MORAY OFFSHORE WINDFARM (WEST) LIMITED

UXO Clearance Environmental Report

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Executive Summary

Moray Offshore Wind Farm (West) Limited is currently preparing for surveys to identify potential unexploded ordnance (pUXO) prior to commencement of construction of the Moray West Offshore Wind Farm and associated Offshore Transmission Infrastructure (OfTI) (referred to as 'the Development').

Before the majority of construction and installation works can begin, it will be necessary to undertake pre-construction seabed preparations. These preparations will include the clearance of Unexploded Ordnance (UXO) as a necessary measure to mitigate this potentially major risk to safety. Any UXO, identified through a dedicated survey, that are deemed to be hazardous must be removed from the areas in the vicinity of the turbine and Offshore Substation Platform (OSP) foundations and inter-array and offshore export cables before the construction of these key project elements can commence.

Wherever possible, pUXO will be avoided through re-routing of cables (inter-array, interconnector, and export cables) or micrositing of foundations. Where pUXO avoidance is not possible, a detailed inspection will be carried out by a remote underwater vehicle (ROV) or diver, to confirm whether the target is UXO and, therefore, a hazard to construction, operation or maintenance activities. If UXO is confirmed, and avoidance is not possible, Moray West will clear the UXO using controlled detonation or deflagration. The method of disposal shall depend on the target identified, with low order deflagration and high order detonations considered (with preference in that order).

In order to safely undertake any UXO clearance activities within the Development area, a Marine Licence and a European Protected Species (EPS) Licence are required from Marine Scotland Licensing Operations Team (MS-LOT). This Environmental Report is submitted in support of the Marine Licence application by Moray West for the UXO clearance activities. The potential UXO (pUXO) identification works in the nearshore area were carried out in January 2023, resulting in no confirmed UXO requiring disposal. The UXO clearance activities will take place between February 2023 and May 2023 (inclusive).

An appraisal of the potential effects of the UXO clearance activities has been undertaken regarding key receptor groups, namely: physical processes; benthic and intertidal ecology; fish and shellfish; marine mammal ecology; offshore ornithology; commercial fisheries; shipping and navigation; archaeology and cultural heritage; infrastructure and other users; and designated sites. The impact appraisal concluded that there will be no adverse residual effects (following mitigation) due to the proposed UXO clearance activities. With regard to designated sites, an assessment of Likely Significant Effects (LSE) and Adverse Effects On Integrity (AEOI) has been undertaken, which found an LSE for Moray Firth SAC and Dornoch Firth and Morrich More SAC only, due to potential impacts on marine mammal receptors. Taking into account the mitigation proposed in the Marine Mammal Mitigation Plan (MMMP), the assessment found no potential Adverse Effect on Site Integrity (AEoSI) for Moray Firth SAC and Dornoch Firth and Morrich More SAC in relation to the conservation objectives for their marine mammal features.

An MMMP has been produced in support of the Marine Licence application in order to mitigate against any potential effects to marine mammals due to the UXO clearance activities (**Appendix B**).

Abbreviations and Acronyms

Acronym / Abbreviation	Description
AAA	Anti-Aircraft Artillery
ADD	Acoustic Deterrent Device
AEOI	Adverse Effect on Integrity
AIS	Automatic Identification System
ASA	Archaeological Study Area
BOWL	Beatrice Offshore Windfarm Ltd
CES	Coastal East Scotland
CGNS	Celtic Greater North Sea
CI	Confidence Interval
CV	Coefficient of Variation
EDR	Effective Deterrent Radius
EIA	Environmental Impact Assessment
EOD	Explosive Ordnance Disposal
EPS	European Protected Species
FCS	Favourable Conservation Status
FLO	Fisheries Liaison Officer
FRC	Fast Rescue Craft
FWPM	Freshwater Pearl Mussel
GNS	Greater North Sea
HE	High Explosive
HF	High Frequency
HVDC	High Voltage Direct Current
IAMMWG	Inter-Agency Marine Mammal Working Group
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LF	Low Frequency
LOD	Limit of Detection
LSE	Likely Significant Effect
MF	Medium Frequency
MMMP	Marine Mammal Mitigation Plan
MMO	Marine Mammal Observer
MS-LOT	Marine Scotland – Licensing Operations Team
MoD	Ministry of Defence
MU	Management Unit
NCMPA	Nature Conservation Marine Protected Area
NEQ	Net Explosive Quantity
nm	Nautical Miles

Acronym / Abbreviation	Description
NMFS	National Marine and Fisheries Service
NNR	National Nature Reserve
NtM	Notice to Mariners
OECC	Offshore Export Cable Corridor
OfTI	Offshore Transmission Infrastructure
OFTO	Offshore Transmission Owner
OSP	Offshore Substation Platform
OWF	Offshore Windfarm
PAD	Protocol for Archaeological Discoveries
PAH	Polyaromatic hydrocarbons
PAM	Passive Acoustic Monitoring
PAM-Op	Passive Acoustic Monitoring Operator
PEXA	(Military) Practice and Exercise Areas
PMF	Priority Marine Features
PTS	Permanent Threshold Shift
pUXO	Potential Unexploded Ordnance
RAF	Royal Air Force
RIB	Rigid Inflatable Boat
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SCANS	Small Cetaceans in European Atlantic Waters and the North Sea (study)
SEL	Sound Exposure Level
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SPL	Sound Pressure Level
SSC	Suspended Sediment Concentrations
TI	Transmission Infrastructure
TTS	Temporary Threshold Shift
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
VHF	Very High Frequency
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generators

1 Introduction

1.1 Background

The Moray West Offshore Wind Farm and associated Offshore Transmission Infrastructure (OfTI) (referred to as 'the Development') is being developed by Moray Offshore Windfarm (West) Limited (known as 'Moray West'; see **Appendix A** for defined terms). Consent for the Development was granted on 14 June 2019 under Section 36 (S36) of the Electricity Act 1989 (as amended), Part 4 of the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 from Scottish Ministers. One S36 consent was granted by Scottish Ministers for the wind farm (012/OW/MORLW-8) and two Marine Licences were granted by Scottish Ministers, one for the wind farm and another for the offshore transmission infrastructure.

Variations of the S36 consent and wind farm Marine Licence were granted by the Scottish Ministers on 7 March 2022, and further variations of the Wind Farm Marine Licence (licence number: MS-00009774) and OfTI Marine Licence (licence number: MS-00009813) were granted on 7 March 2022 and 11 April 2022. The revised S36 consent and associated Marine Licences are referred to collectively as 'offshore consents'.

The Moray West Site covers an area of approximately 225 km^2 on the Smith Bank in the Outer Moray Firth approximately 22 km from the Caithness coastline (Figure 1-1). The Moray West Offshore Wind Farm will comprise 60 wind turbine generators (WTGs), associated substructures and seabed foundations, inter-array cables, one offshore substation platform (OSP) inter-connector cable and any scour protection around substructures or cable protection. The OfTI comprises up to two OSPs which will be located within the Moray West Site, and two offshore export cable circuits which will be located within the OfTI Corridor and will be used to transmit the electricity generated by the offshore wind farm to shore.

The offshore export cable circuits will come ashore at Sandend Bay, which is located on the Aberdeenshire Coast at Broad Craig, approximately 65 km south of the Moray West Site. There will be two underground circuits from landfall at Sandend Bay to Whitehillock where the onshore substation will be located. There will also be further underground cabling between Whitehillock substation and Blackhillock substation. Moray West will transfer ownership of the transmission assets to an Offshore Transmission Owner (OFTO) who will manage the transmission infrastructure.

The development is aiming to be fully operational in 2024/25 with an operational life of 25 years from the date of final commissioning of the Development.

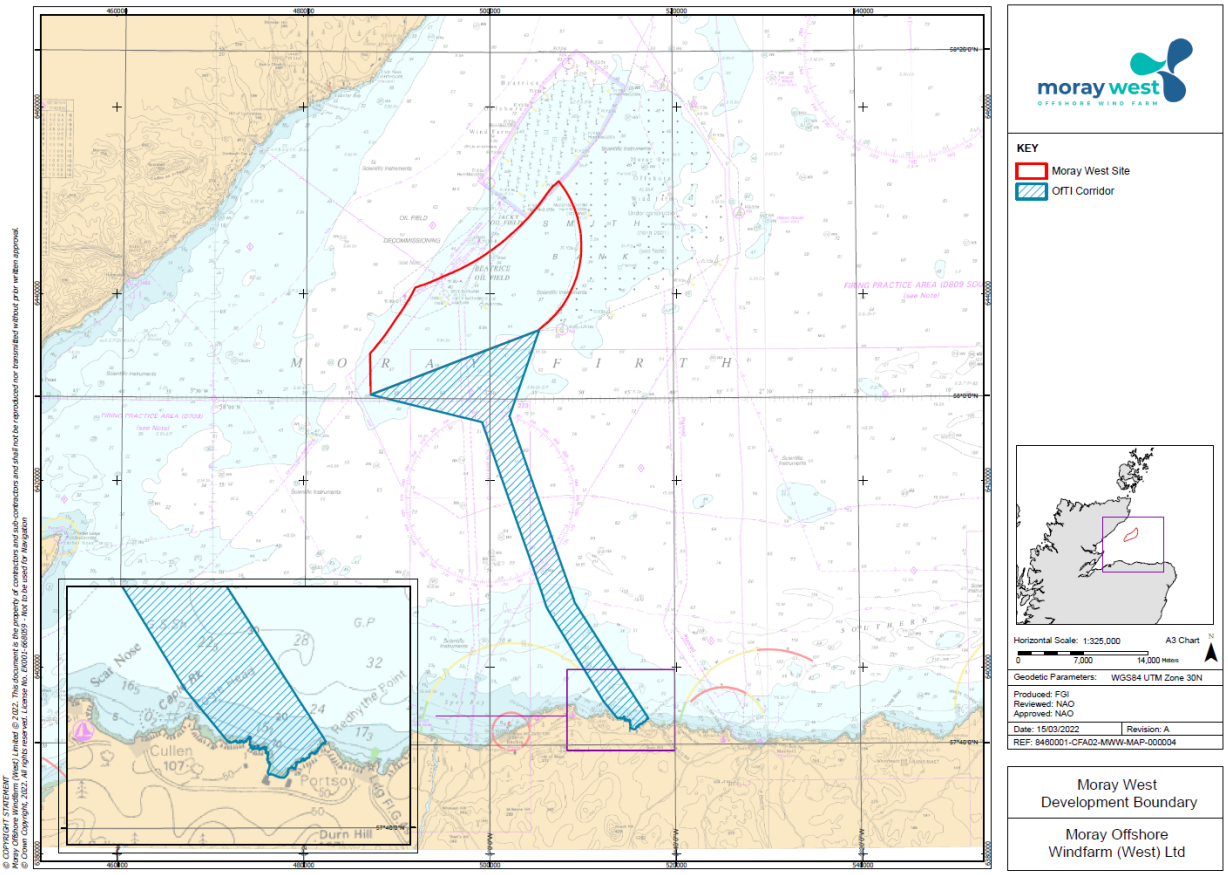

Figure 1-1 Moray West Offshore Wind Farm Development Site.

1.2 Purpose of the Report

The offshore consents for the development contain a variety of conditions that must be discharged through approval by the Scottish Ministers prior to the commencement of any offshore construction works. Moray West is currently undertaking preparatory work to progress the necessary pre-construction conditions under these existing offshore consents.

Before the majority of construction and installation works can begin, it will be necessary to undertake pre-construction seabed preparations. These preparations will include the clearance of Unexploded Ordnance (UXO) as a necessary measure to mitigate this potentially major risk to safety. Any UXO, identified through a dedicated survey, that are deemed to be hazardous must be removed from the areas in the vicinity of the planned Wind Turbine Generator (WTG) and Offshore Substation Platform (OSP) foundations and inter-array, interconnector and offshore export cables before the construction of these key project elements can commence.

UXO clearance activity is not covered under the list of activities licensed by the existing offshore consents. Therefore, in order to undertake this necessary prerequisite activity, a Marine Licence is required from Marine Scotland Licensing Operations Team (MS-LOT) under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 to undertake the UXO clearance within the Moray West Site and OfTI Corridor.

In addition, the clearance of UXO by detonation means that a European Protected Species (EPS) Licence is required under the Conservation of Offshore Marine Habitats and Species Regulations 2017. A separate application for an EPS license is submitted alongside this document.

The information contained within this report is presented in support of the Marine Licence application to MS-LOT for the required UXO clearance works. This document is intended to provide the necessary information to MS-LOT (and statutory advisers, where relevant) to facilitate the Marine Licence decision-making process.

2 Description of the Proposed Works

The following section provides a description of the UXO clearance activities, including the number, size and location of UXO that may be found and the activities that are licensable under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009.

2.1 Potential for UXO

2.1.1 Background

All military technology has a baseline failure rate, meaning that a subset of all ordnance used will not function as the designer intended, either during training or operational use. Consequently, the totality of military activities and conflicts over the 20th century has resulted in munitions contamination of the marine environment, and now it is not uncommon to encounter UXO during intrusive seabed activities.

During WWII, the failure rate of aerially delivered bombs was at least 10%. In addition, bombs often missed targets or were dumped from aircraft to reduce weight (6 Alpha, 2022). During the conflicts of the 20th century, sea mines were deployed in significant quantities, and there was a common practice of dumping small arms ammunition at sea which occurred without regard to the accurate recording of dumping position (6 Alpha, 2022). This has resulted in a scenario where UXO, particularly WWII UXO, is extant in the marine environment in unknown locations and at a sufficiently high abundance to pose a significant threat to activities interacting with the seabed in the marine environment.

2.1.2 Potential UXO Sources

The potential for UXO to exist within the Development Site (Figure 1-1) has been assessed through a desktop risk assessment (6 Alpha, 2022), which has identified the following key UXO threats that may be encountered across the Development:

- Aerially delivered High Explosive (HE) bombs;
- Projectiles (naval and anti-aircraft artillery (AAA));
- Torpedoes;
- Naval mines; and
- Shipwreck related munitions.

The likelihood of encountering these UXO sources within the Development Site, as assessed through the desktop study, is displayed in **Table 2-1.**

Table 2-1: Summary of Potential UXO Sources (likely sources highlighted in red and marked with *) (6 Alpha, 2022)		
Potential Sources of UXO	**Likelihood of UXO Contamination**	**Associated UXO Threat Items**
Aerial Bombing*	Likely: A British offshore bombing range was documented across the Development Site.	HE Bombs
Naval Engagements	Unlikely: Although there is evidence of limited submarine activity across the Development Site.	Naval Projectiles and Torpedoes
Naval Minefields	Unlikely: Although the Development Site was intersected by one WWI-era minefield.	Naval Mines
Military Practice and Exercise Areas*	Likely: Several historic and modern military training areas were recorded intersecting the Development Site.	HE Bombs, Torpedoes and AAA Projectiles
Coastal Armaments*	Likely: An AAA firing range was recorded as intersecting the Development Site.	AAA Projectiles
Munitions Related Shipwrecks and Aircraft	Unlikely: Although, two munitions related shipwrecks were documented within the Development Site.	Shipwreck Related Munitions
Munitions Dumping (within 10km)	Highly Unlikely: No munitions dumps were recorded within 10km of the Development Site.	N/A

UXO in the form of projectiles could be present anywhere in the area. In the Moray West Site, it is most likely that identified targets would be types of aerial bombs or torpedoes, while in the nearshore area of the OfTI Corridor it is predicted to be differing types of artillery and naval projectiles. These are most likely to be smaller calibre shells with a Net Explosive Quantity (NEQ - based upon equivalent Trinitrotoluene (TNT) masses) in the region of 25 kg, but larger projectiles could be encountered and with a slightly larger NEQ of up to 51 kg of Amatol or Pentolite explosives, such as British 250lb Medium Capacity (MC) Bomb (6 Alpha, 2022).

Although any size of could be encountered, most are likely to be small the largest hazard item in the area of UXO clearance is unknown at present. However, based on the type of UXO that could be present it could be possible for up to a 364 kg charge weight to be encountered. This is the assumption that has

been used as the worst case for the purposes of this Marine Licence Application (MLA). The worst-case method for UXO clearance is high-order detonation.

Table 2.2 Anticipated worst case UXO items for each category that could be encountered

UXO item	Ferrous Mass	Net explosive quantity (NEQ)	Dimensions
G7a Torpedo	1,248kg	364kg	7,000mm x 535mm
1,000lb MC Bomb	202-225kg	309.4kg	1,334mm x 451mm
E-Mine	208kg	165kg	1,168mm x 864mm
SC-50 HE Bomb	25-30kg	25kg	762mm x 200mm
6” Artillery Projectile	39.4kg	6kg	582mm x 152mm

2.1.3 Number of UXO

UXO surveys in the Development Site are planned but yet to be completed, and these will provide up-to-date and precise information to inform UXO clearance activities. As this information is not yet available, this report is informed by the Unexploded Ordnance Threat and Risk Assessment (6 Alpha, 2022), which in turn draws upon 6 Alpha’s UXO database, and is benchmarked using the number of confirmed UXO found during the installation works at the nearby Moray East Offshore Wind Farm.

From the above sources, on a precautionary basis, it is estimated that a maximum of 30 detonations of UXO may be required within the Development Site during UXO clearance activities. The number, size and locations of any UXO to be cleared by detonation will be confirmed with MS-LOT following investigation of the identified targets and prior to any clearance activities.

2.2 The Moray West Approach

A UXO survey campaign is due to be undertaken June to January 2023 to identify the potential for UXO within the Moray West Site and OfTI Corridor. The results of this campaign will be analysed to identify potential UXO (pUXO) within the Development Site. Should pUXO be identified, the preference is to avoid the pUXO and re-route or microsite where possible. Where practicable, taking into account health and safety, any pUXO targets will be avoided by placing an industry standard 15 m radius avoidance zone around the target for the siting of any infrastructure and other “seabed intrusive” activities (e.g., vessel jack-up). The target pUXO will be left in-situ, locations will be noted and relevant authorities and other sea users notified, where required. Should re-routing, or micrositing not be possible at this stage, the pUXO will be targeted for inspection, and the targets will be confirmed as either UXO or non-UXO debris.

