-00010363) is required to cover the following:

- One UXO clearance close to the export cables using low-order (deflagration) clearance in September 2023.

The findings from this risk assessment are in line with those assessed in the original UXO EPS Risk Assessment (Document: 8460005-DG0207-MWW-REP-000002), thus, no changes to mitigation outlined in the MMMP (Appendix B of Document: 8460005-DG0207-MWW-REP-000002) are required.

The mitigation strategy is outlined in Section 3 of this document.

1 Introduction

The purpose of this addendum is to provide further information for the application of a license variation to the existing EPS Licence (EPS/BS-00010363) (European Protected Species Risk Assessment (document reference: 8460005-DG0207-MWW-REP-000002)).

This addendum is specifically for the LMB UXO identified 11m from the export cables within the OfTI Corridor which overlaps with the Southern Trench NCMPA. The map in Figure 1 shows where the LMB UXO is located within the OfTI Corridor and Table 1 summarises the new UXO item.

In light of the recent findings of the additional large UXO, it is now anticipated that the clearance works could be extended to the end of September 2023 (accounting for weather downtime), not 31st May 2023 as covered in previous application and current licence.

Table 1: Summary of additional UXO

Count	UXO item	NEQ (kg)	Ferrous mass (kg)	Dimensions
1	Luftmine B (LMB) magnetic influence mine	705	14	2.64 m long x 635 mm wide

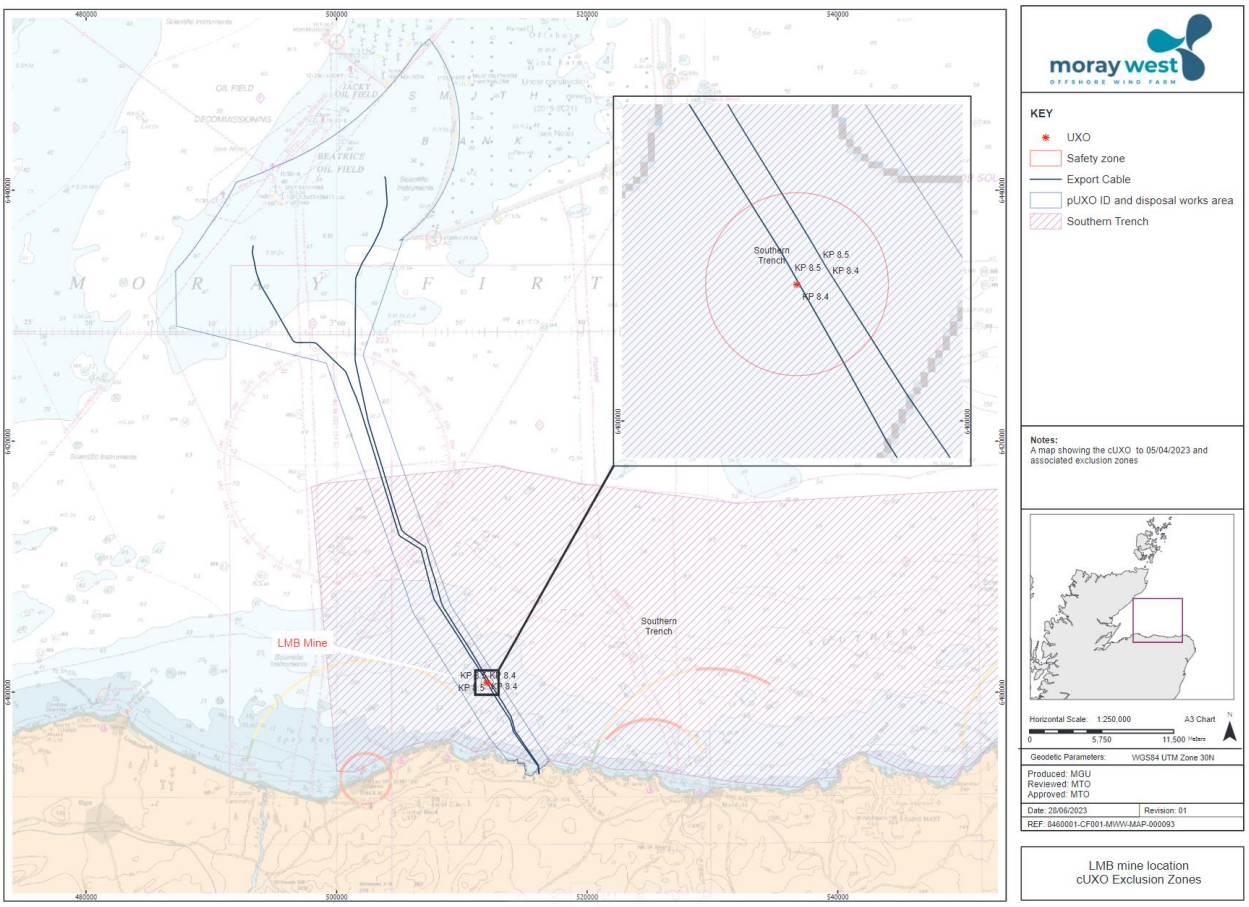


Figure 1: Map showing the findings of the confirmed and pending UXO at Moray West (dated 13th July 2023)

2 Low-Order Clearance

Deflagration is an alternative technique to high-order clearance, which results in a 'low-order' burn of the explosive material in a UXO using a small donor charge, this destroys but does not detonate the internal explosive material of the UXO. The LMB UXO device located within the OfTI Corridor cannot be moved or left in-situ, therefore low-order clearance using deflagration represents the best-case scenario in respect to environmental effects.

A risk assessment for low-order clearance with a donor charge of 0.15kg has been assessed for all marine mammals for a single clearance event and three attempts in a 24-hour period.

Using low-order clearance (deflagration) for the LMB UXO would be less than the worst-case high-order impact ranges for marine mammals previously assessed.

The MMMP (document reference: 8460005-DG0207-MWW-REP-000002; Appendix B) outlines the mitigation measures to reduce the risk of PTS in marine mammals which could result in a residual impact of **minor (not significant)** and also reduce the number of animals at potential risk of TTS.

The mitigation procedures as outlined in the MMMP (document reference: 8460005-DG0207-MWW-REP-000002; Appendix B) and Section 3 of this document include:

- the establishment of a mitigation zone of 1 km;
- the monitoring of the mitigation zone by dedicated and trained MMOs during daylight hours and when conditions allow suitable visibility, pre- and post-clearance;
- the deployment of PAM devices, if required, and if the equipment can be safely deployed and retrieved;
- the activation of ADD;
- Clearance to take place in daylight and, when possible, in favourable conditions with good visibility (sea state 3 or less); and
- UXO clearance will be undertaken by specialist contractors, using the minimum amount of donor charge required in order to achieve safe disposal of the device (150 gr).

2.1 Marine mammal species at risk

The potential impacts for low-order clearance with a donor charge of 0.15kg has been assessed for all marine mammals based on the density and abundance of the cetacean species which regularly occur in the Moray Firth, as used in previous assessments and summarised in Table 2. Reference population for harbour porpoise is the North Sea (NS) management unit (MU), reference population for bottlenose dolphin is the Coastal East Scotland (CES) MU, and the reference population for common dolphin, white-beaked dolphin and minke whale is Celtic and Greater North Seas (CGNS) MU (IAMMWG, 2023; Table 2).

Table 2: Density and abundance estimates for cetacean species regularly occurring in the Moray Firth			
Species	**Density estimates (individuals/km²)**	**Estimated population abundance in the relevant MU**	**References**
Harbour porpoise	1.468	346,601 (NS MU)	Moray West (2018); IAMMWG (2023)
Bottlenose dolphin	0.0037	224 (CES MU)	Hammond *et al*. (2021); Arso Civil *et al*. (2021); IAMMWG (2023)
White-beaked dolphin	0.123	43,951 (CGNS MU)	Waggitt *et al*. (2019); IAMMWG (2023)
Common dolphin	0.074	102,656 (CGNS MU)	Hammond *et al.* (2021); IAMMWG (2023)
Minke whale	0.023	20,118 (CGNS MU)	Waggitt *et al*. (2019); IAMMWG (2023)
		383 (Moray Firth population)	Based on SCANS-III Survey Block S; Hammond *et al*. (2017)

2.2 Assessment of potential risk to marine mammals

2.2.1 Potential for PTS due to Deflagration Clearance

The maximum predicted impact ranges for permanent change in hearing sensitivity / auditory injury (Permanent Threshold Shift (PTS)) in harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale from underwater noise from 0.15kg donor charge for clearance of the large (705kg) UXO using deflagration, are presented in Table 3 based on the underwater noise modelling for single event and three attempts in a 24 hour period.