Should the target be confirmed as non-UXO debris, the debris will either be recovered to the deck of the vessel for disposal onshore, or the debris will be repositioned on the seabed. Where debris cannot be repositioned or recovered to the deck of the vessel, they will be avoided through re-routing.

Should the target be confirmed as UXO (cUXO), the preference is to avoid this target where practicable. If avoidance is not possible, the target will be subject to Explosive Ordnance Disposal (EOD) operations. There are three options for UXO disposal which could be used as part of EOD operations:

1. UXO clearance in situ – this is the preferred option for health and safety reasons;
2. Relocation of the UXO on the seabed and then detonation – an example of when this would occur are in instances when detonating in situ could potentially compromise the safety of existing nearby assets. In the instance where third party assets are situated nearby, Moray West will contact the third party prior to detonation in order to establish a safe distance between the asset and detonation site. Another example of this occurrence is where two UXO are located in close proximity to one another, whereby one UXO is relocated nearer to the other UXO, allowing a single detonation to take place rather than two separate detonations; and
3. Recovery of the UXO to the deck of the vessel – this would be undertaken for small items of UXO e.g., hand grenades, or as a last resort for larger items should options 1 or 2 not be possible.

After detonation of the UXO, an as left survey will be conducted to confirm disposal of the target.

2.3 Licensable Activities (UXO Clearance Activities)

2.3.1 Identification Operations

The following describes the pUXO target identification operations, which will be carried out from December 2022, following the UXO survey campaign.

2.3.1.1 pUXO Target Investigation by ROV

This work will utilise a Remotely Operated Vehicle (ROV) to localise, excavate and identify pUXO based on a master target list generated in the UXO survey campaign. The procedure is as follows:

1. The ROV spread will begin by covering a 10 x 10 m, centred on the target position, using electromagnetic sensors at a height of < 0.5 m above seabed.
2. Once the target is located, localised dredging works will commence and continue until the target is visible. Dredging will be carried out with the dredge-pump attached to the ROV until the target is free from sediment.
3. If the target is confirmed as non-UXO, the object will be checked for being of potential archaeological interest. If it is not of archaeological interest, the object will be relocated either to the vessel, or outside the 10 x 10 m box. This will ensure it is placed outside the clearance corridor.
4. The target location will then be inspected again with the electromagnetic sensor to make sure that no second target is hidden under the first target.
5. If a target inspection results in a confirmed UXO identification, it will be treated according to the protocol outlined below in Section 2.3.2

Dredging of targets will be carried out with a 4” dredge-pump excavation/jetting system (e.g., Tritech Merlin; see Figure 2-1) fitted on the ROV. Dredging will excavate up to 3 m (depth) of sediment and deposit it immediately adjacent to the excavated area. No sediment will be brought on the board the launch vessel.

Figure 2-1: Tritech Dredge Pump.

2.3.1.2 pUXO Target Investigation by Diver (Nearshore area only)

The vessel will transit to the given pUXO position and hold position to provide a stable diving platform. The diver will be deployed with a hand-held magnetometer to pinpoint the location of the target. The survey of the target area will be a conducted as a minimum radial search area covering an initial 5m x 5m area over the given target position, extending by 1 m increments to 10 m if no object is found.

Once the target has been located and suspected to be a potential UXO, the diver will visually inspect the target. The diver will attempt to uncover by hand those pUXO targets that are buried or will use diver-held airlift / high pressure water jet to safely expose the item to enable positive identification of the target. A HD Sonar camera (ARIS) may be utilised to aid safe identification of items located on the seabed and enhance diver safety. The camera can be hand-carried by the diver with a live feed to the surface allowing the Explosive Ordnance Disposal (EOD) Supervisor to assess the target sonar image in low water visibility.

2.3.2 Explosive Ordnance Disposal Operations

The following describes the sequencing of the EOD operations (it should be noted that all EOD operations will be undertaken in accordance with the Marine Mammal Mitigation Plan (MMMP) as included in **Appendix B**, and the information below is provided as a summary of that procedure only. Please see the full MMMP for all mitigation requirements.

EOD clearance will commence in February 2023 and will be complete by the end of May 2023. A total of 9 targets were identified as pUXO in the nearshore area, and none were confirmed UXO. Nearshore UXO ID works were completed in January 2023, resulting in non-confirmed UXO requiring disposal. EOD clearance in the ECC and Wind Farm Site are expected to take place from February 2023 onwards. All clearance works will take place during daylight hours and in sea state no greater than 3 (estimated working limits for disposal operations are wind speed no greater than 25 knots and wave height of 2.5 m).

Firstly, after all the pUXO targets have been inspected (after consideration of whether they can be avoided), the confirmed and unavoidable UXO targets will need to be cleared in a separate EOD campaign. For this campaign, two vessels will be required:

- an inspection/operations vessel from which the (ROV) or diver will be deployed and where the explosives will be stored; and
- a launch vessel.

The Acoustic Deterrent Device (ADD) and portable Passive Acoustic Monitoring System (PAM) equipment will be deployed from the operations vessel, along with the Marine Mammal Observers (MMOs) and PAM Operator (PAM-Op).

If a target is confirmed as a UXO by the EOD expert after the UXO inspection, a 250 m radius exclusion zone shall be implemented around the target, the position noted, and all relevant authorities notified.

Once all the target inspections are complete, the vessel will return to the confirmed UXO target, and the geodetic position of the item will be correlated and confirmed with the Client Representative, survey team and EOD Superintendent, at which point the EOD system will be deployed by the ROV (or diver) and placed

in the optimum firing position. The method of disposal shall depend on the target identified, with low order deflagration the preferred method, and high order detonation considered. Preference shall always be for low order deflagration followed by high order detonation:

- For low order deflagration, a cone shall penetrate the UXO and burn the explosive material.
- For high order detonation, a charge shall be placed next to the target to dispose of the explosive material.

Whichever EOD system is used by the EOD contractor, the system shall be safe and reliable, and will have undergone a proven safety and performance testing regime.

2.3.2.1 Low-Order Deflagration

The UXO clearance method preferred to be utilised during the construction of Moray West Offshore Wind Farm is deflagration. Following confirmation by hand-diving or uncrewed vehicle that the anomaly is indeed a UXO requiring clearance by deflagration, the methodology below would be completed:

- A plastic casing would be attached directly to the UXO by hand by a diver or an uncrewed vehicle, containing the materials used to make-safe the UXO.
- Once environmental and safety mitigation has been applied, the initiation of the Deflagration will begin with the contents of the plastic casing causing a 'rapid burning' through the UXO.
- This begins the incineration of the UXOs contents which in-turn builds up a gas pressure whilst consuming the UXOs explosive contents.
- Once the contents ignite and the UXO reaches a critical pressure, the case bursts and the UXO is made safe.
- The methodologies employed by EODEX allow for all the remains of the UXO to be concentrated at its original location.
- Once considered safe to do so, the remains of the UXO will be recovered for final safe disposal at an environmentally accredited site ashore, meaning that all parts of the neutralised UXO will be removed from its identified location on the seabed following deflagration action.

Although Deflagration is still a kinetic process, it has greatly reduced effects on the surrounding environment from those created during a clearance by High Order detonation, i.e. detonating the UXO with the same explosive results the UXO was designed for.

2.3.2.2 High-Order Detonation

When a "live firing" run is ordered, the charge will be drawn from the on-board explosives magazine (bomb-proof storage location for explosives), fitted to an anchoring system (typically a concrete block) and secured in the manipulator arm of the ROV. Also attached to the anchoring system is a float with the firing line (typically a shock tube). It is common for safety features like Non-Electric Detonators and Hydrostatic Safety Breaks to be fitted to the EOD system immediately prior to the launching of the ROV to ensure there is no accidental firing of the charge.

The ROV will be deployed and return to the target at the designated position. When the ROV is 1 m away from the intended target, the anchoring system will be deployed and placed 0.5 m away from the target. In this way, the EOD system will be placed in the optimum firing position without making any physical contact with the target at any time.

Once in position, the float with the firing line will be released from the ROV manipulator and will ascend to the surface paying out the firing line as it ascends. Afterwards, the ROV will be recovered back to the deck.

The EOD system will subsequently be in the optimum firing position with the float and firing line at the surface ready to be fitted to the firing mechanism. This is achieved by deploying the launch vessel (fast rescue craft (FRC) or EOD rigid hull inflatable boat (RIB)), with the EOD Technicians onboard, back to the float to connect the firing line to the firing mechanism.

The launch vessel will move to 200-300 m range from the target. Within a safe distance of the target, the ADD and portable PAM will be deployed, and the MMOs will perform a visual survey from the operations vessel (see **Appendix B**).

The launch vessel will return to the shot-line float, recover it, and connect the firing shot line to the e-clips fitted to the surface initiation float. On completion, the surface initiation float will be released and the launch vessel will advise that the operation has been successfully completed.

On completion of the ADD procedure, the ADD and PAMs hydrophone will be recovered to the operations vessel and return to a safe distance from the UXO detonation and remaining available to advise other vessels in the vicinity if required.

The safety management of vessels and other traffic within the UXO mitigation zone (1,500 m) will be managed and coordinated by the EOD Superintendent and the vessel master who will liaise directly with the authorities for the area in accordance with the embedded mitigation described in **Section 5**. A security radio message will be transmitted to state the vessel name, position of firing, and planned time at six hours, 30 minutes, and 10 minutes before the UXO detonation.

At the agreed firing time, the launch vessel will initiate the firing mechanism and fire the EOD main charge.

On completion of successful detonation, the launch vessel will return to the target location and recover the surface initiation float. The MMOs will conduct post-detonation MMO routines (see **Appendix B**). The ROV will be deployed and carry out an as-left survey centred on the target location using the ROV sensors. UXO debris greater than 30 cm in size, or debris which may contain explosive material originating from the UXO target will be recovered by the ROV to the deck of the vessel. This will ensure that the area is cleared of any UXO and that no significant metallic objects remain. The ROV will also provide multibeam bathymetry results to quantify the size and shape of any resulting detonation crater, to record any significant environmental impacts and to assist with future engineering plans.

For UXO detonations in shallow waters, (less than 12 m Lowest Astronomical Tide (LAT)), it is possible the target charge may be set by divers or an ROV (as described above). Initiation and firing procedures remain the same.

It is noted that within the 12 nautical mile (nm) zone, the responsibility for UXO clearance is in principle with the UK authorities such as Coastguard and Royal Navy. Therefore, if a UXO item is found within the 12 nm zone, consultation will be held with the Police, Royal Navy, and Coast Guard following completion of the survey and prior to implementation of UXO clearance activities to determine if the Moray West contractor should clear all required UXO, including those within 12 nm. As with UXO items found outside the 12 nm zone, all UXO identified will be reported to MS-LOT and other marine users, as set out in the embedded mitigation measures provided in **Section 5** below.

2.3.3 Non-UXO Debris Clearance

In the event a target is identified as non-UXO (debris) by an EOD expert, a decision will be made regarding the threat of the object to construction and operations and maintenance activities, and the object will either be left in situ or relocated. This may be through re-location on the seabed at a pre-determined lay down area or through recovery to the vessel deck with subsequent disposal at an onshore disposal facility. The non-UXO debris may be transported to an alternative location hanging from a crane grab or “held” by the ROV in the water column. Otherwise, the non-UXO item (debris) will be recovered on the deck of the vessel for transport, depending on the size and weight of the target. Items relocated to the seabed will have their coordinates logged. Waste disposal onshore will be undertaken by a suitably registered and licensed contractor.

3 Scotland's Marine National Plan

This UXO Clearance Environmental Report has been prepared in consideration of, and in reference to, Scotland's National Marine Plan.

Scotland's National Marine Plan covers both Scottish inshore waters (out to 12 nautical miles (nm)) and offshore waters (12 to 200 nm). It also applies to the exercise of both reserved and devolved functions. Marine planning matters in Scotland's inshore waters are governed by the Marine (Scotland) Act 2010, and offshore waters by the Marine and Coastal Access Act 2009 (referred to as the Marine Acts).

The National Marine Plan sets out strategic policies for the sustainable development of Scotland's marine resources. Regional Marine Plans will be implemented at a local level within Scottish Marine Regions, to take into account local circumstances and smaller ecosystem units.

The following policies are relevant to this Marine Licence application:

- GEN 7 Landscape/seascape: Marine planners and decision makers should ensure that development and use of the marine environment take seascape, landscape and visual impacts into account.
- GEN 9 Natural heritage: Development and use of the marine environment must:
    - Comply with legal requirements for protected areas and protected species.
    - Not result in significant impact on the national status of Priority Marine Features.
    - Protect and, where appropriate, enhance the health of the marine area.
- GEN 13 Noise: Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects.

GEN 7 considers the importance of landscape and seascape elements to people's enjoyment of the coastal and marine environment. The UXO clearance works form part of preparation works for the Moray West Offshore Wind Farm, which has undergone a robust Environmental Impact Assessment (EIA) assessment to minimise any landscape/seascape impacts. The UXO clearance itself is all carried out underwater and will not alter any landscape or seascape views.

GEN 9 considers the natural heritage of the surrounding environment and ensure that it is protected. This environmental report ensures that the effects from the UXO clearance, are reduced and mitigated as much as possible, to ensure the integrity of the surrounding environment is protected.

GEN 13 states that the any man-made noise and vibration does not adversely affect those species sensitive to underwater noise. A risk assessment has been prepared and submitted alongside the EPS Licence application. In addition, an MMMP has been prepared and can be found in **Appendix B**.

4 Environmental Appraisal of UXO Clearance Works

4.1 Overview

A detailed description of the baseline environment for each environmental parameter is available from the original project EIA Report (Moray West, 2018). The following sections provide an overview of the baseline environment and potential impacts on key receptors that may be potentially affected by any UXO clearance activities required within the Development Site.

The information utilised to provide details of the key receptors has been drawn from the Moray West EIA Report 2018, the results of more recent post-consent / pre-construction surveys and other publicly available information.

Each assessment is based on the worst-case scenario of 30 UXO high-order detonations (6 Alpha Associates Ltd., 2022) and concludes, based on professional judgement and appraisal of the relevant data, whether the UXO clearance activities are likely to result in an adverse effect on the receptor.

4.2 Physical Processes

4.2.1 Existing Environment

The Moray West Site spans the crest and western flank of Smith Bank and is characterised by water depths in the range 35 to 54 m below LAT. Smith Bank is a submerged bathymetric high in the Outer Moray Firth, covered by a veneer of sands and gravels of variable thickness and proportion. Overall, Smith Bank is approximately 35 km long from south-west to north-east, around 20 km wide, rising from a base level of between 50 and 60 m below sea level to less than 35 m at the crest.

The Moray West Site is situated within a meso-tidal setting (typical tidal ranges in water level between 2 to 4 metres). There is some variation in tidal range along the Offshore Export Cable Corridor (OECC), with the highest water levels experienced at the landward end. At Buckie, (near the Landfall Area), the mean spring range is 3.4 m. Recorded (depth-averaged) peak spring current speeds are around 0.25-0.3 m/s, with the fastest speeds recorded in the north of the Moray West Site. Along most of the OECC, peak spring current speeds are typically less than 0.3 m/s.

Seabed sediments across the Moray West Site generally consist of Holocene gravelly sand and sand with a minor proportion of fines (<5 to 10% silt and clay sized). Seabed sediments along the OfTI are variable, with areas of mixed sands and gravels (with a small proportion of fines (<5 to 10%)) present close to the Moray West Site become progressively finer in deeper water along the route, becoming relatively muddy (30 to 65% fines) in the deepest parts.

The available evidence suggests that (bedload) material is travelling into the Firth from the north, passing along the Caithness coast and towards the Inner Moray Firth. Tidal currents are largely incapable of mobilising anything larger than fine sand-sized material within the Moray West Site and as a result, there is only limited net bedload transport of sediment due to tidal currents alone. However, it is likely that the commonly present fine sand is regularly mobilised within the Moray West Site during storms.

Within the Moray West Site, suspended sediment concentrations (SSCs) are typically very low (approximately < 5 mg/l). However, during storm events, near seabed SSC can be significantly increased in the short-term due to the influence of waves stirring the seabed.

4.2.2 Assessment of Effects

4.2.2.1 Impact 1: Increases in suspended sediment concentrations (SSC) and deposition on the seabed

There will likely be an increase in SSC within the vicinity of the UXO detonation location due to the blast mobilising sediment into the water column. Following this, the suspended sediment will begin to re-deposit on the seabed, with time taken to re-deposit dependent largely upon the sediment particle size. Due to the impulsive nature of the detonation, the duration of sediment suspension will be highly temporally limited, with resettlement of sediment beginning almost immediately following the detonation. With an estimated maximum of 30 detonations, the total area affected will be small in the context of the wider Moray Firth area. Whilst SSC above baseline levels will occur immediately following detonation, these SSC will not likely be of greater magnitude than that experience during storm events. Any craters created during detonation process are expected to be backfilled over time via natural processes. The rate of natural backfill will vary over spatial scales according to the varying sediment transport dynamics in the local area, with the severity and regularity of storm events contributing to the rate of infill. Any small fractions of fine sediment that are resuspended by detonation will quickly dissipate in the wider environment to levels that are indiscernible from the baseline. In consideration of the methods being employed for UXO clearance and the scale of the UXO clearance works, effects are expected to be temporary and localised to the immediate vicinity of the works.

4.3 Benthic and Intertidal Ecology

4.3.1 Existing Environment

The benthic survey for the Moray West EIA report (Moray West, 2018) revealed that the dominant sediment habitat type in the Moray West Site is slightly gravelly sand which tended to have a relatively small amount of gravel (<5%) typically shell fragment/grit or occasional small stones. There were also patches of gravelly muddy sand, gravelly sand, (slightly gravelly) muddy sand, sand, sandy gravel and muddy sandy gravel.

Along the OfTI, sediment habitat type varies from clean sand or (slightly gravelly) sand with negligible mud content in inshore areas, to progressively muddier sediments moving offshore towards to the middle of the OfTI with quite high mud content (31% to 63% mud) recorded at the stations in the deepest water depths. In the furthest offshore sections of the OfTI, sediments tended to be (slightly gravelly) sand with a modest mud content (<10%) and very low quantities of gravel (<5%).

Four habitats or biotopes of conservation interest were identified during the Moray West Site and OfTI survey. These included the Priority Marine Features (PMF) **SS.SMu.CFiMu.SpnMeg** 'Seapens and burrowing megafauna in circalittoral fine mud' (found within the OfTI) and **SS.SCS.ICS.MoeVen** '*Moerella* spp. with venerid bivalves in infralittoral gravelly sand' (found within the Moray West Site) and **SS.SSa.CFiSa.EpusOborApri** '*Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral

fine sand' a component of the offshore subtidal sands and gravel PMF (found throughout the Moray West Site).

Since submission of the EIA report, the Southern Trench Nature Conservation Marine Protected Area (NCMPA) has since been designated (2020). The OfTI travels through the NCMPA (Figure 4-1), which, relevant to benthic and intertidal ecology, has been designated for 'burrowed mud' PMF, a habitat type supporting Norway lobster *Nephrops norvegicus* and sea pens.

4.3.2 Assessment of Effects

4.3.2.1 Impact 1: Temporary Habitat Loss and/or Disturbance

The clearance of UXO within the Development Site has the potential to result in the loss of benthic habitat and associated fauna within the vicinity of the blast site. Sandy and coarse sand sediments dominate across the Development Site, with associated infaunal bivalve and annelid communities that are routinely subject to natural physical disturbance. Similar sediments and communities are found across the Development Site and surrounding areas; therefore, recovery at the affected areas will be rapid due to colonization from surrounding unaffected areas. Any craters created during the detonation process are expected to be backfilled over time via natural processes. The rate of natural backfill will vary over spatial scales according to the varying sediment transport dynamics in the local area, with the severity and regularity of storm events contributing to the rate of infill (Moray West, 2018). Due to the localised nature of the impact, coupled with the high recoverability of the communities present, the impact of temporary habitat loss and/or disturbance on benthic ecology will be highly localised and temporary.

Norway lobster, sea pens, and other characteristic burrowing organisms supported by the designated 'burrowed mud' habitat of Southern Trench NCMPA have the potential to be negatively impacted via disturbance and habitat loss during UXO detonation in the section of OfTI that overlaps with the NCMPA. As outlined in the Conservation and Management Advice for the Southern Trench NCMPA, burrowing species have the capacity to recover from such impacts provided that the habitat has not been permanently changed, pressures that they are sensitive to are removed/avoided, suitable environmental conditions are maintained and that there are undisturbed neighbouring burrowed mud communities which can recolonise the area (NatureScot, 2020). As discussed above, habitat loss and disturbance will be highly localised, with a maximum of 30 detonations across the entire Development Site (and, therefore, significantly fewer in the area of OfTI and NCMPA overlap (Figure 4-1)). Any craters created during the detonation process are expected to be backfilled over time via natural processes. With undisturbed neighbouring burrowed mud communities recolonising any craters, the potential impact on the burrowed mud of Southern Trench NCMPA will be both localised and temporary.

4.3.2.2 Impact 2: Increases in suspended sediment concentrations (SSC) and deposition on the seabed

Increased SSC and sediment deposition has the potential to affect benthic ecology through blockage to the sensitive filter feeding apparatus of certain species and / or smothering of sessile species upon deposition of the sediment. However, the communities found in the Development Site are predominantly infaunal mobile species or sessile species including polychaetes and venerid bivalves, many of which are

suspension or deposit feeders and capable of tolerating high levels of SSC and localised events of sediment deposition.

The sensitivity of the benthic communities across the Moray West Site to seabed disturbance and increases in suspended sediments was assessed as low to moderate in the Moray West EIA Report (Moray West, 2018).

Due to the low sensitivity of the benthic communities present and the naturally dispersive nature of the baseline environment, the impacts of increased SSC and sediment deposition on benthic ecology within the Development Site will be low and highly temporary.

4.3.2.3 Impact 3: Release of Sediment Contaminants

During the site characterisation surveys for the Moray West EIA (Moray West, 2018), all metals were found at concentrations below respective guidelines, with no samples above UK Cefas Action Levels, Dutch Quality Standards or Canadian Sediment Quality Guidelines. Polyaromatic hydrocarbon (PAH) concentrations were also recorded as low and generally below the limit of detection (LOD) for the analytical tests. As a result of this, it is not expected that elevated SSC would result in a release of contaminated sediments.

Given the dispersive and dilutive nature of the environment, any minor elevated levels of contaminants in the water column that may arise in association with the elevated SSC following UXO clearance activities are unlikely to result in adverse effects on benthic ecology.

4.4 Fish and Shellfish Ecology

4.4.1 Existing Environment

The Moray West EIA Report lists a number of fish and shellfish species of commercial and conservation importance within the Moray Firth and the Development Site. According to fisheries catch data the key commercial species which account for the majority of landings of fish is haddock (*Melanogrammus aeglefinus*) and shellfish species landed are Nephrops (*Nephrops norvegicus*), squid (various loliginid species), lobsters (*Homarus gammarus*), and scallops (*Pectens maximus*).

Spawning and nursery grounds have been defined for a number of species within, and in the immediate vicinity, of the Development (Coull *et al.*, 1998; Ellis *et al.*, 2010), including cod, herring, lemon sole, Nephrops, plaice, sandeel, sprat and whiting.

Demersal species inhabiting the area include monkfish, plaice, lemon sole, sandeel. Pelagic species that may be present in the area include herring, cod, sprat, whiting, blue whiting, haddock, hake, ling, mackerel and saithe. A number of elasmobranch species are also found in the area, including spotted ray, spurdog and thornback ray.

Freshwater riverine habitats along the east coast of Scotland and England support a number of migratory species that may pass through the wind farm area during the ocean-going phase of their lifecycle (Malcolm *et al.*, 2010). Migratory species include Atlantic salmon, sea trout, eel, and lamprey species. It should be

noted that of the diadromous fish species listed above, Atlantic salmon and sea lamprey are of conservation interest in a number of Special Area of Conservation (SAC) rivers in the Moray Firth area. In general, Atlantic salmon are of greatest concern due to the large distances they travel, their conservation status, and their sensitivity to sound. Migration activity takes place throughout the year with smolt activity from rivers occurring between April and June, peaking in the latter half of April and in May.

4.4.2 Assessment of Effects

4.4.2.1 Impact 1: Noise and vibration disturbance

Detonation of UXO has the potential to cause disturbance or injury to fish species in the vicinity of the detonation. The extent and type of impact is dependent upon the sound source level, the distance of the individual receptor from the detonation and the sensitivity of that receptor to sound. In close proximity to the detonation, physical injury can occur, whilst further away behavioural impacts are more likely.

Gadoids such as cod and whiting and clupeids such as herring and sprat are more sensitive to the sound pressure component of underwater noise and, therefore, at higher risk of behavioural disturbance in the intermediate to far field from the UXO detonation.

Baseline characterisation of Coull et. al (1998) spawning areas indicates the Development is not within key (high intensity) spawning grounds for cod, herring or sandeel and that these spawning grounds are located in more suitable areas out with the Development Site.

Research has shown that spawning adults are unlikely to show displacement as their spawning activity takes precedence over any other behaviour due to the amount of energy put into the spawning process and its importance in successful recruitment (Moray West, 2018).

Herring spawning activity occurs further to the north around the Orkney and Shetland islands between August and September (Coull *et al.*, 1998; Moray Offshore Renewables Ltd, 2018) meaning spawning activity for herring will not be affected by the clearance activity taking place over February 2023 to 31 May 2023.

Atlantic salmon may be sensitive to noise emissions (although to a lesser degree than the clupeids and gadoids mentioned above as they are considered to detect particle motion only) as they migrate through the Moray Firth either as smolts migrating outward from rivers into the Firth, or as adults returning to rivers to spawn. Smolt migration from rivers generally takes place between April and June (Moray West, 2018), peaking during the latter half of April and in May. There is the potential for adult salmon to be affected during their migrations, although it is unlikely that smolts will be present in the Firth during UXO clearance activity. Sea lamprey may also transit through the Moray West Site; however, they are considered less sensitive to sound than Atlantic salmon (Popper, 2014) and, therefore, will receive impacts less than or equal to that of Atlantic salmon.

Beyond noise-induced behavioural disturbance, UXO detonation has the potential to cause direct mortality, physical injury, and disturbance to fish and shellfish species in the vicinity of the detonation. Given the limited number of detonations in total (30 as a worst-case), the intermittent nature of

detonations (estimated one per day maximum), with each detonation occurring in a different location, the potential for a significant proportion of fish and shellfish populations to be affected, or to be exposed to a cumulative sound exposure threshold for recoverable injury or disturbance (Popper *et al.*, 2014), either at a localised level or within the wider Moray Firth is low. Population level impacts are, therefore, not expected to occur.

Due to the short duration and localised nature of the impact and the activity occurring outside of peak spawning and migration periods (clearance activity scheduled between February 2023 and 31 May 2023) the effects of physical injury and behavioural disturbance before the application of mitigation will be temporary and localised.

Mitigation

No specific mitigation measures can be taken with regard to fish and shellfish populations. However, the mitigation measures to be undertaken under the MMMP (see **Appendix B**), will allow sound sensitive fish to respond to acoustic deterrents and move away from the area prior to UXO detonation. It should also be noted that any discovered UXO will be avoided (through re-siting or re-routing of subsurface infrastructure) or removed wherever possible, so the number of detonations will likely be lower than the worst case considered in this report.

Residual Impact

With a short duration and localised nature of the impact and the activity occurring outside of peak spawning and migration periods (clearance activity scheduled between February 2023 and 31 May 2023), in addition to the mitigation measures that will be adopted as part of the MMMP, any impacts of UXO detonation will be minimised. The residual impacts of physical injury and behavioural disturbance following the application of mitigation will be highly localised and temporary.

4.4.2.2 Impact 2: Temporary Habitat Loss and/or Disturbance

The clearance of UXO within the Development Site has the potential to result in the loss of benthic habitat in the vicinity of the blast site that may have importance to fish species. Any craters created during the detonation process are expected to be backfilled over time via natural processes. The rate of natural backfill will vary over spatial scales according to the varying sediment transport dynamics in the local area, with the severity and regularity of storm events contributing to the rate of infill (Moray West, 2018). The spatially limited area of disturbed seabed will be minimal in comparison to the wider benthic habitats of the Moray Firth.

Sandy and coarse sand sediments dominate across the Development, so resettlement will be rapid following suspension by the detonation.

Fish eggs and larvae are sensitive to smothering by settling sediment, so there is a potential for impacts on the early life stages of fish species resident in the Development Site. However, whilst spawning and nursery grounds overlap with the Development, these grounds extend over large spatial scales to the extent that the highly localised SSC increases resulting from UXO detonations will affect a minimal proportion of these wider spawning and nursery grounds.

Adult fish and shellfish are mobile (with the exception of bivalves) and so are able to move away from areas of SSC increases. Bivalves, whilst sessile and, therefore, unable to move away from areas of increased SSC are generally tolerant to settling sediment (Tyler-Walters, 2008).

Due to the spatially and temporally limited nature of the impact, the large extent of fish spawning, nursery and foraging habitats in the wider area in comparison to the localised impact, the impact of temporary habitat loss and disturbance is considered to be temporary and limited in the context of the wider fish and shellfish populations in the Southern Trench NCMPA and Moray Firth. No further mitigation is required.

4.4.2.3 Impact 3: Release of Sediment Contaminants

As discussed in **Section 4.3.2.3**, during the site characterisation surveys for the Moray West EIA Report (Moray West, 2018), all metals were found at concentrations below respective guidelines, with no samples above UK Cefas Action Levels, Dutch Quality Standards or Canadian Sediment Quality Guidelines. PAH concentrations were also recorded as low and generally below the LOD for the analytical tests. As a result of this, it is not expected that elevated SSC would result in a release of contaminated sediments.

Given the dispersive and dilutive nature of the environment, any minor elevated levels of contaminants in the water column that may arise in association with the elevated SSC following UXO clearance activities are unlikely to result in adverse effects on fish and shellfish populations.

Due to the low level of contaminants in sediments across the project area, no discernible effects of resuspension of sediment contaminants on fish and shellfish are expected within the Development. No further mitigation is required.

4.5 Marine Mammal Ecology

4.5.1 Existing Environment

4.5.1.1 Cetaceans

A total of 19 cetacean species have been recorded in UK waters (Reid *et al.*, 2003). To date, a total of 14 cetacean species have been recorded alive within the Moray Firth (see **Table 4-1**). Cetaceans within the Moray Firth can be divided into three groups – those present all year, those that occur seasonally and those which are considered rare visitors.

A comparison has been made between the results of the original Moray West EIA Report 2018 and the results of the assessment based on updated population and density estimates. Overall, the results are generally the same as those presented in the Moray West EIA Report 2018.

4.5.1.1.1 Harbour porpoise

Harbour porpoise are the most abundant cetacean species in Scottish waters (Reid *et al.* 2003; Hammond *et al.* 2021). They are also the most frequently encountered species in both visual and acoustic surveys in and around the proposed Moray West Offshore Wind Farm Site and are present throughout the Moray Firth all year (Moray West, 2018). The global population of harbour porpoise is listed in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species as *Least Concern*; however, the

current population trend is unknown (Braulik *et al*., 2020). In the most recent 2013-2018 reporting by the Joint Nature Conservation Committee (JNCC), the overall assessment of Conservation Status was unknown and the overall trend in Conservation Status is also unknown (JNCC, 2019).

Since the Moray West EIA Report 2018, the harbour porpoise abundance estimate for the North Sea Management Unit (MU)[1] has been updated. The current estimate for the North Sea MU is 346,601 porpoise (95% Confidence Interval (CI): 289,498- 419,967; Coefficient of Variation (CV) = 0.09), of which 159,632 animals are considered as UK portion (Inter-Agency Marine Mammal Working Group (IAMMWG), 2022). This is slightly higher than the MU reference population estimate used in the Moray West EIA (345,373, 95% CI: 246,526- 495,752). The surface density estimate used in Moray West EIA was a 4x4 km grid surface density, created for Moray East (Moray Offshore Renewables Ltd, 2012). There is no updated surface density estimate available for harbour porpoise, and thus the same density estimate of 1.468 harbour porpoise per kilometre squared (km^2) is used in the impact assessment presented in this report. This is greater than the density estimate of 0.152 harbour porpoise per km^2 for survey block S which covers the Moray Firth, from Small Cetaceans in European Atlantic waters and the North Sea (SCANS) III survey (Hammond *et al*., 2021) and density estimates of 0.368-0.481 / km^2 in July for the Moray Firth area in Waggitt *et al*. (2019).

4.5.1.1.2 Bottlenose dolphin

The Moray Firth is an important habitat to the resident population of bottlenose dolphin in the North Sea, which is in the Coastal East Scotland (CES) MU (Moray West, 2018; IAMMWG, 2022). Whilst occupation of the Moray Firth by this population varies between years, recent survey data has confirmed that approximately half of the estimated population occupy the area regularly (Graham *et al.*, 2016). Habitat modelling of survey data indicates that the southern coastline of the Firth is particularly important habitat to this population (Thompson *et al.*, 2014). Based on the most recent 2013-2018 reporting by the JNCC, the overall Conservation Status for bottlenose dolphin is currently classified as unknown (JNCC, 2019).

Since the Moray West EIA, the estimated CES MU size for bottlenose dolphins has been updated. The current estimate for the CES MU is 224 dolphins (95% CI: 214- 234) (Arso Civil *et al.,* 2021; IAMMWG, 2022). This is slightly higher than the MU estimate used in the Moray West EIA (195, 95% CI: 164-224). The Moray Firth is also part of the wider Greater North Sea (GNS) MU for the bottlenose dolphin which has a current estimate is 2,022 dolphins (CV = 0.75; 95% CI = 548 – 7,453; IAMMWG, 2022).

The surface density estimate of 0.00048/km^2 used in Moray West EIA was a 4x4 km grid surface density, created for Moray West, revised from the density surface used for Moray East (Moray Offshore Renewables Ltd, 2012). There is no updated surface density estimate available for bottlenose dolphins. However, as a precautionary approach the higher density estimate of 0.0037 bottlenose dolphin per km^2 from the SCANS-III survey block S in the Moray Firth (Hammond *et al*., 2021), has been used in the

[1] Management Units (MUs) are agreed upon spatial scales at which the impacts of proposed activities on the UK's seven most common cetacean species are assessed by UK Statutory Nature Conservation Bodies (SNCBs)

assessments. This is greater than the density estimates of 0.001-0.002 / km^2 for the Moray Firth area in Waggitt *et al*. (2019).

4.5.1.1.3 White-beaked dolphin

White-beaked dolphin frequent the eastern extent of the Moray Firth year-round, predominantly at depths of 50 – 100 m (Reid *et al*., 2003). The density of white-beaked dolphin in the waters inand around the Moray Firth (survey block S) is 0.021 animals/km^2, which is low compared to regions in the east and north of Scotland (Hammond *et al*., 2021). They are usually found in small groups of 10 or less but have also been observed in large groups of 50 and more. Based on the most recent 2013-2018 reporting by the JNCC, the overall Conservation Status and trend in Conservation Status for white-beaked dolphin is currently classified as unknown (JNCC, 2019).

There is a single MU for white-beaked dolphin, the Celtic and Greater North Seas (CGNS) MU. The reference population for white-beaked dolphin in the CGNS MU is 43,951 animals (CV = 0.22; 95% CI = 28,439 – 67,924; IAMMWG, 2022). The density estimates of up to 0.123 white-beaked dolphin per km^2 for the Moray Firth area in Waggitt *et al*. (2019) has been used for the assessments, as this is greater than the SCANS-III density estimate of 0.021/km^2 (Hammond *et al.,* 2021).