Table 3: The maximum predicted impact ranges (km) and areas (km²) for PTS in marine mammals, based on the underwater noise modelling for low-order deflagration using a 0.15 kg donor charge (single event and three attempts in 24 hour period)			
Species	**PTS Criteria and Threshold (Southall *et al*., 2019)**	**0.15 kg Single event**	**0.15 kg Three attempts in 24 hour period**
Harbour porpoise (VHF)	PTS SPL_{peak} 202 dB re 1 µPa Unweighted Impulsive criteria	0.885 km (2.46 km²)	
	PTS SEL 155 dB re 1 µPa²s Weighted Impulsive criteria	0.267 km (0.22 km²)	0.548 km (0.94 km²)

Table 3: The maximum predicted impact ranges (km) and areas (km^2) for PTS in marine mammals, based on the underwater noise modelling for low-order deflagration using a 0.15 kg donor charge (single event and three attempts in 24 hour period)			
Species	**PTS Criteria and Threshold (Southall *et al.*, 2019)**	**0.15 kg Single event**	**0.15 kg Three attempts in 24 hour period**
Bottlenose dolphin, white-beaked dolphin and common dolphin (HF)	PTS SPL_{peak} 230 dB re 1 µPa Unweighted Impulsive criteria	0.051 km (0.0082 km^2)	
	PTS SEL 185 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.002 km (0.000013 km^2)	0.006 km (0.00011 km^2)
Minke whale (LF)	PTS SPL_{peak} 219 dB re 1 µPa Unweighted Impulsive criteria	0.157 km (0.077 km^2)	
	PTS SEL 183 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.069 km (0.015 km^2)	0.159 km (0.079 km^2)

2.2.1.1 PTS assessment for 0.15kg donor charge for deflagration of 705kg UXO (single)

The maximum number of harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale that potentially be at risk of PTS from deflagration using 0.15kg donor charge (single event), based on the maximum potential PTS impact areas (Table 3) are presented in Table 4**.**

The magnitude for harbour porpoise has been assessed as low, and for bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale has been assessed as negligible for the PTS SPL_{peak} and weighted SEL criteria (Table 4), without proposed mitigation outlined in Section 3.

Table 4: The maximum number of marine mammals that could be at risk of PTS from low-order clearance using a 0.15kg donor charge (single event)			
Species	**PTS criteria and maximum impact area**	**Maximum number of animals and % of reference population based on maximum potential impact area**	**Magnitude**
Harbour porpoise	PTS SPL_{peak} (2.46 km^2)	3.61 harbour porpoise (0.00104% of North Sea MU) based on site survey density 1.468/km^2	Low magnitude (i.e. 0.001% to 0.01% of the North Sea MU reference population anticipated to be exposed to the permanent impact).

Table 4: The maximum number of marine mammals that could be at risk of PTS from low-order clearance using a 0.15kg donor charge (single event)			
Species	**PTS criteria and maximum impact area**	**Maximum number of animals and % of reference population based on maximum potential impact area**	**Magnitude**
	PTS weighted SEL impulsive criteria (0.22 km^2)	0.32 harbour porpoise (0.000093% of North Sea MU) based on site survey density 1.468/km^2	Negligible magnitude (i.e. 0.001% or less of the North Sea MU reference population anticipated to be exposed to the permanent impact).
Bottlenose dolphin	PTS SPL_{peak} (0.0082 km^2)	0.00003 bottlenose dolphin (0.000014% of CES MU) based on the density estimate of 0.0037/km^2	Negligible magnitude (i.e. 0.001% or less of the CES MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive criteria (0.000013 km^2)	0.00000005 bottlenose dolphin (0.000000021% of CES MU) based on the density estimate of 0.0037/km^2	Negligible magnitude (i.e. 0.001% or less of the CES MU reference population anticipated to be exposed to the permanent impact).
White-beaked dolphin	PTS SPL_{peak} (0.0082 km^2)	0.001 white-beaked dolphin (0.0000023% of CGNS MU) based on the density estimate of 0.123/km^2	Negligible magnitude (i.e. 0.001% or less of the CES MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive criteria (0.000013 km^2)	0.0000016 white-beaked dolphin (0.000000004% of CGNS MU) based on the density estimate of 0.123/km^2	Negligible magnitude (i.e. 0.001% or less of the CES MU reference population anticipated to be exposed to the permanent impact).
Common dolphin	PTS SPL_{peak} (0.0082 km^2)	0.0006 common dolphin (0.0000006% of CGNS MU) based on the density estimate of 0.074 /km^2	Negligible magnitude (i.e. 0.001% or less of the CGNS MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive criteria (0.000013 km^2)	0.00000096 common dolphin (0.000000001% of CGNS MU) based on the density estimate of 0.074 /km^2	Negligible magnitude (i.e. 0.001% or less of the CGNS MU reference population anticipated to be exposed to the permanent impact).
Minke whale	PTS SPL_{peak} (0.077 km^2)	0.0018 minke whale (0.0000088% of CGNS MU; 0.00046% of Moray Firth	Negligible magnitude (i.e. 0.001% or less of the CGNS

Table 4: The maximum number of marine mammals that could be at risk of PTS from low-order clearance using a 0.15kg donor charge (single event)			
Species	**PTS criteria and maximum impact area**	**Maximum number of animals and % of reference population based on maximum potential impact area**	**Magnitude**
		population) based on the density estimate of 0.023/km^2	MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive criteria (0.015 km^2)	0.00035 minke whale (0.0000017% of CGNS MU; 0.00009% of Moray Firth population) based on the density estimate of 0.023/km^2	Negligible magnitude (i.e. 0.001% or less of the CGNS MU reference population anticipated to be exposed to the permanent impact).

2.2.1.1.1 Assessment of Significance

The impact significance for PTS in marine mammals, without mitigation outlined in Section 3, based on negligible to low magnitude (Table 4) and high sensitivity, has been assessed as moderate adverse for harbour porpoise, and minor adverse for bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale for low-order deflagration using single 0.15kg donor charge (Table 5).

As a precautionary approach, taking into account the proposed mitigation in the MMMP, the impact significance of the potential risk of PTS to marine mammals a result of underwater low-order (deflagration) UXO clearance is **minor adverse (not significant)** (Table 5).

Table 5: Assessment of impact significance for PTS in marine mammals during low-order UXO clearance using a 0.15kg donor charge (single event)						
Species	**Potential Impact**	**Sensitivity**	**Magnitude without mitigation**	**Significance**	**Mitigation**	**Residual impact**
Harbour porpoise	Risk of PTS during underwater low-order UXO clearance using 0.15 kg donor charge (single event)	High	Low	Moderate adverse	MMMP	Minor adverse (not significant)
Bottlenose dolphin			Negligible	Minor adverse		Minor adverse (not significant)
White-beaked dolphin			Negligible	Minor adverse		Minor adverse (not significant)
Common dolphin			Negligible	Minor adverse		Minor adverse (not significant)

Table 5: Assessment of impact significance for PTS in marine mammals during low-order UXO clearance using a 0.15kg donor charge (single event)						
Species	**Potential Impact**	**Sensitivity**	**Magnitude without mitigation**	**Significance**	**Mitigation**	**Residual impact**
Minke whale			Negligible	Minor adverse		Minor adverse (not significant)

2.2.1.2 PTS assessment for 0.15kg donor charge for deflagration of 705kg UXO (three attempts in 24 hour period)

The maximum number of harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale that potentially be at risk of PTS during maximum of three attempts in a 24 hour period for low-order deflagration using a 0.15 kg donor charge, based on underwater noise modelling (Table 3) are presented in Table 6.

The magnitude for harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale has been assessed as negligible for the PTS SPL_{peak} and weighted SEL criteria (Table 6), without proposed mitigation outlined in Section 3.

Table 6: The maximum number of animals that could be at risk of PTS from low-order clearance using a 0.15kg donor charge (three attempts in a 24 hr period)			
Species	**PTS criteria and maximum impact area**	**Maximum number of animals and % of reference population based on maximum potential impact area**	**Magnitude**
Harbour porpoise	PTS SPL_{peak} (2.46 km^2)	3.61 harbour porpoise (0.0010% of North Sea MU) based on site survey density 1.468/km^2	Negligible magnitude (i.e. 0.001% or less of the North Sea MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive criteria (0.94 km^2)	1.38 harbour porpoise (0.0004% of North Sea MU) based on site survey density 1.468/km^2	Negligible magnitude (i.e. 0.001% or less of the North Sea MU reference population anticipated to be exposed to the permanent impact).

Table 6: The maximum number of animals that could be at risk of PTS from low-order clearance using a 0.15kg donor charge (three attempts in a 24 hr period)			
Species	**PTS criteria and maximum impact area**	**Maximum number of animals and % of reference population based on maximum potential impact area**	**Magnitude**
Bottlenose dolphin	PTS SPL_{peak} (0.0082 km^2)	0.00003 bottlenose dolphin (0.000014% of CES MU) based on the density estimate of 0.0037/km^2	Negligible magnitude (i.e. 0.001% or less of the CES MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive criteria (0.00011 km^2)	0.0000004 bottlenose dolphin (0.0000002% of CES MU) based on the density estimate of 0.0037/km^2	Negligible magnitude (i.e. 0.001% or less of the CES MU reference population anticipated to be exposed to the permanent impact).
White-beaked dolphin	PTS SPL_{peak} (0.0082 km^2)	0.001 white-beaked dolphin (0.0000023% of CGNS MU) based on the density estimate of 0.123/km^2	Negligible magnitude (i.e. 0.001% or less of the CES MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive criteria (0.00011 km^2)	0.00001 white-beaked dolphin (0.00000003% of CGNS MU) based on the density estimate of 0.123/km^2	Negligible magnitude (i.e. 0.001% or less of the CES MU reference population anticipated to be exposed to the permanent impact).
Common dolphin	PTS SPL_{peak} (0.0082 km^2)	0.0006 common dolphin (0.0000006% of CGNS MU) based on the density estimate of 0.074 /km^2	Negligible magnitude (i.e. 0.001% or less of the CGNS MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive criteria (0.00011 km^2)	0.000008 common dolphin (0.00000001% of CGNS MU) based on the density estimate of 0.074 /km^2	Negligible magnitude (i.e. 0.001% or less of the CGNS MU reference population anticipated to be exposed to the permanent impact).
Minke whale	PTS SPL_{peak} (0.077 km^2)	0.0018 minke whale (0.0000088% of CGNS MU; 0.00046% of Moray Firth population) based on the density estimate of 0.023/km^2	Negligible magnitude (i.e. 0.001% or less of the CGNS MU reference population anticipated to be exposed to the permanent impact).
	PTS weighted SEL impulsive	0.0018 minke whale (0.0000090% of CGNS MU; 0.00047% of Moray Firth	Negligible magnitude (i.e. 0.001% or less of the CGNS

Table 6: The maximum number of animals that could be at risk of PTS from low-order clearance using a 0.15kg donor charge (three attempts in a 24 hr period)			
Species	**PTS criteria and maximum impact area**	**Maximum number of animals and % of reference population based on maximum potential impact area**	**Magnitude**
	criteria (0.079 km^2)	population) based on the density estimate of 0.023/km^2	MU reference population anticipated to be exposed to the permanent impact).

2.2.1.2.1 Assessment of Significance

The impact significance for PTS in marine mammals for three attempts in a 24-hour period of low-order deflagration with 0.15kg donor charge, without mitigation outlined in Section 3, based on negligible magnitude (Table 6) and high sensitivity, has been assessed as minor adverse for harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale (Table 7).

As a precautionary approach, taking into account the proposed mitigation in the MMMP, the impact significance of the potential risk of PTS to marine mammals a result of underwater UXO clearance is **minor adverse (not significant)** (Table 7).

Table 7: Assessment of impact significance for PTS in the marine mammal species during low-order UXO clearance (three attempts in a 24-hr period)						
Species	**Potential Impact**	**Sensitivity**	**Magnitude without mitigation**	**Significance**	**Mitigation**	**Residual impact**
Harbour porpoise	Risk of PTS during underwater low-order UXO clearance using 0.15 kg donor charge (three attempts in 24 hour period)	High	Negligible	Minor adverse	MMMP	Minor adverse (not significant)
Bottlenose dolphin			Negligible	Minor adverse		Minor adverse (not significant)
White-beaked dolphin			Negligible	Minor adverse		Minor adverse (not significant)
Common dolphin			Negligible	Minor adverse		Minor adverse (not significant)
Minke whale			Negligible	Minor adverse		Minor adverse (not significant)

2.2.2 Potential for TTS / fleeing response due to Deflagration Clearance

The risk of TTS / fleeing response in all marine mammals would be reduced by using low-order clearance (deflagration) for the clearance of the UXO. The maximum predicted impact ranges for TTS / fleeing response from a 0.15 kg donor charge, without further mitigation are presented in Table 8, based on the underwater noise modeling for a single event, and three deflagration attempts in a 24 hour period.

Table 8: The maximum predicted impact ranges (km) and areas (km^2) for TTS in marine mammals, based on the underwater noise modelling for low-order deflagration using a 0.15 kg donor charge (single event and three attempts in 24 hour period)

Species	TTS Criteria and Threshold (Southall *et al.*, 2019)	0.15 kg single event	0.15 kg Three attempts in 24 hour period
Harbour porpoise (VHF)	TTS SPL_{peak} 196 dB re 1 µPa Unweighted Impulsive criteria	1.630 km (8.35 km^2)	
	TTS SEL 140 dB re 1 µPa^{2}s Weighted Impulsive criteria	1.860 km (10.87 km^2)	2.835 km (25.25 km^2)
Bottlenose dolphin, white-beaked dolphin and common dolphin (HF)	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria	0.094 km (0.028 km^2)	
	TTS SEL 170 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.034 km (0.0036 km^2)	0.077 km (0.019 km^2)
Minke whale (LF)	TTS SPL_{peak} 213 dB re 1 µPa Unweighted Impulsive criteria	0.288 km (0.260 km^2)	
	TTS SEL 168 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.955 km (2.87 km^2)	2.175 km (14.86 km^2)

2.2.2.1 TTS / fleeing response assessment for 0.15kg donor charge for deflagration of 705kg UXO (single)

The maximum number of harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale that potentially be at risk of TTS / fleeing response from deflagration using a 0.15kg donor charge (single event), based on the maximum potential TTS / fleeing response impact ranges are presented in Table 9**.**

The magnitude for all marine mammal species has been assessed as negligible for the TTS SPL_{peak} and weighted SEL criteria, based on the worst-case impact ranges identified in Table 8**.**

Table 9: The maximum number of marine mammals that could be at risk of TTS from low-order clearance with a 0.15kg donor charge (single event)			
Species	**TTS / fleeing response criteria and maximum impact area**	**Maximum number of marine mammal and % of reference population based on maximum potential impact area**	**Magnitude**
Harbour porpoise	TTS SPL_{peak} 196 dB re 1 µPa Unweighted Impulsive criteria (8.35 km^2)	12.3 harbour porpoise (0.0035% of North Sea MU) based on site survey density 1.468/km^2	Negligible magnitude (i.e. less than 1% of the North Sea MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 140 dB re 1 μPa^2s Weighted Impulsive criteria (10.87 km^2)	16.0 harbour porpoise (0.005% of North Sea MU) based on site survey density 1.468/km^2	Negligible magnitude (i.e. less than 1% of the North Sea MU reference population anticipated to be exposed to the temporary impact).
Bottlenose dolphin	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria (0.028 km^2)	0.0001 bottlenose dolphin (0.00005% of CES MU) based on the density estimate of 0.0037/km^2	Negligible magnitude (i.e. less than 1% of the CES MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 170 dB re 1 μPa^2s Weighted Impulsive criteria (0.0036 km^2)	0.00001 bottlenose dolphin (0.000006% of CES MU) based on the density estimate of 0.0037/km^2	Negligible magnitude (i.e. less than 1% of the CES MU reference population anticipated to be exposed to the temporary impact).
White-beaked dolphin	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria (0.028 km^2)	0.003 white-beaked dolphin (0.000008% of CGNS MU) based on the density estimate of 0.123/km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 170 dB re 1 μPa^2s Weighted Impulsive criteria (0.0036 km^2)	0.0004 white-beaked dolphin (0.000001% of CGNS MU) based on the density estimate of 0.123/km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).
Common dolphin	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria	0.002 common dolphin (0.000002% of CGNS MU) based on the density estimate of 0.074 /km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population

Table 9: The maximum number of marine mammals that could be at risk of TTS from low-order clearance with a 0.15kg donor charge (single event)			
Species	**TTS / fleeing response criteria and maximum impact area**	**Maximum number of marine mammal and % of reference population based on maximum potential impact area**	**Magnitude**
	(0.028 km^2)		anticipated to be exposed to the temporary impact).
	TTS SEL 170 dB re 1 μPa^2s Weighted Impulsive criteria (0.0036 km^2)	0.0003 common dolphin (0.0000003% of CGNS MU) based on the density estimate of 0.074 /km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).
Minke whale	TTS SPL_{peak} 213 dB re 1 µPa Unweighted Impulsive criteria (0.26 km^2)	0.006 minke whale (0.00003% of CGNS MU & 0.0016 of the Moray Firth population) based on the density estimate of 0.023/km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 168 dB re 1 μPa^2s Weighted Impulsive criteria (2.87 km^2)	0.07 minke whale (0.0003% of CGNS MU & 0.02% of the Moray Firth population) based on the density estimate of 0.023/km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).