4.5.1.1.4 Common dolphin

Common dolphin are abundant along shelf breaks and in deeper waters on the west coast of the UK and Europe (Reid *et al*., 2003). Recent data suggests an increasing occurrence of short-beaked common dolphin in the northern North Sea, including the Moray Firth (Robinson *et al.*, 2010; Moray West, 2018). Density estimates for this species occurring in the Moray Firth is approximately 0.074 individuals/km^2 (Robinson *et al.*, 2010), which is roughly equivalent to density estimates in the waters west of Shetland (Hammond *et al*., 2021). Common dolphin are amongst the most gregarious cetacean species, often forming groups of 50 or more individuals, though groups of 200 or more are not uncommon (Robinson *et al.*, 2010). Based on the most recent 2013-2018 reporting by the JNCC, the overall Conservation Status and trend in Conservation Status for common dolphin is currently classified as unknown (JNCC, 2019).

Common dolphin were not recorded in survey block S during the SCANS-III survey (Hammond *et al*., 2021); therefore, the density estimate of 0.074 individuals/km^2 from Robinson *et al*. (2010) is used in the assessments. This is greater than density estimates of 0.024-0.044 / km^2 in July for the Moray Firth area in Waggitt *et al*. (2019). There is a single MU for common dolphin, the CGNS MU. The reference population for common dolphin in the CGNS MU is 102,656 animals (CV = 0.29; 95% CI = 58,932 – 178,822; IAMMWG, 2022).

4.5.1.1.5 Minke whale

Minke whale are wide-ranging baleen whales which are present in the Moray Firth primarily in the summer months (June – September) (Reid *et al.,* 2003; Hammond *et al.,* 2021). They often prefer water depths of up to 200 m and are often solitary or found in pairs, though they occasionally form larger groups (up to15 individuals) while feeding. Based on the most recent 2013-2018 reporting by the JNCC, the overall

Conservation Status and trend in Conservation Status for minke whale is currently classified as unknown (JNCC, 2019).

Since the Moray West EIA, the estimated CGNS MU size for minke whales has been updated. The current estimate for the CGNS MU is 20,118 whales (CV = 0.18; 95% CI: 14,061-28,786; IAMMWG, 2022). This is slightly lower than the MU estimate used in the Moray West EIA (23,528, 95% CI: 13,989-39,572). The density estimate for the SCANS-III survey block S was 0.0095/km^2 (Hammond *et al*., 2021). The density estimates in Waggitt *et al*. (2019) ranges from of 0.008-0.023 / km^2 in July for the Moray Firth area. Therefore, as a precautionary approach, density estimate of 0.023 / km^2 has been used in the assessments.

4.5.1.2 Pinnipeds

Two species of seal are found in the UK, the grey seal and the harbour seal. The grey seal is found on both sides of the North Atlantic Ocean although the greatest proportion of the population is found in UK waters. The UK population of harbour seals has in recent years been in decline but is now increasing and is close to the level it was before the decline occurred. The decline in population levels varies between colonies, with some in Scotland experiencing high levels of declines, while others were stable or increasing. Approximately 38% of the world's grey seals breed in the UK, of which 88% are from sites in Scotland, with the main colonies being in the Inner and Outer Hebrides and Orkney (SCOS, 2018). Approximately 30% of the European harbour seal population are found in the UK, which has declined from approximately 40% in 2002 (SCOS, 2018).

4.5.1.2.1 Grey seal

The approach used for the Moray West EIA was to take the August haul-out count for the Moray Firth MU and scale it to account for the proportion of seals at sea at the time of the count. This resulted in a population estimate for the Moray Firth MU of 3,577 grey seals. In 2018, 10 grey seals were tagged in the Moray Firth MU, at tagging locations in the Dornoch Firth, Findhorn and Ardersier. These telemetry data are presented in the seal habitat-preference map report (Carter *et al.,* 2020). The resulting telemetry track data shows that the grey seals moved out of the Moray Firth MU and into both the North Coast and Orkney MU and the East Scotland MU. Therefore, there is connectivity between the three MUs. As such it is most appropriate to consider that the relevant population against which to assess impacts is the combined Moray Firth, North Coast and Orkney and East Scotland MUs. Combining the most recent haul-out count for the Moray Firth MU (1,657) with the most recent haul-out count for the North Coast and Orkney MU (8,599) and the most recent haul-out count for the East Scotland (3,683), results in a total August haul-out count of 13,939 grey seals.

The habitat preference approach predicted distribution maps provide estimates per species, on a 5 x 5 km grid, of relative at-sea density for seals hauling-out in the British Isles which will be applied to the assessment. The density surface used in Moray West EIA was a 5x5 km grid specific density (Russell *et al.,* 2017). Since then, seal habitat preference maps have been created for the UK (Carter *et al.,* 2020), which are now considered to be the best and more recent estimate of the at-sea distribution of grey seals. Carter *et al.* (2020) provides habitat-based predictions of at-sea distribution for grey and harbour seals in the

British Isles. The relative density of grey seal (from the Carter *et al.,* 2020 data) was converted to absolute seal densities, using the population scalars as presented the Carter *et al.* (2020) report. The absolute density of grey seal (for the mean usage grid cells that overlap with the Moray West area) is 0.762 per km^2. Therefore, the impact assessment presented uses a grey seal density distribution map shown in Carter *et al.,* (2020) and based on the newer habitat preference map and applies the relative density from across the array site and cable corridor of the Development.

4.5.1.2.2 Harbour seal

The approach used for the Moray West EIA was to take the August haul-out count for the Moray Firth MU and scale it to account for the proportion of seals at sea at the time of the count. This resulted in a population estimate for the Moray Firth MU of 1,306 harbour seals. Since the EIA, the haul-out counts have been updated, this resulted in a population estimate for the Moray Firth MU of 1,496 harbour seals. As part of the Strategic Regional Marine Mammal Monitoring Programme for the Moray Firth, a total of 57 harbour seals were tagged at Loch Fleet with GPS/GSM tags in September 2014, February 2015 and February-March 2017 (Graham *et al*., 2017). These telemetry data show that harbour seals tagged in the Moray Firth MU do not all remain within the Moray Firth, with seals showing movement out of the Moray Firth and into the North Coast and Orkney MU (Graham *et al*., 2017). Therefore, there is connectivity between the two MUs and as such it is most appropriate to consider that the relevant population against which to assess impacts is the combined Moray Firth and North Coast and Orkney MUs. Combining the most recent haul-out count for the Moray Firth MU (1,077) with the most recent haul-out count for the North Coast and Orkney MU (1,405), results in a total August haul-out count of 2,482 harbour seals.

The density surface used in Moray West EIA was a 4x4 km grid density surface, created for Moray West (Bailey, 2017). Since then, seal habitat preference maps have been created for the UK (Carter *et al.,* 2020), which are now considered to be the best and more recent estimate of the at-sea distribution of harbour seals. The relative density of harbour seal (from the Carter *et al.,* 2020 data) was converted to absolute seal densities, using the population scalars as presented the Carter *et al.* (2020) report. The absolute density of harbour seal (for the mean usage grid cells that overlap with the Moray West area) is 0.021 per km^2. Therefore, the impact assessment presented in this assessment uses a harbour seal density distribution map shown in Carter *et al.,* (2020) and based on the newer habitat preference map and applies the relative density from across the array site and cable corridor of the Development.

4.5.1.3 Designated Sites

4.5.1.3.1 Moray Firth

Designation of the Moray Firth SAC provides protection of bottlenose dolphin and their habitat, with the aim of maintaining the FCS (NatureScot, 2021; Moray West, 2018). The resident bottlenose dolphin of the Moray Firth SAC predominantly utilise the nearshore environment. The Moray Firth SAC (approximately 17 km from the Development) was designated in 2005 under the European Habitats Directive (92/43/EEC) for bottlenose dolphin. This SAC extends from the inner firths to Helmsdale on the north coast and Lossiemouth on the south coast covers an area of 1,510km^2 (NatureScot, 2021). The Moray Firth supports the only known resident population of bottlenose dolphin in the North Sea, with an estimated 150

individuals. The population is present year-round within the Firth, but they do appear to favour particular areas[2]. **Section 6** assesses whether the proposed UXO clearance works will have an LSE on any European designated sites and there supporting features.

4.5.1.3.2 Dornoch Firth and Morrich More SAC

The Dornoch Firth is the most northerly large estuary in Britain and supports a significant proportion of the inner Moray Firth population of the harbour seal. The seals, which utilise sand-bars and shores at the mouth of the estuary as haul-out and breeding sites, are the most northerly population to utilise sandbanks. Their numbers represent almost 2% of the UK population[3]. The Conservation Objectives ensure that the obligations of the Habitats Directive are met; that is, there should not be deterioration or significant disturbance of the qualifying interest. This will also ensure that the integrity of the site is maintained and that it makes a full contribution to achieving favourable conservation status for its qualifying interests. **Section 6** assesses whether the proposed UXO clearance works will have an LSE on any European designated sites and there supporting features.

4.5.1.3.3 Southern Trench Nature Conservation Marine Protected Area (NCMPA)

Minke whale are one of the protected features of the Southern Trench Nature Conservation Marine Protected Area (NCMPA), through which the Offshore Export Cable Corridor passes. Southern Trench NCMPA is located on the east coast of Scotland, and is proposed to protect minke whale, burrowed mud, fronts and shelf deeps. Fronts in the Southern Trench are created by mixing of warm and cold waters, which creates an area of high productivity, attracting a number of predators to the area. Minke whale are attracted by the fish species brought to the area by the fronts, as well as the abundance of sandeels in the soft sands.

NatureScot (2020) advises that, in order to conserve minke whale, risk of injury and death should be minimised, access to resources within the site should be maintained, and supporting features should also be conserved. The Conservation Objectives of this site are to conserve the features, specifically to ensure "*Minke whale in the Southern Trench NCMPA are not at significant risk from injury or killing, conserve the access to resources (e.g., for feeding) provided by the NCMPA for various stages of the minke whale life cycle, and conserve the distribution of minke whale within the site by avoiding significant disturbance"*[4]. The supporting features of the minke whale is also protected under these Conservation Objectives.

4.5.1.3.4 Loch Fleet National Nature Reserve (NNR)

Loch Fleet was designated as a National Nature Reserve (NNR) in 1998 through an agreement between the landowners, Sutherland Estates and Scottish Natural Heritage (now NatureScot). The area covered by the agreement is 1057.21 hectares (ha). The NNR is managed in partnership with the Scottish Wildlife Trust Loch Fleet NNR is a coastal reserve on the north-east coast of Scotland. An extensive tidal basin fringed by a mosaic of coastal habitats and native Scots pine forest, Loch Fleet is an internationally

[2] https://sac.jncc.gov.uk/site/UK0019808
[3] https://sac.jncc.gov.uk/site/UK0019806
[4]https://www.nature.scot/sites/default/files/2019-06/Southern%20Trench%20possible%20MPA%20-%20Conservation%20and%20Management%20Advice.pdf

important wildlife reserve. The intertidal habitat is the largest habitat on the reserve. The large tidal estuary at Loch Fleet supports a population of harbour seals which haul out on the sandbanks close to the south shore all year round (NatureScot, 2015). Although a direct assessment of Loch Fleet is not possible, a harbour seals population-level assessment has been carried out.

4.5.1.3.5 Protected Seal Haul-Out Sites

Seal haul-out sites are coastal locations that seals use to breed, moult 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.

4.5.1.4 Summary

The density and abundance of the cetacean species which regularly occur in the Moray Firth is summarised in **Table 4.1.** The reference population for harbour porpoise is the North Sea MU (Hammond *et al*., 2021). The reference population for bottlenose dolphin is the CES MU, the reference population for common dolphin, white-beaked dolphin and minke whale is CGNS MU (IAMMWG, 2022; Table4.1).

Table 4.1: Density and abundance estimates for the five regularly occurring cetacean species in the Moray Firth

Species	Density estimates (individuals/km^2)	Estimated population abundance in the relevant MU	References
Harbour porpoise	1.468*	346,601	Moray Offshore Renewables Ltd (2018); IAMMWG (2022)
Bottlenose dolphin	0.0037	224	Hammond *et al.* (2021); Arso Civil *et al.* (2021); IAMMWG (2022)
White-beaked dolphin	0.123	43,951	Waggitt *et al*. (2019); IAMMWG (2022)
Common dolphin	0.074	102,656	Robinson *et al*. (2010); IAMMWG (2022)
Minke whale	0.023	20,118	Waggitt *et al*. (2019); IAMMWG (2022)
Grey seal	0.762	13,939	Carter *et al*. (2020); SCOS (2020)
Harbour seal	0.021	2,482	Carter *et al*. (2020); SCOS (2020)

* Maximum density cell within the Moray West Site

4.5.2 Assessment of Effects

Potential impacts to marine mammals assessed for UXO clearance are:

- permanent change in hearing sensitivity / auditory injury (Permanent Threshold Shift (PTS)) from underwater noise;
- temporary change in hearing sensitivity (Temporary Threshold Shift (TTS)) from underwater noise;
- disturbance from underwater noise from High and Low order clearance;
- potential disturbance from ADD;
- increased collision risk and disturbance from vessels;
- changes to water quality; and
- changes to prey availability.

The marine mammal impact assessments have been based on the worst-case of 30 UXO high-order detonation. Any risk of PTS or TTS and disturbance ranges for low-order clearance (preferred method to clear the UXO) will be significantly less than the impacts assessed for high-order detonation.

The severity of the consequences of UXO high-order detonation will depend on many variables, but principally, on the charge weight and its proximity to the receptor. The marine mammal impact assessment methodology used in this section is provided in **Table 4.2**. Permanent irreversible change to exposed receptors (such as auditory injury) or feature(s) of the habitat which are of particular importance to the receptor have been quantified alongside temporary or intermittent effects (limited to the phase of the Development and timeframe) such as TTS and disturbance to the exposed receptors or feature(s) of the habitat which are of particular importance to the receptor (such as changes to water quality and prey availability).

Table 4.2 Definitions of criteria used for potential impacts on marine mammals

	Permanent Effect	**Temporary Effect**
High	Assessment indicates that >1% of the reference population are anticipated to be exposed to the effect.	Assessment indicates that >10% of the reference population are anticipated to be exposed to the effect.
Moderate	Assessment indicates that between >0.01% and <=1% of the reference population anticipated to be exposed to effect.	Assessment indicates that between >5% and <=10% of the reference population anticipated to be exposed to effect.
Low	Assessment indicates that between >0.001 and <=0.01% of the reference population anticipated to be exposed to effect.	Assessment indicates that between >1% and <=5% of the reference population anticipated to be exposed to effect.
Negligible	Assessment indicates that <=0.001% of the reference population anticipated to be exposed to effect.	Assessment indicates that <=1% of the reference population anticipated to be exposed to effect.

Underwater noise modelling for UXOs with a range of charge weights has been undertaken and compared across projects (see the **European Protected Species Risk Assessment** for more information). This has

been used to inform the assessment of the potential impacts in relation to the worst-case for the UXO that could be present based on high-order detonation.

Underwater noise has the potential to impact marine mammals if the frequency is within their hearing range and / or the sound levels are greater than thresholds for the species (**Table 4.3**) (Southall *et al*., 2019). The potential for auditory injury is not just related to the level of the underwater sound and its frequency relative to the hearing bandwidth of the animal but is also influenced by the duration of exposure.

Southall *et al*. (2019) gives individual criteria based on whether the noise source is considered impulsive or non-impulsive. Southall *et al*. (2019) categorises impulsive noises as having high peak sound pressure, short duration, fast rise-time and broad frequency content at source, and non-impulsive sources as steady-state noise. Seismic airguns are considered impulsive noise sources. Sonars, vessels and other low-level continuous noises are considered non-impulsive. A non-impulsive noise does not necessarily have to have a long duration.

Southall *et al*. (2019) presents single strike, unweighted peak criteria (Sound Pressure Level $(SPL)_{peak}$) and cumulative (i.e. more than a single sound impulse) weighted sound exposure criteria (SEL_{cum}) for both permanent threshold shift (PTS), where unrecoverable hearing damage may occur, and temporary threshold shift (TTS), where a temporary reduction in hearing sensitivity may occur in individual receptors (**Table 4.3**).

The assessments are based on the Southall *et al*. (2019) impact criteria which uses thresholds and weightings in relation to the different marine mammal species hearing sensitivity (**Table 4.3**). The thresholds indicate the risk of PTS and TTS in species of marine mammal that could be present in and around the UXO clearance areas. Note that the Southall *et al*. (2019) Marine Mammal Noise Exposure Criteria are the same as the National Marine and Fisheries Service (NMFS) (2018) criteria, although Southall *et al*. (2019) renames the species groupings: Medium-Frequency (MF) Cetaceans are now classed as High-Frequency (HF) Cetaceans, and previous HF Cetaceans as Very High Frequency (VHF) Cetaceans (**Table 4.3**).

The Sound Exposure Level (SEL) criteria are weighted, which corrects the sound level based on the sensitivity of the receiver, for example, harbour porpoise are less sensitive to low frequency sound than minke whales. The weighting takes that difference into account. Southall *et al.* (2019) also includes criteria based on peak Sound Pressure Level (SPL_{peak}), which are unweighted and do not take species sensitivity into account.

Table 4.3: Marine mammal threshold and criteria for underwater noise (from Southall *et al.*, 2019)						
Species Hearing Group	**Unweighted SPL_{peak} (dB re 1 µPa)**		**Weighted SEL_{cum} (dB re 1 µPa^{2}s)**			
	Impulsive		**Impulsive**		**Non-impulsive**	
	PTS	**TTS**	**PTS**	**TTS**	**PTS**	**TTS**
Harbour porpoise Very high-frequency cetaceans (VHF) (275 Hz to 160 kHz)	202	196	155	140	173	153
Dolphin species High-frequency cetaceans (HF) (150 Hz to 160 kHz)	230	224	185	170	198	178
Minke whale Low-frequency cetaceans (LF) (7 Hz to 35 kHz)	219	213	183	168	199	179
Seal species Phocid carnivores in water (PCW) 50 Hz to 86 kHz	218	212	185	170	201	181

4.5.2.1 Impact 1: Permanent change in hearing sensitivity / auditory injury (Permanent Threshold Shift (PTS)) from underwater noise

The maximum predicted impact ranges for PTS marine mammals, from a range of possible UXO including charge weights for high-order detonation are presented in **Table 4.4** based on the underwater noise modelling for high-order detonation. This is very precautionary as the impact ranges are based on the worst-case scenario for the largest UXO device that may (or may not) be present and that it is cleared using high-order detonation.