2.2.2.1.1 Assessment of Significance

The impact significance for any TTS in marine mammals has been assessed for deflagration clearance (for a single attempt) in Table 9, with a negligible magnitude of effect in all cases. Taking into account the medium sensitivity and the negligible magnitude for all marine mammals, the potential impact significance for any TTS / fleeing response is assessed as minor **adverse (not significant)** (Table 10).

Table 10: Assessment of impact significance for TTS in the marine mammal species during low-order UXO clearance						
Species	**Potential Impact**	**Sensitivity**	**Magnitude without mitigation**	**Significance**	**Mitigation**	**Residual impact**
All marine mammals	Risk of TTS / fleeing response during underwater low-order UXO clearance using deflagration (single attempt)	Medium	Negligible	Minor Adverse	None required	Minor adverse (not significant)

2.2.2.2 TTS / fleeing response assessment for 0.15kg donor charge for deflagration of 705kg UXO (three attempts in 24 hour period)

Table 11 provides an assessment of the number of harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin, and minke whale that could be at risk of TTS / fleeing response for a low-order clearance with a 0.15kg donor charge, for three attempts in a 24-hour period. The magnitude of potential effect is negligible in all cases.

Table 11: The maximum number of animals that could be at risk of TTS / fleeing response from low-order clearance with a 0.15kg donor charge (three attempts in a 24-hour period)			
Species	**TTS / fleeing response criteria and maximum impact area**	**Maximum number of marine mammal and % of reference population based on maximum potential impact area**	**Magnitude**
Harbour porpoise	TTS SPL_{peak} 196 dB re 1 µPa Unweighted Impulsive criteria (8.35 km^2)	12.3 harbour porpoise (0.004% of North Sea MU) based on site survey density 1.468/km^2	Negligible magnitude (i.e. less than 1% of the North Sea MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 140 dB re 1 μPa^2s Weighted Impulsive criteria (25.25 km^2)	37.1 harbour porpoise (0.011% of North Sea MU) based on site survey density 1.468/km^2	Negligible magnitude (i.e. less than 1% of the North Sea MU reference population anticipated to be exposed to the temporary impact).

Table 11: The maximum number of animals that could be at risk of TTS / fleeing response from low-order clearance with a 0.15kg donor charge (three attempts in a 24-hour period)			
Species	**TTS / fleeing response criteria and maximum impact area**	**Maximum number of marine mammal and % of reference population based on maximum potential impact area**	**Magnitude**
Bottlenose dolphin	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria (0.028 km^2)	0.0001 bottlenose dolphin (0.00005% of CES MU) based on the density estimate of 0.0037/km^2	Negligible magnitude (i.e. less than 1% of the CES MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 170 dB re 1 µPa^2s Weighted Impulsive criteria (0.019 km^2)	0.00007 bottlenose dolphin (0.00003% of CES MU) based on the density estimate of 0.0037/km^2	Negligible magnitude (i.e. less than 1% of the CES MU reference population anticipated to be exposed to the temporary impact).
White-beaked dolphin	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria (0.028 km^2)	0.003 white-beaked dolphin (0.000008% of CGNS MU) based on the density estimate of 0.123/km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 170 dB re 1 µPa^2s Weighted Impulsive criteria (0.019 km^2)	0.002 white-beaked dolphin (0.000005% of CGNS MU) based on the density estimate of 0.123/km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).
Common dolphin	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria (0.028 km^2)	0.002 common dolphin (0.000002% of CGNS MU) based on the density estimate of 0.074 /km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 170 dB re 1 µPa^2s Weighted Impulsive criteria (0.019 km^2)	0.001 common dolphin (0.000001% of CGNS MU) based on the density estimate of 0.074 /km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).

Table 11: The maximum number of animals that could be at risk of TTS / fleeing response from low-order clearance with a 0.15kg donor charge (three attempts in a 24-hour period)			
Species	**TTS / fleeing response criteria and maximum impact area**	**Maximum number of marine mammal and % of reference population based on maximum potential impact area**	**Magnitude**
Minke whale	TTS SPL_{peak} 213 dB re 1 µPa Unweighted Impulsive criteria (0.26 km^2)	0.006 minke whale (0.00003% of CGNS MU & 0.002 of the Moray Firth population) based on the density estimate of 0.023/km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).
	TTS SEL 168 dB re 1 µPa^2s Weighted Impulsive criteria (14.86 km^2)	0.34 minke whale (0.001% of CGNS MU & 0.09% of the Moray Firth population) based on the density estimate of 0.023/km^2	Negligible magnitude (i.e. less than 1% of the CGNS MU reference population anticipated to be exposed to the temporary impact).

2.2.2.2.1 Assessment of Significance

The impact significance for any TTS / fleeing response in marine mammals from three attempts at low-order deflagration clearance, has been assessed based on the magnitude of negligible for all species (Table 11), and a medium sensitivity of effect. The impact significance is **minor adverse** (**not significant**) (Table 12).

Table 12: Assessment of impact significance for TTS in the marine mammal species during low-order UXO clearance						
Species	**Potential Impact**	**Sensitivity**	**Magnitude without mitigation**	**Significance**	**Mitigation**	**Residual impact**
All marine mammals	Risk of TTS / fleeing response during underwater low-order UXO clearance (maximum of 3 attempts in a 24 hour period)	Medium	Negligible	Minor Adverse	None required	Minor adverse (not significant)

3 Mitigation Strategy

The MMMP outlines the methods and procedures required for the effective mitigation of impacts associated with the clearance of any UXO for marine mammal species expected to found in the area. In particular, the MMMP will mitigate against the potential risk of physical injury and / or trauma, and PTS exposure on marine mammals.

The JNCC guidance for "*minimizing the risk of injury to marine mammal from use explosives*" (JNCC, 2010[1]) has been consulted in the process of developing this MMMP to determine the best approach for mitigation, and to ensure best practice measures are followed (JNCC, 2010). In addition, this UXO MMMP has been informed by the mitigation implemented during previous work undertaken for the Moray West OWF UXO protocol included in the MMMP (Moray West, 2023).

The mitigation procedures outlined in the MMMP include:

- All clearance works to take place in daylight and in favourable conditions with good visibility (sea state 3 or less);
- The establishment of a mitigation zone of 1 km;
- The monitoring of the mitigation zone by dedicated and trained MMOs during daylight hours and when conditions allow suitable visibility, pre- and post-clearance;
- The deployment of PAM devices and a PAM operator to monitor the mitigation zone in conjunction with MMOs
- The activation of ADDs; and
- The controlled clearance of the UXO will be undertaken by specialist contractors, using the minimum amount of donor charge required in order to achieve safe disposal of the device (150 gr).

3.1 UXO Mitigation Procedures

Mitigation Zone

The monitoring area (MA) is the area which a pre-clearance search is required to be undertaken by trained, dedicated and experienced MMOs. The MA with 1 km radius is measured out from the UXO clearance site with a 360° coverage, with the overall diameter of the monitoring area of 2 km. Figure 2 provides a simple diagram of the monitoring area in relation to the UXO clearance site.

[1] https://data.jncc.gov.uk/data/24cc180d-4030-49dd-8977-a04ebe0d7aca/JNCC-Guidelines-Explosives-Guidelines-201008-Web.pdf

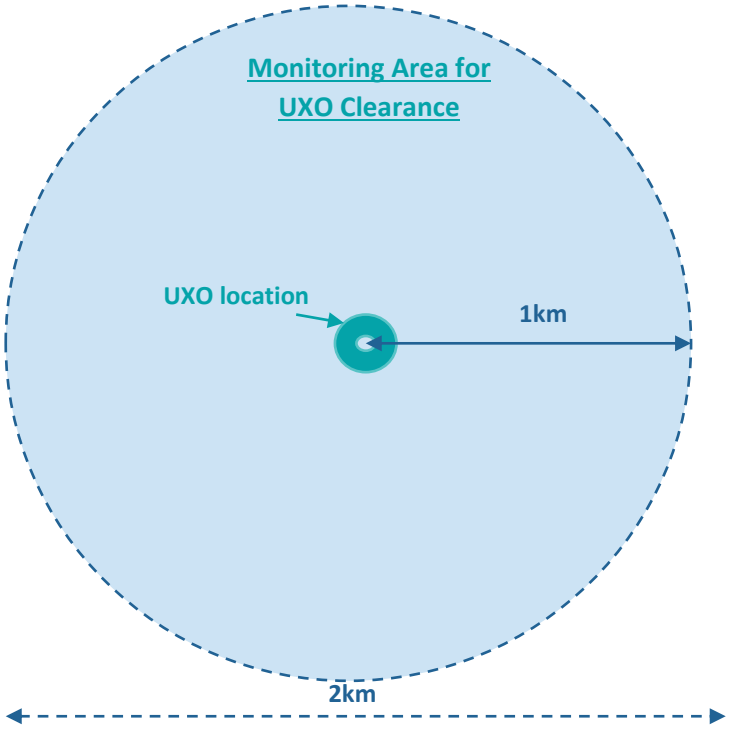


Figure 2 MA of 1 km around each UXO clearance location prior to UXO clearance event.

Surveys of the MA will be conducted by dedicated and trained MMOs and a PAM operator during daylight hours and suitable visibility and sea states[2] prior to UXO clearance, to minimise the potential for marine mammals to be present within the MA prior to UXO clearance activity taking place, in order to reduce the risk of PTS.

The pre-clearance search will commence at least one hour prior to the start of the clearance event, with two dedicated and trained MMOs positioned so the entire MA can be monitored at all times. The MMOs will be in close contact with each other to ensure any sighting of a marine mammal within the MA is communicated.

PAM should be employed for all pre-clearance searches. The PAM hydrophones should be located as close as possible to the clearance site. It is possible to deploy from the vessels already located at the site, however it should be noted that they may be too far from the clearance site at point of the clearance by deflagration to provide effective monitoring of the entire mitigation zone, especially for harbour porpoise.

A PAM system may not always be able to determine the range of a marine mammal detection, or for all species expected to be present in the area. If this is the case, the PAM-Op will need to use experience and expert judgement to determine the range of the individual/s detected and whether it is within the 1 km mitigation zone. If the PAM-Op is unsure of whether an marine mammal is within the mitigation zone or

[2] Good visibility means being able to see at least 2 km in all directions, and suitable sea states are 3 or below.

not, the precautionary principle should always be applied and it therefore should be assumed that the marine mammal/s is within the mitigation zone.

The pre-clearance search will commence prior to all clearance events or sequences, or after any break in the clearance event or sequence, and at the end of a clearance event or sequence. The visual observations by the MMOs will commence at least one hour prior to the clearance event. This will continue until one hour has passed and no marine mammals have been detected within the MA within the previous 30 minutes, the MMOs will then advise that UXO clearance can commence.

If a marine mammal has been sighted within the MA, it will be monitored and tracked until it is clear of the MA, and the Explosive Ordnance Disposal (EOD) team notified. The marine mammals must be clear of the MA for at least 30 minutes before low-order clearance.

The ADD will be activated at the appropriate time during the pre-clearance search of the MA, whether there is marine mammal presence or not. If a marine mammal is detected within the MA during the pre-clearance search, the commencement of the ADD activation will continue at the required time.

If the marine mammal(s) remains clear of the MA for at least 30 minutes and the one hour pre-search has been completed, then the UXO clearance can proceed.

A precautionary approach should always be used. Therefore, if the MMOs cannot be sure whether the individual is within the MA or not, or whether there is a confirmed sighting of a marine mammal within the MA, then the operation should be delayed accordingly until the MMOs are sure that there are no marine mammals present within the MA.

The mitigation team must be a safe distance from the clearance site prior to any UXO clearance.

3.2 Acoustic Deterrent Device

ADD will be activated prior to UXO low-order clearance to ensure marine mammals are deterred from the area and reduce the risk of any physical or auditory injury.

ADDs have proven to be effective mitigation for harbour porpoise, dolphin species, minke whale, grey and harbour seal (Sparling *et al.,* 2015; McGarry *et al.,* 2017, 2020; Boisseau *et al*., 2021). ADDs have been widely used as mitigation to deter marine mammals during offshore wind farm piling and UXO clearance at sites in Europe (for example, Brandt *et al.,* 2011, 2012, 2013a,b) and offshore wind farm sites in the UK, including but not limited to, Galloper, Dudgeon, East Anglia ONE, and Moray East.

Pre-deployment tests

The ADD will be tested prior to each pre-clearance search to ensure they are working correctly. If there are any technical problems with the ADD then the pre-clearance search should be delayed until these issues are resolved.

The ADD-Op will also ensure that the communications are in place between themselves, the MMOs and the EOD supervisor.

The ADD would be deployed and ready to be activated once at the correct time prior to or during the one-hour pre-clearance search.

ADD locations

The ADD will be positioned within the water column in close proximity to the clearance site. It is proposed that the ADD will be deployed from vessels within the MA at a location where it is safe to be positioned prior to the commencement of the UXO clearance.

The best location to deploy the ADD, and the method to provide power to the devices, will be decided through a pre-deployment survey of the vessel or vessels by the ADD operator, MMOs, EOD supervisor and vessel operational manager. Once the best location for the ADD has been determined, the control unit and power supply should be temporarily installed. For deployment of the ADD, the transducer part of the device will be lowered over the side of the deck (they should not be activated at this time) to a water depth that is below the draft of the vessel to ensure the sound can be emitted in all directions and not dampened by the presence of the vessel.

ADD activation times

ADD activation will commence during the one-hour pre-clearance search of the monitoring area and immediately prior to the clearance event to allow marine mammals to move beyond the area of potential PTS risk).

After the ADD has been activated for the required duration, the ADD operator will deactivate and recover the ADD and undertake routine checks to ensure it is still working correctly, ready for the next deployment and activation.

The MMOs will maintain their pre-clearance search during the ADD activation time. If any marine mammals are sighted within the MA during the ADD activation time, the ADD should remain activated until the required activation time has been completed.

If a marine mammal is still observed in the MA after the ADD activation, then the UXO clearance must be delayed and the ADD paused, and a further one-hour pre-clearance search should be undertaken, and the ADD can be re-activated at the appropriate time (i.e. the standard procedure should be re-started). In the case that the required ADD activation time is longer than the 1 hour pre-clearance search, there should always be a break of at least 15 minutes between ADD activations before the mitigations are re-started.

The ADD activation times for low-order clearance are based on swim speed of 1.5m/s are presented in Table 13. The ADD activation times have been based on a swim speed of 1.4 m/s for harbour porpoise, 1.52 m/s dolphin species (Bailey and Thompson, 2010) and of 2.1m/s for minke whale, based on Boisseau *et al.,* 2021. However, Kastelein *et al*. (2018) recorded swimming speeds of 1.97m/s in harbour porpoise during playbacks of pile driving sounds. The distance at which marine mammal species are expected to travel within the ADD activation periods are shown in the following tables.

Table 13: ADD activation times for low-order clearance	
Mitigation	**Low-order clearance**
Maximum PTS range (worst-case of harbour porpoise)	**Up to 1 km**
ADD activation	23 minutes = - 1.93 km deterrence for harbour porpoise - 2.09 km deterrence for dolphin species - 2.89 km deterrence for minke whale

Table 14 shows the number of marine mammals that could be potentially disturbed due to the ADD activation, based on the potential deterrence ranges as presented in

Table 14: The deterrent ranges and the maximum number of animals that could be at risk disturbance from ADD activation		
Species	**Deterrent Range (km)**	**Maximum number of marine mammal and % of reference population based on maximum potential impact area**
Harbour porpoise	1.93	17.21 (0.00005% of the NS MU)
Bottlenose dolphin	2.09	0.05 (0.0002% of the CES MU)
White-beaked dolphin	2.09	1.70 (0.00004% of the CGNS MU)
Common dolphin	2.09	1.02 (0.00001% of the CGNS MU)
Minke whale	2.89	0.06 (0.00003% of the CGNS MU & 0.0016% of the Moray Firth population)

3.3 Post-clearance search

The MMOs will maintain a post-clearance search within the monitoring area **for at least 15 minutes** after the final clearance to look for evidence of injury to marine life, including any fish kills (following the JNCC (2010) guidance). Any other unusual observations will also be noted within the report.