Table 4.4: The maximum predicted impact ranges (km) for PTS in marine mammals, based on the underwater noise modelling for high-order detonation					
Species	**PTS Criteria and Threshold (Southall *et al.*, 2019)**	**Possible UXO including charge weights Net Explosive Quantity (NEQ) and maximum predicted impact range (km)**			
		6 kg	**25 kg**	**166 kg**	**365 kg***
Harbour porpoise (VHF)	PTS SPL_{peak} 202 dB re 1 µPa Unweighted Impulsive criteria	3.05 km	4.96 km	8.86 km	12.20 km (467.6 km^2)
	PTS SEL 155 dB re 1 µPa^{2}s	0.20 km	0.41 km	0.96 km	1.40 km (6.2 km^2)

Table 4.4: The maximum predicted impact ranges (km) for PTS in marine mammals, based on the underwater noise modelling for high-order detonation

Species	PTS Criteria and Threshold (Southall *et al.*, 2019)	Possible UXO including charge weights Net Explosive Quantity (NEQ) and maximum predicted impact range (km)			
		6 kg	25 kg	166 kg	365 kg*
	Weighted Impulsive criteria				
Bottlenose dolphin, common dolphin and white-beaked dolphin (HF)	PTS SPL_{peak} 230 dB re 1 µPa Unweighted Impulsive criteria	0.54 km	0.29 km	0.51 km	0.70 km (1.5 km^2)
	PTS SEL 185 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.007 km	0.015 km	0.035 km	1.20 km (4.5 km^2)
Minke whale (LF)	PTS SPL_{peak} 219 dB re 1 µPa Unweighted Impulsive criteria	0.54 km	0.88 km	1.57 km	2.10 km (13.9 km^2)
	PTS SEL 183 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.57 km	1.16 km	2.74 km	9.00 km (254.5 km^2)
Harbour seal and grey seal (PCW)	PTS SPL_{peak} 218 dB re 1 µPa Unweighted Impulsive criteria	0.60 km	0.97 km	1.74 km	2.40 km (18.1 km^2)
	PTS SEL 185 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.24 km	0.49 km	1.15 km	1.68 km# (8.9 km^2)

*based on Subacoustech modelling of charge weights at Moray East OWF sites as worst-case # based on Associates Ltd modelling of charge weights at Moray West OWF sites as worst-case

The risk of PTS in marine mammals would be reduced by using low-order clearance such as deflagration for the clearance of the UXOs. The maximum predicted impact ranges for PTS from a range of possible charge weights (NEQ) for low-order clearance are presented in **Table 4.5**.

Table 4.5: The maximum predicted impact ranges for PTS in marine mammals from a range of possible charge weights for low-order clearance

Species	PTS Criteria and Threshold (Southall *et al*., 2019)	Possible charge weights for low-order clearance*			
		0.1 kg	0.25 kg	0.5 kg	2.0 kg
Harbour porpoise (VHF)	PTS SPL_{peak} 202 dB re 1 µPa Unweighted Impulsive criteria	0.73 km	0.99 km (3.08 km^2)	1.2 km	1.9 km (11.34 km^2)
	PTS SEL 155 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.05 km	0.08 km (0.02 km^2)	0.11 km	0.2 km (0.13 km^2)
Bottlenose dolphin, common dolphin and white-beaked dolphin (HF)	PTS SPL_{peak} 230 dB re 1 µPa Unweighted Impulsive criteria	0.04 km	0.06 km (0.011 km^2)	0.07 km	0.11 km (0.038 km^2)
	PTS SEL 185 dB re 1 µPa^{2}s Weighted Impulsive criteria	<0.01 km	<0.01 km (0.0003 km^2)	<0.01 km	<0.01 km (0.0003 km^2)
Minke whale (LF)	PTS SPL_{peak} 219 dB re 1 µPa Unweighted Impulsive criteria	0.13 km	0.17 km (0.091 km^2)	0.22 km	0.35 km (0.38 km^2)
	PTS SEL 183 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.14 km	0.23 km (0.17 km^2)	0.32 km	0.63 km (1.25 km^2)
Harbour seal and grey seal (PCW)	PTS SPL_{peak} 218 dB re 1 µPa Unweighted Impulsive criteria	0.14 km	0.19 km (0.11 km^2)	0.24 km	0.39 km (0.48 km^2)
	PTS SEL 185 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.03 km	0.04 km (0.005 km^2)	0.06 km	0.11 km (0.038 km^2)

*based on Erebus Floating OWF (2021) Subacoustech modelling of low-order UXO clearance. UXO modelling is not site specific and therefore is appropriate to use for the Moray West site.

The maximum number of marine mammals that could potentially be at risk of PTS during UXO clearance, based on the maximum potential PTS impact ranges for a UXO high-order and low-order clearance (**Table 4.4** and **Table 4.5**) are presented in **Table 4.6.**

Table 4.6 The maximum number of marine mammals that could be at risk of PTS from the high-order and low-order charge weights based on maximum potential impact area

Species	0.25 kg		2.0 kg		364 kg	
	PTS SPL_{peak}	PTS weighted SEL	PTS SPL_{peak}	PTS weighted SEL	PTS SPL_{peak}	PTS weighted SEL
Harbour porpoise (density 1.468/km²)	4.5 (0.0013% of NS MU)	0.03 (0.000008% of NS MU)	16.6 (0.0048% of NS MU)	0.18 (0.00005% of NS MU)	686 (0.20% of NS MU)	9 (0.0026% of NS MU)
Bottlenose dolphin (density 0.0037/km²)	0.00004 (0.00002% of CES MU)	0.000001 (0.0000005% of CES MU)	0.00014 (0.00006% of CES MU)	0.000001 (0.0000005% of CES MU)	0.006 (0.003% of CES MU)	0.017 (0.007% of CES MU
White-beaked dolphin (density 0.123/km²)	0.0014 (0.000003% of CGNS MU)	0.00004 (0.00000008% of CGNS MU)	0.005 (0.00001% of CGNS MU)	0.00004 (0.00000008% of CGNS MU)	0.2 (0.0004% of CGNS MU)	0.56 (0.0013% of CGNS MU)
Common dolphin (density 0.074/km²)	0.0008 (0.0000008 % of CGNS MU)	0.00002 (0.00000002% of CGNS MU)	0.003 (0.000003% of CGNS MU)	0.00002 (0.00000002% of CGNS MU)	0.11 (0.0001% of CGNS MU)	0.33 (0.0003% of CGNS MU)
Minke whale (density 0.023/km²)	0.002 (0.000010% of CGNS MU)	0.004 (0.00002% of CGNS MU)	0.009 (0.00004% of CGNS MU)	0.029 (0.00014% of CGNS MU)	0.32 (0.002% of CGNS MU)	5.9 (0.03% of CGNS MU)
Grey seal (density 0.762/km²)	0.08 (0.0006% of combined MUs)	0.004 (0.00003% of combined MUs)	0.37 (0.0026% of combined MUs)	0.03 (0.0002% of combined MUs)	13.8 (0.099% of combined MUs)	6.8 (0.05% of combined MUs)
Harbour seal (density 0.021/km²)	0.0023 (0.00009% of combined MUs)	0.0001 (0.000004% of combined MUs)	0.01 (0.0005% of combined MUs)	0.0008 (0.00003% of combined MUs)	0.4 (0.02% of combined MUs)	0.19 (0.008% of combined MUs)

The impact significance for any permanent auditory injury / change in hearing sensitivity (PTS) in bottlenose dolphin and white-beaked dolphin has been assessed as negligible (less than 0.001% of the

reference population) based on the worst case for PTS from high-order and low-order clearance of the maximum size of potential UXO (**Table 4.6**).

For harbour porpoise, common dolphin, minke whale, grey seal and harbour seal the high-order clearance of a 365 kg UXO has a low to moderate impact (i.e., 0.01 - 1%) on the reference population anticipated to be exposed to PTS. Assessment of the high-order clearance (which would only be undertaken as a last resort), without the use of mitigation based is on the worst-case population density that could be present at the Development Site. However, for minke whale the UXO clearance operations will take place outside the peak summer season on which the density has been based making the estimate highly conservative. These assessments have been based on a very precautionary approach, as the worst-case seal density estimate from across the Development (array site and cable corridor) has been applied. Therefore, the number of animals impacted from the PTS from high-order and low-order clearance of the maximum size of potential UXO is likely to be less than in the worst-case assessment. The residual impact of the potential risk of physical injury and permanent auditory injury / change in hearing sensitivity (PTS) to minke whale, grey seal and harbour seal as a result of any underwater UXO clearance is negligible when taking into account the proposed mitigation as set in the MMMP (see **Appendix B**).

4.5.2.2 Impact 2: Temporary change in hearing sensitivity (Temporary Threshold Shift (TTS)) from underwater noise

The maximum predicted impact ranges for temporary auditory injury / change in hearing sensitivity (TTS) in harbour porpoise, bottlenose dolphin, white-beaked dolphin, minke whale, grey seal and harbour seal from the maximum possible UXO with charge weights for high-order detonation are presented in **Table 4.7** based on the unmitigated underwater noise modelling.

Table 4.7: The maximum predicted impact ranges for TTS in marine mammals, based on the underwater noise modelling for high-order detonation

Species	TTS Criteria Threshold (Southall *et al.*, 2019)	Possible maximum UXO with charge weights and maximum predicted impact range (km)			
		6 kg	25 kg	166 kg	365 kg *
Harbour porpoise (VHF)	TTS SPL_{peak} 196 dB re 1 µPa Unweighted Impulsive criteria	5.6 km	9.1 km	16.3 km	22.5 km (1,590.4km^2)
	TTS SEL 140 dB re 1 µPa^{2}s Weighted Impulsive criteria	1.0 km	2.1 km	5.1 km	7.4 km[(6)] (171.1 km^2)
Bottlenose dolphin, white-beaked dolphin	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria	0.3 km	0.5 km	0.9 km	1.3 km (5.31 km^2)

* based on Subacoustech modelling of charge weights at Moray East OWF sites (see EPS Risk Assessment) as worst-case

[6] based on 6 Alpha Associates Ltd modelling of charge weights at Moray West OWF sites (see EPS Risk Assessment) as worst-case

Table 4.7: The maximum predicted impact ranges for TTS in marine mammals, based on the underwater noise modelling for high-order detonation

Species	TTS Criteria Threshold (Southall *et al.*, 2019)	Possible maximum UXO with charge weights and maximum predicted impact range (km)			
		6 kg	25 kg	166 kg	365 kg *
and common dolphin (HF)	TTS SEL 170 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.04 km	0.08 km	0.2 km	0.5 km (0.8 km^2)
Minke whale (LF)	TTS SPL_{peak} 213 dB re 1 µPa Unweighted Impulsive criteria	0.99 km	1.6 km	2.9 km	4.0 km (50.3 km^2)
	TTS SEL 168 dB re 1 µPa^{2}s Weighted Impulsive criteria	2.98 km	6.1 km	14.4 km	99.3 km (30,977.6 km^2)
Harbour seal and grey seal (PCW)	TTS SPL_{peak} 212 dB re 1 µPa Unweighted Impulsive criteria	1.1 km	1.79 km	3.20 km	4.40 km (60.8 km^2)
	TTS SEL 170 dB re 1 µPa^{2}s Weighted Impulsive criteria	1.3 km	2.57 km	6.06 km	18.80 km (1,110.4 km^2)

The assessments undertaken are based on the worst-case scenario for the largest UXO device that may (or may not) be present. Marine mammals within the potential impact area are considered to have limited capacity to avoid such impacts, although any impacts on marine mammals would be temporary and they would be expected to return to the area once the activity had ceased. The MMMP (**Appendix B**) outlines the mitigation measures to reduce the risk of PTS in marine mammals which would also reduce the number of animals at risk of TTS.

The risk of TTS in all marine mammals would be reduced by using low-order clearance such as deflagration for the clearance of the UXOs (**Table 4.8**). The maximum predicted impact ranges for TTS from a range of possible charge weights (NEQ) for low-order clearance are presented in **Table 4.8**. However, assessments are based on the worst-case for high-order detonation (**Table 4.9**).

Table 4.8: The maximum predicted impact ranges for TTS in marine mammals from a range of possible charge weights for low-order clearance

Species	TTS Criteria and Threshold (Southall *et al.*, 2019)	Possible charge weights for low-order clearance*			
		0.1 kg	0.25 kg	0.5 kg	2.0 kg
Harbour porpoise (VHF)	TTS SPL_{peak} 196 dB re 1 µPa Unweighted Impulsive criteria	1.3 km	1.0 km	2.3 km	3.6 km (40.72 km^2)
	TTS SEL 140 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.54 km	0.75 km	0.93 km	1.3 km (5.31 km^2)
Bottlenose dolphin, white-beaked dolphin and common dolphin (HF)	TTS SPL_{peak} 224 dB re 1 µPa Unweighted Impulsive criteria	0.08 km	0.1 km	0.13 km	0.21 km (0.14 km^2)
	TTS SEL 170 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.01 km	0.02 km	0.03 km	0.05 km (0.008 km^2)
Minke whale (LF)	TTS SPL_{peak} 213 dB re 1 µPa Unweighted Impulsive criteria	0.23 km	0.32 km	0.41 km	0.65 km (1.33 km^2)
	TTS SEL 168 dB re 1 µPa^{2}s Weighted Impulsive criteria	2 km	3.2 km	4.5 km	8.8 km (243.28 km^2)
Harbour seal and grey seal (PCW)	TTS SPL_{peak} 212 dB re 1 µPa Unweighted Impulsive criteria	0.26 km	0.36 km	0.45 km	0.72 km (1.63 km^2)
	TTS SEL 170 dB re 1 µPa^{2}s Weighted Impulsive criteria	0.36 km	0.57 km	0.80 km	1.50 km (7.07 km^2)

*based on Erebus Floating OWF (2021) Subacoustech modelling of low-order UXO clearance. UXO modelling is not site specific and therefore is appropriate to use for the Moray West site.

Table 4.9 The maximum number of marine mammals that could be at risk of TTS from the high-order charge weights based on maximum potential impact area (NEQ 365 kg)

Species	TTS SPL_{peak}	TTS weighted SEL
Harbour porpoise (density 1.468/km²)	2,335 harbour porpoise (0.67% of North Sea MU)	251 harbour porpoise (0.07% of North Sea MU),
Bottlenose dolphin (density 0.0037/km²)	0.02 bottlenose dolphin (0.008% of CES MU)	0.003 bottlenose dolphin (0.0013% of CES MU)
White-beaked dolphin (density 0.123/km²)	0.63 white-beaked dolphin (0.001% of CGNS MU)	0.1 white-beaked dolphin (0.0002% of CGNS MU)
Common dolphin (density 0.074/km²)	0.4 common dolphin (0.0004% of CGNS MU)	0.06 common dolphin (0.0001 % of CGNS MU)
Minke whale (density 0.023/km²)	1.2 minke whale (0.006% of CGNS MU)	712 minke whale (3.54% of CGNS MU)
Grey seal (density 0.946/km²)	46 grey seal (0.33% of the combined MUs)	846 grey seal (6.07% of the combined MUs)
Harbour seal (density 0.645/km²)	1.28 harbour seal (0.05% of the combined MUs)	23 harbour seal (0.94% of the combined MUs)

The impact significance for TTS from high-order detonation has been assessed as negligible (less than 1% of the reference population) for harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and harbour seal. The risk of TTS would be further reduced by using low-order clearance such as deflagration for the clearance of the UXOs.

For minke whale and grey seal, for TTS from high-order detonation of a 365 kg UXO, a low (1 – 5%) and moderate (5 – 10%) impact on the reference population is anticipated respectively. The assessment of the high-order clearance (which would only be undertaken as a last resort), without the use of mitigation, is based on the worst-case population density that could be present at the Development Site.

The UXO clearance operations will take place outside the minke whale peak summer season on which the density has been based, making the estimate highly conservative. These assessments have been based on a precautionary approach, as the relative seal density estimate from across the Development Site (array site and cable corridor) has been applied. Therefore, the number of animals impacted from TTS from high-order detonation is likely to be less than in the worst-case assessment.

For high-order clearance, ADD would be activated for up to 60 minutes (Section 4.5.2.4), during which based on precautionary swimming speed of 1.8m/s (Thompson, 2015) seals would at least 6.48 km away and minke whale would move 8.2 km, based on swimming speed of 2.3m/s (Boisseau *et al.,* 2021) further reducing the potential impact of TTS.

The residual impact of the potential risk of temporary change in hearing sensitivity to minke whale and grey seal as a result of any underwater UXO clearance is low when taking into account the proposed mitigation as set in the MMMP (**Appendix B**).

4.5.2.3 Impact 3: Disturbance from underwater noise from High and Low order clearance

For the marine mammal species considered, there is currently no agreed threshold for disturbance from underwater noise, however, a fleeing response is assumed to occur at the same noise levels as TTS. As outlined in Southall *et al*. (2007) the onset of behavioural disturbance is proposed to occur at the lowest level of noise exposure that has a measurable transient impact on hearing (i.e., TTS). Although, as Southall *et al*. (2007) recognise that this is not a behavioural effect per se, exposures to lower noise levels from a single pulse are not expected to cause disturbance. However, any compromise, even temporarily, to hearing functions could have the potential to affect behaviour.

The use of the TTS threshold is appropriate for UXO disturbance, as the noise from the UXO explosion is only fleetingly present in the environment. Therefore, the assumption is that although noise levels lower than TTS threshold may startle the individual, this has no lasting effect. TTS results in a temporary reduction in hearing ability, and therefore may affect the individuals' fitness temporarily (as recommended in Southall *et al*. (2007) for a single pulse).