3.4 Roles and Responsibilities

There are a number of people that would be required in the compliance with this MMMP for UXO clearance activities, including;

- Marine Mammal Observers (MMOs)
- Passive Acoustic Monitoring Operator (PAM-Op)

- Acoustic Deterrent Device Operator (ADD-Op)
- Explosive Ordnance Disposal Technician

More information on each of the above's specific responsibilities are outlined below, including information on the experience of each that would be required.

Marine Mammal Observers

Dedicated and JNCC accredited MMOs will need to be present and on-watch for the pre-clearance and for the post-clearance searches (see Section B.3). Dedicated means that this should be the persons sole responsibility (however in this case it should be noted that the MMO could also act as the ADD operator, although the ADD procedure would more likely be undertaken by the PAM-Op). Two MMOs will be required to cover the entire mitigation zone, with good viewing platforms to allow for 360° coverage. The MMOs must be able to determine the extent of the 1 km mitigation zone from their location, unless poor visibility does not allow.

The MMOs will need to be equipped with binoculars, and a tool to estimate distance i.e. range finding stick or binoculars with reticules and the JNCC reporting forms. The MMOs should scan the mitigation zone with the unaided eye and use binoculars when needed to determine detail (such to look in detail at the area where a possible sighting has been made). Binoculars should not be used continually as they restrict peripheral vision and views close to the vessel.

Marine mammal observations will be carried out to monitor the MA:

- during the pre-clearance search;
- during ADD activation;
- during UXO clearance; and
- during the post-clearance search.

There will be clear communication channels between the MMOs, the PAM-Op, the ADD-Op and the EOD team. The communication procedures will be established and agreed prior to any UXO clearance with regards to the communication of any marine mammals observed within the MA, the deployment of the ADD, and when the MA is clear for the clearance to commence.

The MMOs and ADD operator will be notified and ready to begin the mitigation protocol at a minimum of:

- 2 hours prior to UXO clearance, for clearance by low-order disposal

The MMOs will record all periods of marine mammal observations, including start and finish time of pre-clearance searches, ADD activation, use of PAM, and conditions during observations (e.g., sea state, visibility, weather, etc.). Any sightings of marine mammals around the vessel(s) will also be recorded.

"Dedicated" means trained MMOs who are employed for the sole purpose of undertaking visual observations to detect marine mammals and advising on and monitoring the implementation of the guidelines.

Experienced MMOs will have a minimum of 20 weeks' experience of implementing JNCC guidelines in UK waters within the previous five years. Furthermore, they will be experienced at identifying UK marine mammal species and be familiar with their behaviour.

Passive Acoustic Monitoring Operator (if PAM is required)

PAM is able to detect the vocalizations of marine mammals and works best for echolocating species that are near-continually vocalizing such as harbour porpoise and dolphin species. PAM may be required to complement the monitoring by the MMOs. PAM-Ops should be experienced and trained in PAM hardware and software, as they will be required to determine the range of a detected marine mammal to the hydrophone location (note that this will be located between 100 and 300 m from the EOD operation) if the PAM software is unable to, and to interpret the detected sounds. Given the location of the UXO in relation to the ST NCMPA, designated for minke whale, any PAM undertaken will need to ensure systems are able to monitor low frequency vocalisations of minke whales. It is likely that separate hydrophones would be required to ensure coverage of the frequency ranges of both harbour porpoise and minke whale. The PAM-Ops will also be required to be experienced in the detection of baleen whale species.

The PAM-Ops responsibilities will be the same as those for the MMO outlined above. A dedicated PAM-Op will also be responsible for the deployment, maintenance and operation of the PAM hydrophone, including any spares, and notifying the ADD operator of any issues during the testing of the ADD.

ADD operator

ADD-Op will be responsible for deployment, maintenance and operation of the ADD, including spare equipment, in relation to all UXO activities.

An ADD-Op may be:

- An existing member of the EOD team, who has received the appropriate training in both the MMMP and ADD operation, and would be available to carry out the required duties as a priority in addition to their existing role, or
- An additional member of trained staff employed with the sole responsibility of ADD operation, or
- Undertaken in combination with another environmental role, e.g. fisheries liaison officer or member of the mitigation team.

The ADD-Op duties would be to verify the operation of the ADD before deployment, to operate the ADD throughout the pre-clearance period, ensure batteries are fully charged and that spare equipment is available in case of any problems, and record and report on all ADD and UXO clearance activity.

The ADD-Op will ensure that the ADD devices and spares are functioning correctly before the vessel leaves port. If practical, and in agreement with the Nominated Contact (EOD Supervisor or other appropriate member of the EOD team), testing should also be achieved through an initial deploy and test from the vessel, whilst docked. On site, the ADD will be re-tested prior to the start of the mitigation sequence.

The ADD-Op will also be required to record any marine mammal observations prior to and during ADD deployment.

As outlined in Section 3.1 the ADD-Op will maintain a detailed record of all ADD deployments and activation. These reports will include a record of all ADD start and stop times, a record of each verification of ADD activation and a record of any issues with ADD deployment and activation.

A list of tasks to be undertaken by the ADD-Op include, but is not limited to:

- preparation and update of risk assessment for ADD in collaboration with vessel personnel;
- maintain, test and operate ADD, including spares;
- keep an inventory of spares and advise on any required repairs necessary to ADD including back-ups;
- deploy, test and monitor ADD;
- liaise and communicate with the EOD Supervisor or other nominated appointee to ensure compliance with the mitigation procedure;
- instruct vessel personnel during mitigation procedure to ensure smooth running of tasks;
- update database / reports at the end of each shift with records, including when the ADD was deployed and activated, in relation to UXO clearance, and any marine mammal observations; and
- provide reports to the Client Representative or other nominated appointee as outlined in Section 3.5 to ensure compliance reporting to the MD-LOT.

For every shift one ADD-Op will be required for the ADD deployment and activation.

It is anticipated that the ADD-Op, taking into account their primary ADD duties, would also be able to undertake marine mammal observations, if their position as ADD operator allows them uninterrupted views of the MA and they are fully trained.

If crew members are to be the ADD-Op, they also must have undertaken the required JNCC MMOs course, if being used in both roles, as well as the required MMMP and ADD training.

The ADD-Op will be suitably trained to required standards, with an appropriate level of experience. Details of the ADD operators will need to be supplied in advance for notification to the MMO in accordance with consent conditions.

Explosive Ordnance Disposal Supervisor

The EOD Supervisor has the overall responsibility for the clearance operation, and to ensure that the soft-start charges are used, and will be based on the inspection vessel. The EOD Supervisor will be the main point of communication between the mitigation team (MMOs, PAM-Op and the ADD-Op) and the EOD support teams (who are responsible for carrying out the UXO clearance activities). The EOD Supervisor will be in control of initiating, delaying or pausing the clearance activities.

3.5 Reporting

Reports will be completed detailing the marine mammal mitigation activities and timings, and any detections, and will be submitted to JNCC after the operation has been completed. These reports will include information on the relevant UXO clearance activities, date and location, information on charge sizes, start times of clearances, start and end of pre- and post-clearance watches by MMOs, details of activity during the relevant watches.

Marine Mammal Recording Forms[3] will be completed (including the cover page, operations sheet, effort sheet, and sightings sheet). Deck forms can be used if preferred with the information transferred to the spreadsheet at the end of the watch. Details of ADD used and observations of their efficacy, and any problems encountered and instances of non-compliance with the JNCC guidelines and variations from the agreed procedure will also be reported.

The ADD operator will maintain a detailed record, including all ADD deployment, activation and recovery times, a record of each verification of ADD activation and a note of any issues encountered with regard to the ADD deployment and activation.

After the UXO clearance event, a summary of monitoring and mitigation activities will be prepared and sent to the Client Representative or other nominated responsible person.

In the event of a marine mammal sighting and/or detection, the MMOs will report the following information:

- species, number of individuals, age, sex and size (e.g., juvenile or adult);
- physical description of individual features if unable to identify to species level;
- behaviour when first sighted (e.g., travelling, foraging, resting);
- bearing and distance;
- time, vessel position, vessel speed, vessel activity;
- water depth (if known), sea state, visibility, glare; and
- any other vessels in the area.

Weekly reports will be collated and provided to the MD-LOT on a monthly basis.

In addition to the weekly reports, a final report will be provided which will be submitted to the MD-LOT. The final report will include any data collected during UXO clearance operations, details of ADD deployment and activation, a detailed description of any technical problems encountered and what, if any, actions were taken. The report will also discuss the protocols followed and put forward recommendations on the use of ADD as mitigation during the construction period that could benefit future construction projects.

[3] https://hub.jncc.gov.uk/assets/24cc180d-4030-49dd-8977-a04ebe0d7aca

3.6 Communication protocol

Clear communication channels between the MMOs, PAM-Op (if present), the ADD-Op and the EOD team are required, and the communication procedures will be established and agreed prior to any clearance event with regard to the communication of any detection within the monitoring area, the deployment of ADD, and when the monitoring area is clear for clearance to take place. The EOD team will assign a person responsible for communication with the Lead Operator of the mitigation team.

A member of the mitigation team (ADD-Op, MMO) will be nominated as **Lead Operator** and will liaise directly with the **Nominated Contact** (EOD Supervisor or other appropriate member of the EOD team) via VHF/UHF radio or mobile phone. They will also ensure that information is relayed to the rest of the mitigation team.

The Nominated Contact will keep the Lead Operator updated with timings for UXO clearance events as appropriate to allow sufficient time to commence the ADD deployment and activation in accordance with the procedures set out in this MMMP.

The Lead Operator will inform the Nominated Contact of any delays in the ADD deployment or if any marine mammals are observed not moving out of the MA during the ADD activation period and therefore if a delay in clearance is required.

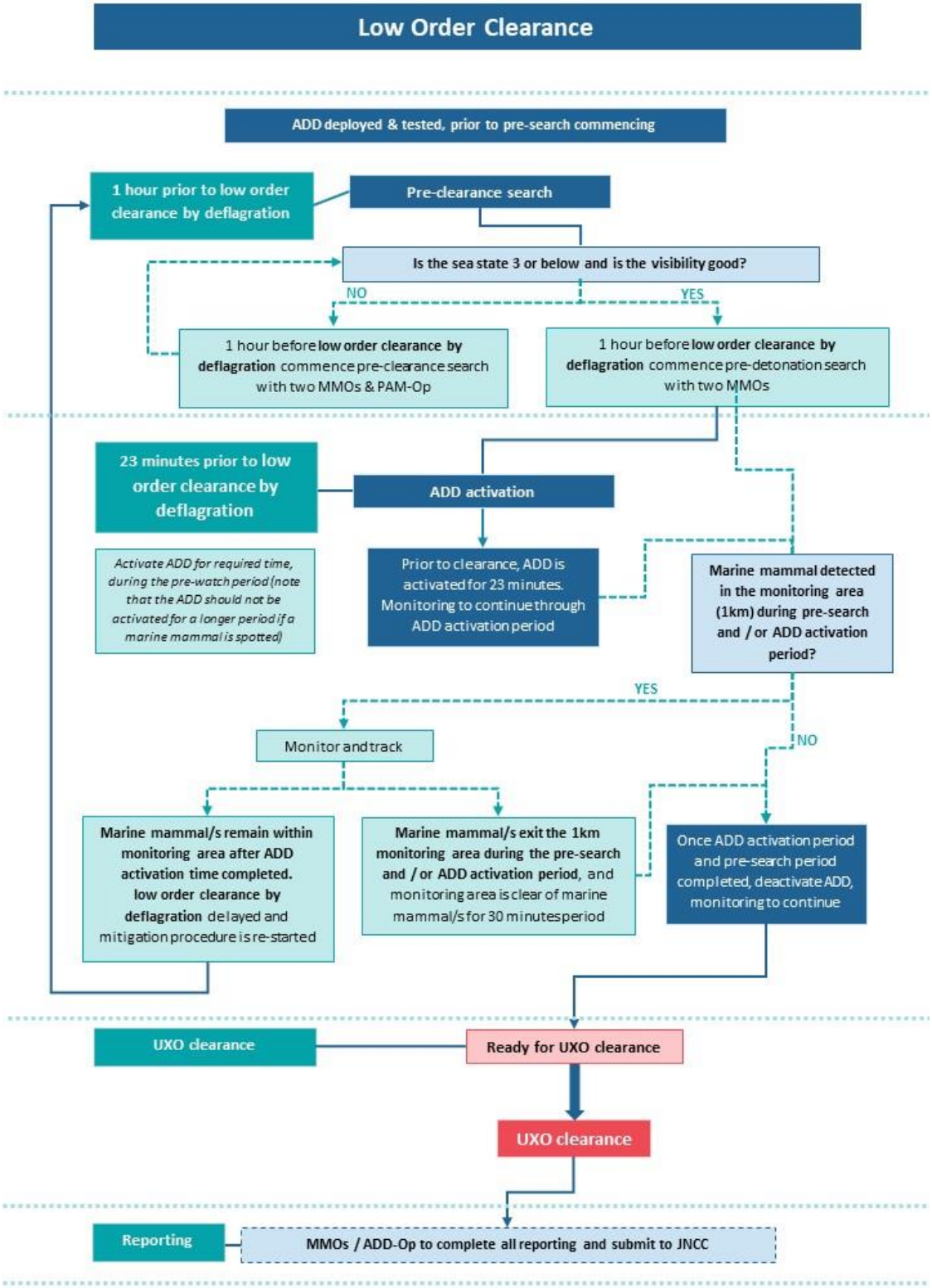
A communications protocol will be developed between the mitigation team and the Nominated Contact.

This communications protocol will include, but not be limited to:

- Notification required prior to UXO clearance vessel deployment to ensure ADD and all equipment required is tested and ready for deployment.
- Once on board, the notification required to set-up equipment, test and deploy ADD to allow for the required activation prior to UXO clearance commencing.
- Procedure to notify the Nominated Contact that deployment of ADD and activation for the required time has been successful, and next steps in the mitigation can commence, or if deployment of ADD and activation has not been successful that clearance activities will be delayed.
- Procedure to notify the Lead Operator that each stage of the mitigation is successfully underway, and when the ADD can be switched off and retrieved from the water.
- Procedure to notify the Lead Operator that further ADD activation is required.
- Procedure to notify the Lead Operator that the UXO clearance operations have been successfully completed.

3.7 Summary of Mitigation Protocol

The outline mitigation protocol (as outlined above) is summarised below in the flow chart.


Low Order Clearance
ADD deployed & tested, prior to pre-search commencing
1 hour prior to low order clearance by deflagration
Pre-clearance search
Is the sea state 3 or below and is the visibility good?
NO
YES
1 hour before low order clearance by deflagration commence pre-clearance search with two MMOs & PAM-Op
1 hour before low order clearance by deflagration commence pre-detonation search with two MMOs
23 minutes prior to low order clearance by deflagration
ADD activation
Activate ADD for required time, during the pre-watch period (note that the ADD should not be activated for a longer period if a marine mammal is spotted)
Prior to clearance, ADD is activated for 23 minutes. Monitoring to continue through ADD activation period
Marine mammal detected in the monitoring area (1km) during pre-search and / or ADD activation period?
YES
NO
Monitor and track
Marine mammal/s remain within monitoring area after ADD activation time completed. low order clearance by deflagration delayed and mitigation procedure is re-started
Marine mammal/s exit the 1km monitoring area during the pre-search and / or ADD activation period, and monitoring area is clear of marine mammal/s for 30 minutes period
Once ADD activation period and pre-search period completed, deactivate ADD, monitoring to continue
UXO clearance
Ready for UXO clearance
UXO clearance
Reporting
MMOs / ADD-Op to complete all reporting and submit to JNCC

4 Potential Effects on Designated Sites

The original UXO Clearance EPS Risk Assessment (document reference: 8460005-DG0207-MWW-REP-000002) details the potential effects on designated sites. A summary of those assessments are provided below.

In summary, the assessments indicated that that without any mitigation, using low-order UXO clearance with a 0.15kg net weight donor charge, the maximum impact area for TTS for bottlenose dolphins is 0.019 km^2 and for harbour seal is 0.54 km^2 and the maximum number of bottlenose dolphins and harbour seal that could potentially be disturbed due to the UXO clearance is less than 1 animal. Therefore, through the application of mitigation as outlined in the there is **no potential Adverse Effect on Site Integrity (AEoSI) of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin** as a result of any disturbance from underwater noise during UXO clearance. Furthermore, there is **no potential AEoSI of the Dornoch Firth and Morrich More SAC in relation to the conservation objectives for harbour seal** as a result of any disturbance from underwater noise during UXO clearance.