As outlined in Southall *et al*. (2021) thresholds that attempt to relate single noise exposure parameters (e.g., received noise level) and behavioural response across broad taxonomic grouping and sound types can lead to severe errors in predicting effects. Differences between species, individuals, exposure situational context, the temporal and spatial scales over which they occur, and the potential interacting effects of multiple stressors can lead to inherent variability in the probability and severity of behavioural responses.

The assessments for TTS / fleeing response have therefore been used for assessing the potential disturbance ranges for UXO high-order detonation. The potential for disturbance has been assessed as negligible (i.e., less than 1% of the reference population anticipated to be exposed to the temporary impact) with or without the use of mitigation for harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and harbour seal (Table 4.9). For minke whale the potential impact is low (i.e., less than 5% of the reference population anticipated to be exposed to the temporary impact) (not significant) based on the worst case for the maximum impact range (without the use of mitigation) for the maximum potential UXO that could be present. However, the UXO clearance operations will take place outside the minke whale peak summer season (June – September) on which the density has been calculated.

For grey seal and the potential for disturbance has been assessed as a moderate (5 – 10%) impact on the reference population anticipated respectively (Table 4.9). These assessments have been based on a very precautionary approach, as the worst-case seal density estimate from across the Development (array site and cable corridor) has been applied and as such, the number of animals impacted from TTS from high-order detonation is likely to be less than in the worst-case assessment. Taking into account the proposed mitigation as set in the MMMP (**Appendix B**) the residual impact of the potential risk of temporary change in hearing sensitivity to grey seal and harbour seal as a result of any underwater high-order UXO clearance is expected to be low.

The Statutory Nature Conservation Bodies (SNCBs) currently recommend that a potential disturbance range based on an Effective Deterrent Radius (EDR) of 26 km around UXO high-order detonation is used to assess harbour porpoise disturbance in the SNS SAC (JNCC *et al*., 2020). The maximum number of animals based on the 26km EDR (an area of up to 2,124km^2) that could be disturbed would be up to 3,118 harbour porpoise (up to 0.90% of NS MU). The potential impact would be negligible with less than 1% of the North Sea MU reference population anticipated to be exposed to the temporary effect.

The potential disturbance for low-order clearance using deflagration (the first option and preferred method) is currently unknown, however as a precautionary approach it has been assumed that there could be an estimated worst-case of 5 km disturbance range (78.54 km^2) including vessels[7]. As a worst-case, marine mammals could be temporarily disturbed from this area for up to 30 days, assuming one day for each of the UXO clearances by low-order clearance using deflagration. Using the 5 km EDR for the temporary disturbance of all marine mammal species during is a precautionary approach to the assessments.

The significance for temporary disturbance from low-order clearance such as deflagration has been assessed as negligible for harbour porpoise, bottlenose dolphin, white-beaked dolphin, minke whale, harbour seal and grey seal (Table 4.10).

Table 4.10: The maximum number of marine mammals that could be disturbed during low-order clearance (including vessels)

Species	Low-order clearance Temporary disturbance
	5 km (78.54 km^2)
Harbour porpoise	114.7 harbour porpoise (0.03% of NS MU) Significance = negligible
Bottlenose dolphin	0.3 bottlenose dolphin (0.13% of CES MU) Significance = negligible

[7] This figure is based on expert judgement, based on estimated disturbance from vesels and low-order deflagration.

Table 4.10: The maximum number of marine mammals that could be disturbed during low-order clearance (including vessels)	
Species	**Low-order clearance Temporary disturbance**
	5 km (78.54 km^2)
White-beaked dolphin	9.7 white-beaked dolphin (0.02% of CGNS MU) Significance = negligible
Common dolphin	6.8 common dolphin (0.01% of CGNS MU) Significance = negligible
Minke whale	1.8 minke whale (0.009% of CGNS MU) Significance = negligible
Grey seal	59.8 grey seal (0.43% of the combined MUs) Significance = negligible
Harbour seal	1.6 harbour seal (0.07% of the combined MUs) Significance = negligible

The impact would be negligible (i.e., less than 1% of all MU reference populations anticipated to be exposed to the temporary impact) for all species.

Disturbance from any UXO clearance would be temporary and for a short duration (i.e., the detonation). Based on a worst-case scenario of one UXO clearance per day, there could be up to 30 days of potential disturbance as a result of UXO clearance.

In addition, as previously outlined, the preferred and first option for all UXO that require clearance would be low-order clearance such as deflagration. No further mitigation measures, other than those proposed in the MMMP to reduce the risk of auditory injury, are required for the potential disturbance from underwater noise during UXO clearance.

4.5.2.4 Impact 4: Potential disturbance from ADD

As outlined in **Section 2.3** and the MMMP (**Appendix B**), ADDs will be used to mitigate the risk of physical or auditory injury to cetaceans from the detonation of UXO; the ADD will be used to ensure marine mammals are beyond the maximum potential impact range for PTS. The ADD will be activated at the appropriate time during the marine mammal observations of the 1 km radius monitoring area prior to any UXO clearance. Timing of ADD activation is dependent on the time required for the UXO clearance method and size of UXO (as outlined in the MMMP).

4.5.2.4.1 Efficacy of ADDs

Overall, there is good evidence for the effective deterrence ranges of the ADDs on harbour porpoises and harbour seals, but less available for minke whales and none for dolphin species (McGarry *et al*., 2020).

The evidence available suggests that the Lofitech is highly effective in deterring harbour porpoise to at least 7.5 km (i.e., near exclusion) with some deterrence observed to 15 km range (Brandt *et al*., 2013a; Brandt *et al*., 2013b). A recent study also showed strong deterrence from a single 15 min ADD exposure, including >50% chance of a porpoise response at distances up to 21.7 km within the 3 hours after exposure (Thompson *et al*., 2020). For minke whale, consistent avoidance to a 15 min exposure has been reported to >1 km, with several animals continuing to swim further away to a distance of between c. 3 km and 4.5 km (McGarry *et al*., 2017). Deterrence to ~1 km has been reported in harbour seals (Gordon *et al.,* 2015; Gordon *et al*., 2019), with suggestions that this can also be applied to grey seals (Sparling *et al*., 2015).

4.5.2.4.1.1 ADD use for Low Order Clearance Events

For low-order clearance, ADD would be activated for 23 minutes, during which harbour porpoise would move at least 2.07 km away, based on precautionary swimming speed of 1.5m/s (Otani *et al*., 2000), dolphin species would move at least 2.10 km away, based on precautionary swimming speed of 1.52m/s (Bailey and Thompson, 2006), based on precautionary swimming speed of 1.8m/s (Thompson, 2015) seals would at least move 2.48 km away and minke whale would move 3.17 km, based on swimming speed of 2.3m/s (Boisseau *et al.,* 2021).

4.5.2.4.1.2 ADD use for High Order Clearance Events (of 25 kg or less)

60 minutes of ADD use is expected to displace harbour porpoise to 5.4 km range, which is sufficient for the maximum predicted PTS impact range of 4.96 km for a NEQ UXO size of 25 kg. This ADD use will also be expected to cause deterrence of dolphin sp. and minke whale, which will contribute to reducing the likelihood that individuals of these species are within the 0.29 km and 0.88 km PTS impact ranges, respectively, for this disposal method and the NEQ UXO size.

4.5.2.4.1.3 ADD use for High Order Clearance Events (of more than 25 kg)

For high-order detonation NEQ UXO size above 25 kg, ADD activation time would be up to 100 minutes (9.0 km). The ADD will not be activated for longer than 60 minutes, regardless of the size of the UXO and maximum predicted PTS range due to the potential for excessive disturbance.

Distances have been based on precautionary swimming speed of 1.5m/s for harbour porpoise (Otani *et al*., 2000); however, Kastelein *et al*. (2018) recorded swimming speeds of 1.97m/s in harbour porpoise during playbacks of pile driving sounds.

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4.5.2.4.2 Assessment of Disturbance due to ADD use

The impact for disturbance from ADD has been assessed as negligible for harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin, minke whale and harbour seal (**Table 4.11**).

Table 4.11: The maximum number of marine mammals that could be temporary disturbed during ADD activation			
Species	**Low-order clearance**	**High-order detonation UXO**	
	23 minutes	Up to 60 minutes	
Harbour porpoise	20 harbour porpoise (0.006% of NS MU) Significance = negligible	135 harbour porpoise (0.039% of NSMU) Significance = negligible	
Bottlenose dolphin	0.051 bottlenose dolphin (0.023% of CES population) Significance = negligible	0.35 bottlenose dolphin (0.16% of CES population) Significance = negligible	
White-beaked dolphin	1.7 white-beaked dolphin (0.004% of CGNS MU) Significance = negligible	11.6 white-beaked dolphin (0.026% of CGNS MU) Significance = negligible	
Common dolphin	1.02 common dolphin (0.001% of CGNS MU) Significance = negligible	6.96 common dolphin (0.007% of CGNS MU) Significance = negligible	
Minke whale	0.73 minke whale (0.0036% of CGNS MU) Significance = negligible	4.95 minke whale (0.025% of CGNS MU) Significance = negligible	
Grey seal	14.7 grey seal (0.11% of the combined MUs) Significance = negligible	100 grey seal (0.72% of the combined MUs) Significance = negligible	
Harbour seal	0.41 harbour seal (0.016% of the combined MUs) Significance = negligible	2.77 harbour seal (0.11% of the combined MUs) Significance = low	

ADD would only be activated for the minimum time required to ensure effective mitigation and would only be deployed as a worst case on up to 30 days, based on one UXO clearance per day. Therefore, ADD activation will not result in any significant disturbance of marine mammals. The use of the ADD will be capped at 60 minutes during high-order detonation for all UXOs, regardless of their size.

It should be noted that the disturbance as a result of ADD activation is within the maximum impact range assessed for TTS / disturbance from UXO clearance and is therefore not an additive effect to the overall area of potential disturbance.

4.5.2.5 Impact 5: Impacts due to an increase in vessel presence

4.5.2.5.1 Increased risk of collision

There is the potential for a small number of vessels to be required for the UXO clearance works, ranging from large vessels to small craft. Dynamic positioning is likely to be the most appropriate method for maintaining location during clearance works.

Marine mammals are able to detect and avoid vessels, although vessel strikes are known to occur. However, it is unlikely that marine mammals present in the UXO clearance area would be at increased collision risk with vessels, as the vessels would be stationary or slow moving. In addition, the number of vessels moving to and from the sites would be very small compared to the existing vessel movements in and around the area. Therefore, the potential magnitude for any increased collision risk during the proposed UXO clearance has been assessed as negligible.

Marine mammals present within or around the UXO clearance area are likely to be habituated to the presence of vessels given the existing levels of marine traffic and would therefore be expected to detect and avoid vessels. For this reason, marine mammals that could be present in the area are considered to have a low probability to the risk of a vessel strike.

4.5.2.5.2 Disturbance from vessels

Disturbance from underwater noise and the presence of vessels is likely to be restricted to the area around the vessel. For example, underwater noise modelling for the East Anglia TWO ES (SPR, 2019), indicated that the impact range for TTS / fleeing response for marine mammals, including harbour porpoise, dolphin species, minke whale, grey and harbour seal, was less than 100 m for large and medium sized vessels. Therefore, any potential disturbance as a result of vessel noise or the presence of vessels associated with the UXO clearance work would be significantly less than the area of potential disturbance assessed for UXO detonation. Also, these vessels would be within the area of potential disturbance assessed for UXO detonation, therefore there would be no increase in disturbance as a result of vessels. As a result, the potential for any increased disturbance from vessels during the proposed UXO clearance has been assessed as negligible.

All vessel operators will use good practice to reduce any risk of collisions with marine mammals as outlined in the Scottish Marine Wildlife Watching Code[8]. No further mitigation measures are proposed for the potential increased collision risk or increased disturbance from vessels during UXO clearance.

4.5.2.6 Impact 6: Changes to water quality

The proposed UXO clearance works will result in the disturbance of small amounts of sediment, on a localised spatial scale. UXO clearance at each location (and overall) will affect a very small percentage of the UXO clearance area for a very short period of time and will be intermittent. As outlined in **Section 3.2.2**effects are expected to be temporary and localised to the immediate vicinity of the works. Given the small spatial and temporal scale of the UXO clearance works, and that the mitigation put in place through the MMMP will ensure that there are no marine mammals close to the works, there will be no significant effects on marine mammals as a result of any changes in water quality. Therefore, the potential magnitude for any changes in water quality during the proposed UXO clearance has been assessed as negligible for marine mammals.

[8] Available at: https://www.nature.scot/professional-advice/land-and-sea-management/managing-coasts-and-seas/scottish-marine-wildlife-watching-code

Taking into account the overall impact significance of any temporary and localised changes to water quality has been assessed as **negligible** (not significant) for all marine mammals. No further mitigation measures are proposed or required for the potential changes to water quality during UXO clearance for marine mammals.

4.5.2.7 Impact 7: Changes to prey availability

The underwater noise modelling (see **EPS Risk Assessment** (8460005-DG0207-MWW-REP-000002) submitted with the **EPS Licence application**) indicates that the maximum potential range for potential mortal injury in fish species for the largest potential UXO is less than 1 km without mitigation. Whilst it is recognised that the impact ranges for recoverable injury and disturbance effects will be larger than those presented for mortal injury, given that the potential for impact from underwater noise arising from the UXO clearance works will relate to a limited number of very discrete sources of underwater noise, even for the most sensitive species, the limited scale and temporal nature of the works is not considered likely to be significant for fish species (**Section 4.4.2**). Similarly, any potential impacts on fish as a result of disturbance of the seabed are likely to be in close proximity to the clearance activities it is therefore considered that there will be no significant impacts on fish.

Only a relatively small number of prey species would be at risk of potential mortal injury in the area around the UXO during clearance and any disturbance of prey species as a result of underwater noise or seabed disturbance would be temporary and localised, with fish expected to return to the area after completion of the UXO clearance works. Marine mammals feed on a range of prey species and their diet can vary geographically and seasonally depending on available prey resources. Taking into account the temporary and localised changes to prey availability is considered not significant for all marine mammals.

No further mitigation measures, other than those proposed in the MMMP (**Appendix B**) to reduce the risk of auditory injury, are required for the potential changes to prey species during UXO clearance.

4.5.2.8 Impact 8: Disturbance at seal haul-out sites

As outlined in **Section 4.5.1.3**, the nearest seal haul-out sites based on latest SCOS report (SCOS, 2020) and additional information for the area by shortest swimmable distance are on the North coast of the Moray Firth at Dunbeath-Helmsdale (21 km) and Dunbeath-Wick (22 km) corridor at the closest point both of which are designated for grey seal.

Given the distance to the closest seal haul-out sites there is unlikely to be any direct disturbance at seal haul-out sites as a result of the proposed UXO clearance and associated vessels. All vessel operators will use good practice to reduce any risk of collisions with marine mammals as outlined in the Scottish Marine Wildlife Watching Code[9].

The impact of any disturbance to seal haul-out sites is defined as negligible due to the distance from the seal haul-out sites, and the intermittent and temporary nature of any disturbance from vessels moving to

[9] Available at: https://www.nature.scot/professional-advice/land-and-sea-management/managing-coasts-and-seas/scottish-marine-wildlife-watching-code

and from the site. Seal species are highly protected and as such have a high value. However, the impact of the small increase in vessel disturbance and their habituation to the already high vessel use in the area is expected to be negligible.

No further mitigation measures are proposed or required for the potential disturbance from vessels at seal haul-out sites during UXO clearance. As previously stated, the first and preferred option for any UXO that require detonation is low-order detonation clearance. The MMMP (**Appendix B**) for UXO clearance at the Development Site will apply all measures to seals and reduce the risk of PTS and therefore there would be no potential for any significant effects.

4.5.2.9 Assessment of effects on the Southern Trench NCMPA

Minke whale are wide-ranging baleen whales which are present in the Moray Firth primarily in the summer months (June – September) (Reid *et al.,* 2003; Hammond *et al.,* 2021). They often prefer water depths of up to 200 m and are often solitary or found in pairs, though they occasionally form larger groups (up to 15 individuals) while feeding.

The MMMP (**Appendix B**) for UXO clearance at the Development Site will reduce the risk of PTS for minke whale and therefore there would be no potential for any significant effects. As previously stated, the first and preferred option for any UXO that require clearance is low-order clearance such as deflagration. The UXO clearance works are also scheduled to take place outside the summer season (February 2023 – May 2023) when the minke whale population will be at its lowest.

The assessments in **Section 4.5.2.5** indicate that vessels used during the proposed UXO clearance at the Development will not increase the collision risk or disturbance of minke whale, therefore there is no potential for any significant effects.

The assessments in **Section 4.5.2.6** and **4.5.2.7**, indicate that any changes to water quality or prey resources as a result of the proposed UXO clearance work would be temporary and localised and will not result in significant adverse effects.

The assessment in **Section 4.5.2.4** indicates there would be no significant disturbance from ADD as a result of ADD activation.

There could be the potential for the proposed UXO clearance in the Development Site to disturb minke whale associated with the Southern Trench NCMPA. As a precautionary approach, it has been assumed that any minke whale in the Development Site could be from the Southern Trench NCMPA; therefore, the assessments have been presented in the context of the latest estimate for the Moray Firth; this is based on SCANS-III abundance for survey Block S if 383 animals (Hammond *et al.,* 2021).

The number of minke whale that could potentially be disturbed due to the UXO clearance, based on the precautionary 5 km disturbance range, is less than 2 animals (0.24% of estimated Moray Firth population).

The assessment indicates that through the application of mitigation as outlined in the MMMP (**Appendix B**) there is no potential adverse effect on minke whale as a designated feature of the Southern Trench

NCMPA and no predicted impact on the conservation objectives for minke whale as a result of any disturbance from underwater noise during UXO clearance.