In the case of the Southern Trench NCMPA, the number of minke whale that could potentially be disturbed due to the UXO clearance, based on the precautionary 5 km disturbance range[4], is less than 2 animals (0.009% % of CGNS MU & 0.47% of Moray Firth population estimate), but there is **no potential AEoSI of the Southern Trench NCMPA in relation to the conservation objectives for minke whale.** Due to the recent detection of the UXO, the LMB UXO item would be disposed of in the summer period (June – September), which is of where minke whale are mostly likely to be present in the Moray Firth, (Reid *et al.,* 2003; Hammond *et al.,* 2021). Table 4, Table 6 and Table 9 provide the number of minke whale in the Moray Firth that is at risk of PTS and TTS within the Southern Trench NCMPA population, with no potential for significant effects identified.

5 Potential Effects on Protected Seal Haul-Out Sites

Seal haul-out sites are coastal locations that seals use to breed, molt and rest. Almost 200 seal haul-out sites have been designated through The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 which was amended with additional sites in 2017. These haul-out sites are protected under Section 117 of the Marine (Scotland) Act 2010. The Act is designed to assist in protecting the seals when they are at their most vulnerable, and as such provide additional protection from intentional or reckless harassment. The nearest designated haul-out site to the development are Dunbeath-Helmsdale (21 km) and Dunbeath-Wick (22 km) both of which are designated for grey seal.

Given the distance between the UXO area and the protected seal haul-out sites, there is no potential for direct impact due to the surveys. However, there is the potential for transiting vessels to disturb seals at haul-out sites, depending on the port used and vessel route.

[4] *https://www.nature.scot/sites/default/files/2019-06/Southern%20Trench%20possible%20MPA%20-%20Conservation%20and%20Management%20Advice.pdf*

The response of seals to disturbance at haul-out sites can range from increased alertness to moving (stampeding) into the water (Wilson, 2014). The potential impact on pupping groups can include temporary or permanent pup separation, disruption of suckling, energetic costs and energetic deficit to pups, physiological stress and, sometimes, enforced move to distant or suboptimal habitat. Potential impacts on moulting groups can include energy loss and stress, while impacts on other haul-out groups can cause loss of resting and digestion time and stress (Wilson, 2014). The potential impacts will be determined by the response of the seals, the duration and proximity of the disturbance to the seals.

For grey seal, mothers responded by moving into the water more due to boat speed than as a result of the distance, although movement into the water was generally observed to occur at distances of between 20 and 70m, with no detectable disturbance at 150m (Wilson, 2014; Strong and Morris, 2010). However, grey and harbour seals have also been reported to move into the water when vessels are at a distance of approximately 200m to 300m (Wilson, 2014).

In a study of the reaction of harbour seal to cruise ships, harbour seal were 25 times more likely to flee into the water when cruise ships passed 100m from haul-out sites than when ships passed within 500m, beyond 600m there was no discernible effect on the behaviour of harbour seal (Jansen *et al*., 2010). Similarly, disturbance of harbour seals from vessel noise and presence has been demonstrated at up to 500m from UK haul-out sites (Cates and Acevedo-Gutierrez, 2017).

To reduce potential disturbance at seal haul-out sites along vessel routes, all vessels transiting to the UXO clearance area will remain at a distance of at least 500m from the protected seal haul-out sites and use existing shipping lanes and transit routes, wherever possible.

In addition, all vessel operators will use good practice to reduce any risk of collisions with marine mammals or significant disturbance at seal haul-out sites, this includes following the Scottish Marine Wildlife Watching Code (SNH, 2017).

With these proposed measures, there would be no potential for significant disturbance to protected seal haul-out sites.

6 Conclusions

While the UXO clearance works with mitigation present a temporary disturbance to a localised marine environment, this particular clearance is required to remove a health and safety hazard for all sea users, in addition to enabling construction work to proceed on the Moray West Wind Farm, an important addition to Scotland's growing contributions to the UK's renewable energy sector. It will provide additional support to the UK government's national and international commitments to reduce greenhouse gasses.

The assessment above demonstrates that, with the implementation of the mitigation measures detailed in Section 3 there will be no injury resulting from the proposed activities due to underwater noise or vessel

collision risk and, thus, no offence related to injury of any cetacean species under either the inshore or offshore regulations. In this context, a Marine EPS Licence would not be required for injury.

It is possible that a small number of animals may experience some level of disturbance for the short period they may encounter noise during the UXO clearance operations. Given the short term and temporary impacts of the survey to cetaceans, it is considered that there is no potential for a significant impact on the wider populations of harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin, or minke whale.

There is potential for cumulative effects from the proposed survey and other surveys such as, piling, geophysical surveys and so on that could be undertaken at the same time in the East Coast of Scotland area. However, any cumulative disturbance effects will be temporary and there will be no impact on the FCS of any EPS.

Therefore, a Marine EPS Licence is required for activities where there is potential for disturbance to cetaceans as per Regulation 39(2); this disturbance will not be sufficient to cause any population level effects, and it is concluded that an EPS licence to disturb can be issued.

7 References

Arso Civil, M., Quick, N., Mews, S., Hague, E., Cheney, B.J., Thompson, P.M. and Hammond, P.S. (2021). Improving understanding of bottlenose dolphin movements along the east coast of Scotland. Final report. Report number SMRUC-VAT-2020-10 provided to European Offshore Wind Deployment Centre (EOWDC), March 2021 (unpublished).

Bailey, H. and Thompson, P. (2006). Quantitive analysis of bottlenose dolphin movement patterns and their relationship with foraging. Journal of Animal Ecology 75: 456-465.

Boisseau, O., McGarry, T., Stephenson, S., Compton, R., Cucknell, A. C., Ryan, C., McLanaghan, R. and Moscrop, A. (2021). Minke whales *Balaenoptera acutorostrata* avoid a 15 kHz acoustic deterrent device (ADD). Marine Ecology Progress Series, 667, 191-206.

Equnior New Energy Ltd (2022) Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects Environmental Statement Volume 3, Appendix 10.2: Underwater Noise Modelling Report.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Boerjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M., Scheidat, M., Teilmann, J., Vingada, J., and Oien, N. (2021). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys.

IAMMWG (2023). Updated abundance estimates for cetacean Management Units in UK waters (Revised 2022). JNCC Report No. 680, JNCC Peterborough, ISSN 0963-8091.

Jansen, J.K., Boveng, P.L., Dahle, S.P. and Bengston, J.L. (2010). Reaction of harbor seals to cruise ships. Journal of Wildlife Management,74,1186–1194. https://doi.org/10.1111/j.1937-2817.2010.tb01239.x

Kastelein, R.A., Van de Voorde, S, and Jennings, N. (2018). Swimming Speed of a Harbour Porpoise (*Phocoena phocoena*) During Playbacks of Offshore Pile Driving Sounds. Aquatic Mammals: 44(1):92-99.

Joint Nature and Conservation Committee (JNCC) (2010). JNCC guidelines for minimising the risk of injury to marine mammals from using explosives. August 2010.

Marine Research. Available from: https://synergy.st-andrews.ac.uk/scans3/files/2021/06/SCANS-III_design-based_estimates_final_report_revised_June_2021.pdf

Moray West (2018) Offshore Environmental Impact Assessment Report. https://marine.gov.scot/data/moray-west-offshore-windfarm-environmental-impact-assessment-report

Reid, J.B, Evans, P.G.H. and Northridge, S.P. (2003). Atlas of cetacean Distribution in North west European waters. JNCC, Peterborough.

SNH (2017) The Scottish Marine Wildlife Watching Code: https://www.nature.scot/sites/default/files/2017-06/Publication%202017%20-%20The%20Scottish%20Marine%20Wildlife%20Watching%20Code%20SMWWC%20-%20Part%201%20-%20April%202017%20%28A2263518%29.pdf

Southall, B., J. J. Finneran, C. Reichmuth, P. E. Nachtigall, D. R. Ketten, A. E. Bowles, W. T. Ellison, D. Nowacek, and P. Tyack. (2019). Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals 45:125-232.

Waggitt, J.J., Evans, P.G., Andrade, J., Banks, A.N., Boisseau, O., Bolton, M., Bradbury, G., Brereton, T., Camphuysen, C.J., Durinck, J. and Felce, T. (2019). Distribution maps of cetacean and seabird populations in the North-East Atlantic. Journal of Applied Ecology, 57(2), pp.253-269

Wilson, S. (2014). The impact of human disturbance at seal haul-outs. A literature review for the Seal Conservation Society. Available at: http://www.pinnipeds.org/attachments/article/199/Disturbance%20for%20SCS%20-%20text.pdf