4.6 Offshore Ornithology

4.6.1 Existing Environment

The Moray Firth's coastal and offshore waters are internationally important for populations of seabird, seaduck, wader and wildfowl. Because of this, a number of areas bordering the Moray Firth have been designated as Special Protection Areas (SPAs) under EU Directive 79/409/EEC (the Birds Directive). In addition to resident birds, the area is used for breeding, over-wintering or as a temporary feeding ground during the spring and autumn migrations of species breeding in Scandinavia and the Arctic. There is only one designated site that potentially directly overlaps with the Development Site, the Moray Firth pSPA, which is located along the OECC.

The Moray West EIA Report describes the environmental baseline, which was informed by site specific digital aerial surveys and additional datasets for the Moray Firth, including boat-based surveys and tagging studies. Twenty birds were identified at the Moray West Site by aerial survey over the period 2016-2017, the four most abundant of these species were guillemot, kittiwake, razorbill, and fulmar. These species accounted for 90% of all birds observed on site. Based on this analysis, 20 bird species were taken forward for assessment as key species in the Moray West EIA Report (Moray West, 2018):

- Scaup
- Eider
- Long-tailed duck
- Common scoter
- Velvet scoter
- Goldeneye
- Red-breasted merganser
- Red-throated diver
- Great northern diver
- Fulmar
- Gannet
- Shag
- Slavonian grebe
- Arctic Skua
- Guillemot
- Razorbill
- Puffin
- Kittiwake
- Herring gull
- Great black-backed gull

All other species occurred only sporadically and in low or very low numbers.

4.6.2 Assessment of Effects

4.6.2.1 Impact 1: Noise disturbance

The detonation of UXO within the Development Site has the potential to cause disturbance or displacement to birds in the vicinity of the detonation. Underwater sound does not transfer efficiently to air, rather it reflects from the water-air boundary layer, so noise associated with the UXO detonation will be underwater and not expected to lead to airborne noise above ambient noise levels.

The potential for impact will, therefore, be limited to diving birds that are underwater at the time of each individual detonation.

Any impacts resulting from disturbance and displacement from UXO clearance activities are considered to be short-term, temporary, and reversible in nature, lasting only for the duration of EOD operations, with birds expected to return to the area once clearance activities have ceased. Therefore, impacts are considered to be negligible. No further mitigation is required.

4.6.2.2 Impact 2: Indirect disturbance due to reduced presence of prey

UXO detonation has the potential to cause indirect disturbance to seabirds that forage in the Development Site, through the disturbance and subsequent reduction in density of prey species. Given that no significant potential impacts to benthic ecology and fish and shellfish ecology have been identified (see **Section 4.3** and **Section 4.4**) it is reasonable to conclude that the indirect impact on seabirds occurring in or around the Development Site during the UXO clearance activities would be negligible. No further mitigation is required.

4.7 Commercial Fisheries

4.7.1 Existing Environment

The principal fishing activities in the vicinity of the Development Site were identified through assessment of available data and consultation with local fishery stakeholders to inform the EIA (Moray West, 2018).

The active fisheries in the region are:

- potting for crustacea species such as lobster, edible crab and velvet crab;
- demersal trawlers targeting Nephrops, squid and whitefish;
- scallop dredgers targeting king scallops;
- Scottish seiners targeting whitefish; and
- seasonal mackerel jigging (particularly focused around an inshore area of the OECC).

4.7.2 Assessment of Effects

4.7.2.1 Impact 1: Interference with or displacement of fishing activity

UXO clearance activities may interfere with or displace commercial fishing activity. A temporary safety distances of 1,500 m radius will be implemented around EOD operations which may result in the restriction of access to fishing grounds. Any exclusion zone will be implemented over a short period of time (a few hours) and across a small area (a 3.1 km^2 circle surrounding the UXO) in relation to the wider

available fishing area within Moray Firth and is required for safety purposes. Once the area has been deemed safe following detonation then the exclusion zone will be removed, and fishing activity will be able to resume within the previously restricted area. Therefore, it is considered that the impact would be short term, temporary, and reversible.

Evidence shows that the majority of landings occur between June and October (Moray West, 2018), so this has no temporal overlap with the clearance activity scheduled between February 2023 and 31 May 2023.

There are a number of existing embedded mitigation measures which will reduce the magnitude of any impact to commercial fisheries receptors. As set out in **Section 4.8**, mitigation measures include Notice to Mariners (NtM) and consultation with the fishing industry through a Fisheries Liaison Officer (FLO) to ensure that the fishing industry is as far as practicable aware of the location and timing of any activity and will be able to plan in order to minimise disruption.

Due to the spatially and temporally limited nature of the impact, and the embedded mitigation in place to give fishers sufficient prior warning about UXO activities, the impact of interference with or displacement of fishing activity is considered to be temporary and limited in magnitude. No further mitigation is required beyond the already embedded mitigation.

4.8 Shipping and Navigation

4.8.1 Existing Environment

4.8.1.1 The Moray West Site

During the summer survey, an average of ten unique vessels per day was recorded on automatic identification system (AIS) and radar passing within the offshore wind farm EIA study area, four of which intersected the Moray West Site. The majority of activity was from vessels associated with the Beatrice oil field and fishing vessels. Commercial vessels (cargo and tanker) and passenger vessels (the majority of which were cruise liners) were also commonly recorded.

During the winter survey, an average of four unique vessels per day were recorded on AIS passing within the offshore wind farm EIA study area, with two vessels per day intersecting the Moray West Site. As noted during summer, the majority of traffic recorded was associated with the Beatrice oil field and fishing vessels.

No anchoring activity was recorded during either survey.

4.8.1.2 The OfTI Corridor

During the summer survey, an average of 15 unique vessels per day was recorded on AIS and radar passing within the OfTI study area, with eight intersecting the OECC itself. Traffic levels dropped during the winter survey, with an average of eight unique vessels per day recorded as passing within the OfTI study area, four of which intersected the OECC itself.

The most commonly recorded traffic within the OfTI study area during both summer and winter was associated with the fishing industry.

4.8.2 Assessment of Effects

4.8.2.1 Impact 1: Interference with shipping and navigation

UXO clearance activities have the potential to result in obstructions to shipping and navigation in the vicinity of the detonation location. Temporary safety distances of 1,500 m radius will be implemented around UXO clearance activities, which will be closed to all normal marine traffic.

As described above, between 10 vessels per day were recorded in the vicinity of the Development during the maritime traffic surveys in summer, and four vessels during winter.

There are a number of embedded mitigation measures which will reduce the magnitude of any impact to shipping and navigation receptors (see **Section 5**). Safety distances will be put in place to ensure the safety of other mariners. NtMs, combined with radio navigation broadcasts, will ensure that mariners are aware of the location and nature of the works, including the details of the safety distances.

The impact would be short term, temporary, reversible and localised to the UXO detonation location. Due to the low level of commercial vessel traffic recorded in the Development and due to the embedded mitigation measures, which are designed to ensure the safety of mariners, the potential impact of interference to shipping and navigation will be temporary and of low magnitude. No further mitigation is required beyond the already embedded mitigation.

4.9 Archaeology and Cultural Heritage

4.9.1 Existing Environment

The Moray West EIA Report (2018) defined the archaeological and cultural heritage baseline for the Development Site through analysis and interpretation of geophysical data acquired in 2010 for the Moray West Site combined with a review of findings from geophysical data interpretation in context of additional data obtained from desk-based assessments, historical data, known archaeological sites and other previous investigations in the Development Site.

There are currently no known prehistoric sites within the Development Site and no individual paleogeographic features (e.g., individual buried palaeochannels) of archaeological interest were identified within the geophysical data assessed by Wessex Archaeology (for the Moray West Site and 2 km buffer only; excludes OECC). However, there remains potential for archaeological material of a prehistoric date to exist within the Development.

There are 29 geophysical anomalies located within the Moray West Site archaeological study area (ASA), with one confirmed wreck site (WA7228). This recorded wreck has been identified in the United Kingdom Hydrographic Office (UKHO) database as the Sunbeam (Possibly). The remaining 28 anomalies have been classified as being of A2 archaeological discrimination – uncertain origin of possible archaeological interest, ranging from seafloor disturbance to magnetic anomalies.

A further ten sites have been identified within the OECC ASA, consisting of six recorded wrecks and five recorded obstructions (WA7229-WA7238).

4.9.2 Assessment of Effects

4.9.2.1 Impact 1: Physical damage or disturbance

UXO clearance activities have the potential to affect marine archaeology through direct and indirect impact to the seabed. It is also possible that finds of archaeologist interest may be identified because of UXO investigation activities.

Any UXO work will avoid archaeological exclusion zones (AEZs), in accordance with the Moray West Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) (8460005-DBHA15-MWW-PLN-000001) unless absolutely necessary and otherwise agreed with MS-LOT in consultation with Historic Environment Scotland. Increased SSCs can have the potential to impact marine archaeology or cultural interest features through the re-deposition of suspended particles; however, increased SCC associated with UXO detonation will be highly spatially and temporally limited. Any archaeological feature discovered through the UXO search process will be reported to the Nominated Contact and Retained Archaeologist in accordance with the Moray West WSI and PAD.

Given the planned avoidance of all AEZs and established protocol should any archaeological features be discovered, as set out in the embedded mitigation, and the spatially and temporally limited extent of SSC increases from UXO detonation, no adverse effects on archaeology and cultural heritage are expected. No further mitigation is required beyond the already embedded mitigation.

4.10 Infrastructure and Other Users

4.10.1 Existing Environment

4.10.1.1 Oil and Gas

The Development is located within an area which supports oil exploration and production activity. **Table 4-12** below provides details of the oil production platforms present within the EIA study area, which are associated with the 'Beatrice' and 'Jacky' oil fields. Both the Jacky and Beatrice oil fields are no longer producing and are scheduled for decommissioning.

Table 4-12 Oil Platforms within the Study Area

Block Number	Oil Field	Platform Name	Operator	Production Start Date	Production End Date	Distance from Development (m)
11/30a	Beatrice	Beatrice Alpha Drilling platform	Repsol Sinopec Resources UK.	1981	2015	0
11/30a	Beatrice	Beatrice Alpha Production platform	Repsol Sinopec Resources UK.	1981	2015	0
11/30a	Beatrice	Beatrice Bravo platform	Repsol Sinopec Resources UK.	1981	2015	1,194
11/30a	Beatrice	Beatrice Charlie platform	Repsol Sinopec Resources UK.	1981	2015	204
12/21c	Jacky	Jacky platform	Ithaca Energy.	2009	2014	2,500

4.10.1.2 Offshore Wind

Beatrice Windfarm Demonstrator Project

The inactive Beatrice Windfarm Demonstrator Project is located adjacent to the Beatrice oil field, immediately to the west of the Moray West Site. This small offshore wind farm was developed in 2007 and comprises two 5 MW WTGs. Each WTG has three rotor blades 126 m in diameter, with a hub height of 88 m above LAT. All electricity generated by these two turbines was fed to a nearby oil platform. It is understood that these turbines will be decommissioned at the same time as the Beatrice Oil Field infrastructure, with decommissioning work expected to begin in 2024, with planned completion by 2029 (Repsol Sinopec Resources UK, 2017).

Beatrice Offshore Wind Farm

The fully operational wind farm, operated by Beatrice Offshore Windfarm Ltd (BOWL) lies adjacent to the extreme north-east corner boundary of the Moray West Site approximately 13.5 km from the Caithness Coast in the Outer Moray Firth. BOWL is fully operational, with 84 Siemens Gamesa WTGs and 588 MW capacity.

Moray East Wind Farm

The Moray East site is adjacent to the eastern border of the Moray West Site. Moray East is fully operational, with 100 WTGs and a capacity of 950 MW.

4.10.1.3 Military Practice and Exercise Areas

There are four Military Practice and Exercise Areas (PEXA) used for various military practice activities by the Royal Navy, the Army, the Royal Air Force (RAF) and the Ministry of Defence (MoD) in the vicinity of the Development. The Moray Firth D809 (South), Moray Firth D809 (North), and Tain D703 Danger Areas are the largest of the PEXA Danger Areas and are used by the RAF for a variety of flying and firing exercises. The OECC, although in close proximity to the Moray Firth D809 (South) Danger Area, does not intersect its boundary or that of any Danger Zone.

4.10.1.4 Subsea Cables and Pipelines

The SHEFA-2 fibre-optic telecommunications cable links the Faroe Islands to mainland Scotland via the Northern Isles. It runs south from the Orkney Islands to the Scottish mainland at Inverboyndie and is buried under the seabed surface as it transits the Moray Firth and makes landfall 10 km east of the Moray West landfall area. The Beatrice Offshore Wind Farm has two parallel export cables totalling 130 km in length (65 km each) which will extend from the Beatrice Offshore Wind Farm, through the Development, to make landfall 1.5 km west of Portgordon harbour (BOWL, 2016). The Caithness – Moray Link, a 113 km subsea High Voltage Direct Current (HVDC) cable that runs between Noss Head on the east Caithness coast and Portgordon on the south coast of the Moray Firth, crosses the southern inshore section of the Export Cable Corridor of the Development. Oil and gas extracted from the Beatrice Oil Field was exported to shore via a 67 km submarine pipeline. This pipeline crosses the north-west corner of the Moray West Site and runs to shore at Nigg in the Cromarty Firth.

4.10.2 Assessment of Effects

4.10.2.1 Impact 1: Disturbance of infrastructure and other marine users

UXO clearance activities have the potential to temporarily affect existing infrastructure and other users in the Moray Firth including the two operational oil fields, Beatrice Offshore Wind Farm, Moray East Offshore Wind Farm and recreational users. An example of such disturbance is oil and gas receptors in the vicinity of the Moray West Site have the potential to be impacted via interference with support vessel activity in the area.

There are a number of embedded mitigation measures in place to minimise the impact of UXO clearance on infrastructure owners and other sea users (see **Section 5**). These measures will include regular and close contact with the infrastructure owners, to ensure that any possible measures to protect assets are taken. There will also be the implementation of a 1,500 m safety zone around any UXO clearance activities. NtMs will also be issued to give prior warning to other marine users of the timing and location of UXO activities.

Recreational receptors may also be affected by UXO clearance activities. However, the maritime traffic survey to inform the Moray West EIA recorded no recreational vessels during the winter survey and an average of one unique vessel every three days during the summer survey period at the Moray West Site (Moray West, 2018). The likelihood of a recreational vessel being impacted by UXO activity is, therefore, low year-round. The embedded mitigation measures of NtMs combined with radio navigation broadcasts

will ensure that recreational receptors are aware of the location and nature of the works, and the implementation of a 1,500 m safety zone will ensure the safety of other marine users.

The UXO clearance activities will be temporary and of short duration. Due the implementation of the above embedded mitigation measures, only temporary impacts of low magnitude of UXO clearance activities on other marine users in the Moray Firth. No further mitigation is required beyond the already embedded mitigation.

4.11 Designated Sites

4.11.1 Existing Environment

There are a number of nature conservation designations within the Moray Firth and in the vicinity of the Development Site. Designated sites have been screened into the assessment where there is spatial overlap and/or there are mobile features of the designated site which may occur within the Development Site.

A summary of the designated sites that have been screened into this assessment as having the potential to interact with the UXO clearance activities is provided in Table 4-13 and displayed in Figure 4-1.

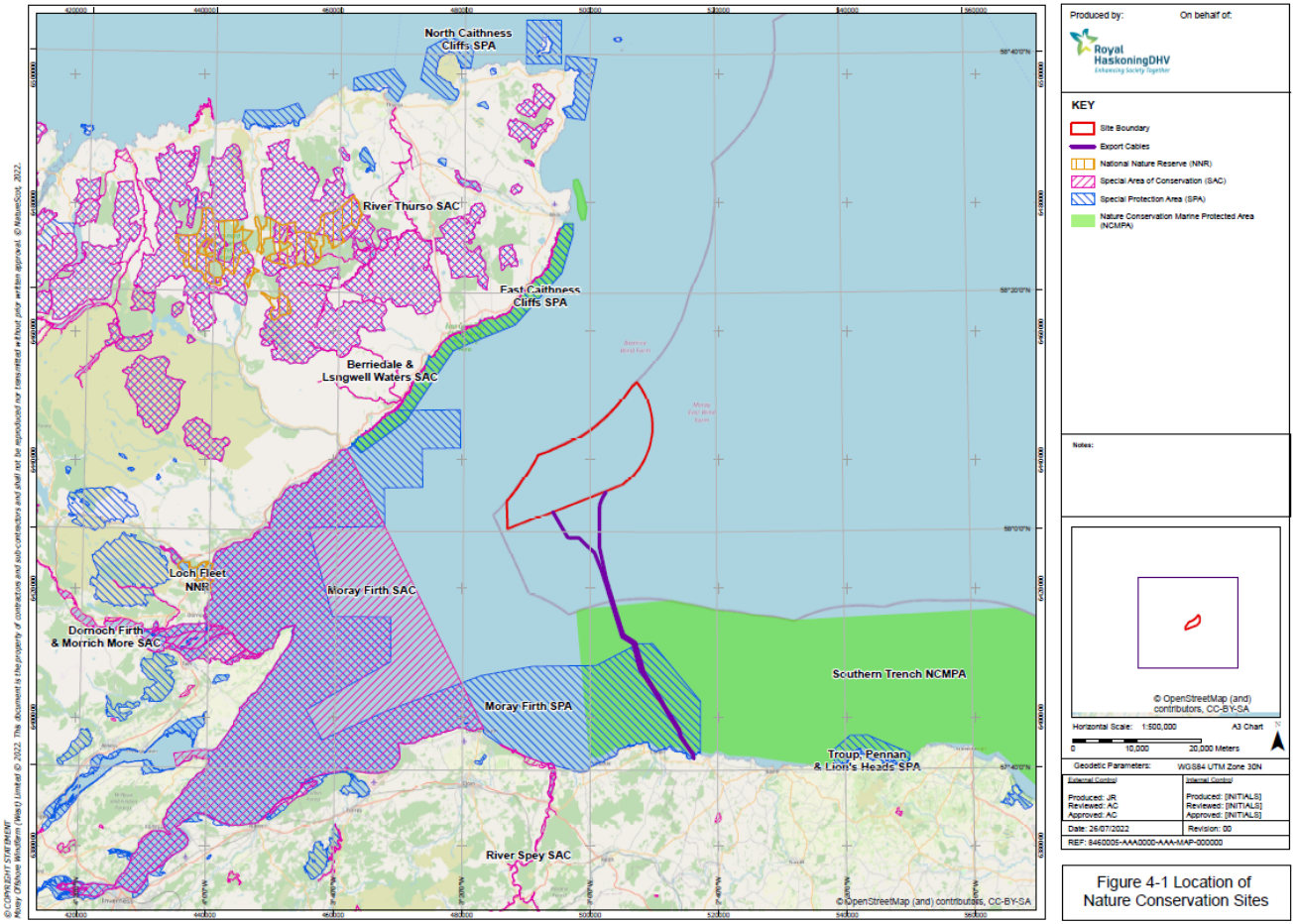

Figure 4-1 Location of nature conservation sites.

Table 4-13: Summary of the nature conservation designations and specific features that have been screened in as having the potential to interact with the UXO clearance activities within the Moray West Development Area

Site name	Distance from offshore wind farm (OWF) (km)	Screened in qualifying features	Conservation objectives in relation to screened in qualifying features
Moray Firth SAC	17 km southwest	Primary reason for site selection: Bottlenose dolphin (*Tursiops truncatus*)	To ensure for the qualifying species that the following are established then maintained in the long term: population of the species as a viable component of the site; distribution of the species within the site; distribution and extent of habitats supporting the species; structure, function and supporting processes of habitats supporting the species; and no significant disturbance of the species.
Dornoch Firth and Morrich More SAC	46 km southwest	Primary reason for site selection: Harbour seal (*Phoca vitulina*)	
Loch Fleet National Nature Reserve (NNR)	46.8 km southwest	Designated for a number of marine, coastal and terrestrial features. Marine mammal interest feature with potential for interaction with UXO activities is harbour seal, which haul out year-round.	No specific conservation objectives are listed in relation to marine mammals, but the overall objective is to allow natural change to occur with minimal disturbance to habitats and species in the tidal basin.
Berriedale and Langwell Waters SAC	23.5 km northwest	Primary reason for site selection: Atlantic salmon (*Salmo salar*)	To ensure for the qualifying species that the following are maintained in the long term: population of the species, including range of genetic types for salmon, as a viable component of the site; distribution of the species within the site; distribution and extent of habitats supporting the species; structure, function and supporting processes of habitats supporting the species; and

River Spey SAC	37.6 km south	Primary reason for site selection: Sea lamprey (*Petromyzon marinus*) Atlantic salmon	no significant disturbance of the species.
River Thurso SAC	95.6 km (around the coast moving northwards from the OWF)	Primary reason for site selection: Atlantic Salmon	
Southern Trench NCMPA	0 km	Biodiversity: Minke whale (*Balaenoptera acutorostrata*) Burrowed mud Fronts Shelf deeps Geodiversity: Quaternary of Scotland Submarine Mass Movement	The Conservation Objectives of the Southern Trench NCMPA are that the protected features: so far as already in favourable condition, remain in such condition; so far as not already in favourable condition, be brought into such condition, and remain in such condition. "Favourable condition", with respect to a marine habitat, means that a) its extent is stable or increasing; and b) its structures and functions, its quality, and the composition of its characteristic biological communities are such as to ensure that it is in a condition which is healthy and not deteriorating. "Favourable condition", with respect to a mobile species of marine fauna, means that a) the species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the NCMPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds;

			b) the extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered; and c) the structure and function of any supporting feature, including any associated processes supporting the species within the NCMPA, is such as to ensure that the protected feature is in a condition which is healthy and not deteriorating. "Favourable condition", with respect to a feature of geomorphological interest, means that a) its extent, component elements and integrity are maintained; b) its structure and functioning are unimpaired; and c) its surface remains sufficiently unobscured for the purposes of determining whether the criteria in paragraphs (a) and (b) are satisfied. "Favourable condition", with respect to a large-scale feature, means that a) the extent, distribution and structure of that feature is maintained; b) the function of the feature is maintained so as to ensure that it continues to support its characteristic biological communities and their use of the site including, but not restricted to, feeding, spawning, courtship or use as nursery grounds; and c) the processes supporting the feature are maintained
East Caithness Cliff SPA	19.6 km northwest	Annex I species: peregrine Migratory species during breeding season: guillemot, herring gull, kittiwake, razorbill, and shag Birds present during breeding season: puffin, great black-backed gull, cormorant, fulmar,	To ensure for the qualifying species that the following are established then maintained in the long term: population of the species as a viable component of the site; distribution of the species within the site; distribution and extent of habitats supporting the species; structure, function and supporting processes of habitats supporting the species; and no significant disturbance of the species.

		razorbill, guillemot, kittiwake, herring gull and shag.	
North Caithness Cliffs SPA	44 km north	Annex I species: peregrine Migratory species during breeding season: guillemot Species present during breeding season: puffin, razorbill, kittiwake, fulmar, and guillemot	
Troup, Pennan and Lion's Head SPA	52 km southeast	Migratory species during breeding season: guillemot Species present during the breeding season: razorbill, kittiwake, herring gull, fulmar, and guillemot.	
Moray Firth SPA	14.3 km west	The European Shag is proposed as a breeding and non-breeding species. The following non-breeding species have also been proposed: common eider; common goldeneye; common scoter; great northern diver; greater scaup; long-tailed duck; red-breasted merganser; red-throated diver; Slavonian grebe; and velvet scoter.	

4.11.2 Assessment of Effects

Further information on potential effects to Atlantic salmon and sea lamprey as qualifying features of the Berriedale and Langwell Waters SAC (Atlantic salmon only) and River Spey SAC are provided in **Section 4.4** and **6.4**.

Details of the potential effects on bottlenose dolphin as the qualifying feature for the Moray Firth SAC, on harbour seals as the qualifying feature for the Dornoch Firth and Morrich More SAC, and on minke whale as a qualifying feature for Southern Trench NCMPA are provided in **Sections 4.5; 6.2;** and **6.3**.

Details on the potential effects on harbour seals at Loch Fleet NNR are provided within **Section 4.5** and for Dornoch Firth and Morrich More SAC details can be found within **Sections 4.5** and **6.3**.

Details on the potential effects on the 'Burrowed mud' qualifying feature, and the species associated with this habitat type (e.g., Norway lobster) are provided in **Sections 4.3** and **4.4**.

Details on the potential for effects on SPA birds can be found in **Sections 4.6** and **6.5**.

Consideration of Likely Significant Effects (LSE) is given in **Section 6.**

5 Embedded Mitigation Measures

There are a number of embedded mitigation measures that will be implemented for the UXO clearance activities, which reduce the potential for certain impacts. These measures are listed in Table 5-1 below and are referred to in the individual assessments where relevant.

Table 5-1: Embedded Mitigation Measures

Measure	Description
Shipping & navigation and other sea users	
Notification of UXO locations to MS-LOT and Coastguard	Before detonation of UXO begins, all positively identified UXO Items will be documented, and notifications sent to HM Coastguard and the Royal Navy. Notification of the location and size of any UXO to be detonated will also be made to MS-LOT. Following completion of the surveys to identify potential UXO, further inspection of suspected UXO locations and confirmation of which UXO require detonation, a log of the location, type, and size of each UXO will be compiled and sent to HM Coastguard, the Royal Navy, and MS-LOT as soon as possible prior to the first detonation. Once confirmation that the information has been received and the planned detonation can take place has been given by these organisations, the detonation process can begin.
Notices to Mariners (NtM)	NtMs will be issued in advance of any UXO clearance activities to alert vessels and other interests of the timing and location of UXO clearance activity.
Safety distances	A safety distance of 1,500 m will be implemented during EOD operations, to ensure the safety of vessels and other interests operating in the vicinity. Detonation activities will be stopped when any vessel (with the exception of vessels conducting detonation operations) enters or appears to approach within a safety distance of 1,500 m around the blast site. The area (i.e., the 1,500 m safety distance) will also be closed down for normal marine vessel traffic in agreement with the HM Coastguard National Maritime

	Operations Centre and the Royal Navy and via a NtM.
Marine mammals	
Low-order deflagration is the preferred method of UXO disposal (where feasible).	Low-order deflagration minimizes the sound levels produced by UXO clearance, thereby reducing the potential for impacts to occur on sound-sensitive marine mammal and fish species.
All UXO clearance to take place in daylight and, when possible, in favourable conditions with good visibility (sea state 3 or less).	Carrying out UXO clearance under these conditions allows for the effective use of on board MMOs.
Establishment of a monitoring area with minimum of 1 km radius. The observation of the monitoring area will be by dedicated and trained MMOs during daylight hours and suitable visibility.	The monitoring area 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. Surveys of the monitoring area will be conducted by dedicated and trained MMOs during daylight hours and suitable visibility and sea states prior to UXO clearance, regardless of clearance method, to minimise the potential for marine mammals to be present within the monitoring area 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 at least two dedicated and trained MMOs positioned so the entire monitoring area 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 monitoring area is communicated.
The deployment of PAM devices, if required, and if the equipment can be safely deployed and retrieved.	In the event of periods of low visibility (due to adverse weather and/or sea states of 4 or higher), the use of PAM will be required as an additional measure to monitor the mitigation zone. The MMOs and PAM-Op will be in the launch vessel, within a maximum distance of 300 m of the detonation location, during the pre-detonation search period.
The activation of ADD.	The ADD will be activated at the appropriate time during the pre-clearance search of the monitoring area, whether there is marine mammal presence or not. Timing of ADD activation is dependent on the time required for the UXO clearance method and size of UXO. ADD will be activated prior to any UXO low-order or high-

	order detonation to ensure marine mammals and sound-sensitive fish are deterred from the area and reduce the risk of any physical or auditory injury.
The controlled explosions of the UXO will be undertaken by specialist contractors, using the minimum amount of explosive required in order to achieve safe disposal of the UXO.	The EOD Supervisor, who has the overall responsibility for the detonation operation, will be the main point of communication between the mitigation team (MMOs, PAM-Op (if present) 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 detonation activities.
The fusing of multiple devices.	If there are multiple UXO in close proximity (e.g., within 20 m of each other) then one may be moved to be detonated with the other. In this case, the charges should be fused together, allowing for a millisecond of delay between the device detonations in order to reduce the cumulative impact of the shock wave.
Other	
Archaeological mitigation	The vessel master and UXO contractor will be briefed on the exact locations of any Archaeological Exclusion Zones (AEZ) and a chart of these locations provided to ensure limited interference with AEZs. UXO clearance works will avoid AEZs unless otherwise agreed with MS-LOT in consultation with Historic Environment Scotland. Any object that is identified as potential archaeology will be reported to the retained archaeologist. If an undocumented archaeological target is deemed to be of potentially high importance during any of the UXO clearance activities, the retained archaeologist will be consulted.

6 Information for the Assessment of Likely Significant Effects and Adverse Effects On Integrity

6.1 Introduction

This section considers the potential for the UXO clearance works to lead to a Likely Significant Effect (LSE) on the conservation objectives of any relevant European site, either alone or in combination with other plans or projects (previously known as a 'Natura 2000' site, now known as 'UK National site network') or Ramsar site (referred to as a Stage 1 – screening assessment) and, in the event of a LSE being identified, to provide information on the potential for the UXO activity to have an adverse effect on integrity (AEOI) of the relevant site/feature in relation to the stated conservation objectives (information to support Stage 2 – Appropriate Assessment). For the purposes of this section, European/UK National site network sites and Ramsar sites will collectively be referred to as 'designated sites'.

The Habitats Regulations is the collective term for the regulations which implement the Habitats Directive[10], and certain aspects of the Birds Directive[11], in Scotland. The following regulations are applicable:

1. The Conservation of Habitats and Species Regulations 2017
2. The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)
3. The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) (referred to as the "Offshore Marine Regulations 2017") (applies to Marine Licence consent applications within Scottish waters beyond 12 nm).

Under the Habitats Regulations, the competent authority would be required to make an Appropriate Assessment of the implications of a proposed activity in view of any affected designated site's conservation objectives, should it be determined that the proposed activity represents an LSE. The information presented in this section is intended to provide the competent authority with the relevant information to enable them to determine whether an Appropriate Assessment is required and where required, to support the completion of an Appropriate Assessment.

This section considers whether there is an LSE on the interest features of a designated site, either alone or in-combination; where there is not a clear-cut case for there being no LSE on the interest feature or conservation objectives, a fuller consideration is then applied, using further analysis and information, to confirm and justify the presence or absence of AEOI.

6.2 Moray Firth SAC

The Moray Firth SAC was designated in 2005 for bottlenose dolphin. The Moray Firth SAC extends from the inner firths to Helmsdale on the north coast and Lossiemouth on the south coast and covers an area of 1,510 km^2 (NatureScot, 2021). The population is present year-round within the Moray Firth

[10] European Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive').
[11] European Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive').

(NatureScot, 2021). The Moray Firth supports an estimated 224 individuals (95% CI 214-234; Arso Civil *et al.,* 2021). The closest point to the Development UXO clearance area is more than 17 km from the Moray Firth SAC.

6.2.1 Screening for LSE

Table 6-1 Screening of impacts with the potential for LSE in the Moray Firth SAC

Feature	Potential Impacts and Rationale for LSE decision	Potential for LSE alone	Potential for LSE in-combination
Bottlenose dolphin *Tursiops truncatus*	As a precautionary approach it has been assumed that bottlenose dolphin within or near the area of UXO clearance could be from the Moray Firth SAC, therefore the assessments have also been presented in the context of bottlenose dolphin from the Moray Firth SAC. Therefore, there is the potential for: PTS and TTS from underwater noise during UXO detonations.	**Yes** - Assessed in **Section 6.2.2.**	No (see **Section 6.6**).
	Disturbance from underwater noise during UXO clearance.	**Yes** – assessed further in **Section 6.2.2.**	No (see **Section 6.6**)
	Disturbance from ADD use.	No (see **Section 4.5).**	No
	Increased collision risk and disturbance from vessels.	No (see **Section 4.5**).	No
	Changes to water quality.	No (see **Section 4.5**).	No
	Changes to prey resources.	No (see **Section 4.5**).	No

6.2.2 Information to inform Appropriate Assessment

There is the potential for the following effects on bottlenose dolphin from the Moray Firth SAC as a result of the proposed UXO clearance in the nearshore area:

1. PTS and TTS from underwater noise during UXO detonations.
2. Disturbance resulting from the underwater noise associated with the clearance of UXO.

The MMMP (**Appendix B**) for UXO clearance at the Development Site will reduce the risk of any PTS in bottlenose dolphin and therefore there would be no potential for any significant effects.

The assessments in **Section 4.5** indicate that vessels during the proposed UXO clearance will not increase the collision risk or disturbance of bottlenose dolphin, therefore there is no potential for any significant effects.

The assessments in **Section 4.5** indicate that any water quality or changes to prey resources as a result of the proposed UXO clearance work would be temporary and localised and will not result in significant adverse effects.

The assessment in **Section 4.5** indicates there would be no additional disturbance from ADDs as any disturbance as a result ADD activation is within the maximum range assessed for disturbance from UXO clearance.

There could be the potential for the proposed UXO clearance in the Development Site to disturb bottlenose dolphin.

As a precautionary approach it has been assumed that any bottlenose dolphin in the Development Site could be from the Moray Firth SAC, therefore the assessments have been presented in the context of the bottlenose dolphin Moray Firth SAC count.

The assessment indicates that through the application of mitigation as outlined in the MMMP (**Appendix B**) 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 (**Table 6-2**).

Table 6-2 The maximum number of bottlenose dolphin that could be disturbed during UXO clearance without mitigation, based on maximum TTS ranges

Potential effect	Maximum number of animals and % of SAC reference population based on maximum potential impact area	Potential AEoSI
One UXO high-order UXO clearance located in the Development Site unmitigated TTS SPL_{peak} (5.3 km^2)	0.02 bottlenose dolphin (0.009% of Moray Firth SAC count) based on the density estimate of 0.0037/km^2	No
5 km EDR during 1 low-order UXO clearance, including vessels (78.54 km^2)	0.3 bottlenose dolphin (0.13% of Moray Firth SAC count), based on the density estimate of 0.0037/km^2	No

There is no potential for any effects in relation to Moray Firth SAC Conservation Objectives for bottlenose dolphin during the proposed UXO clearance at the Development Site (**Table 6-3**).

Table 6-3 Potential effects in relation to the Conservation Objectives of the Moray Firth SAC for bottlenose dolphin

Conservation Objective for bottlenose dolphin	Potential Adverse Effect
Bottlenose dolphin is a viable component of the site	No potential adverse effect Physical and permanent auditory injury from the clearance of UXO will be mitigated and therefore there is no potential for an adverse effect.
	No potential adverse effect There is no adverse effect as a result of underwater noise during UXO clearance Table 6-2 to bottlenose dolphin from the Moray Firth SAC.

Table 6-3 Potential effects in relation to the Conservation Objectives of the Moray Firth SAC for bottlenose dolphin	
Conservation Objective for bottlenose dolphin	**Potential Adverse Effect**
	There will be no potential for any increased risk that could result in an adverse effect on the site integrity.
Distribution of the species within site is maintained by avoiding significant disturbance.	No potential adverse effect There will be no potential for any change to the distribution of bottlenose dolphin in the Moray Firth SAC. There is no significant disturbance or adverse effect as a result of underwater noise during UXO clearance to bottlenose dolphin from the Moray Firth SAC.
Distribution and extent of the habitats of qualifying species	No potential adverse effect There will be no potential for any change to the distribution and extent of the habitats in the Moray Firth SAC supporting bottlenose dolphin.
The supporting habitats and processes relevant to bottlenose dolphin and the availability of prey for bottlenose dolphin are maintained.	No potential adverse effect There will be no potential for any change to the structure, function and supporting processes of habitats and availability of prey supporting bottlenose dolphin in the Moray Firth SAC.

6.3 Dornoch Firth and Morrich More SAC

Harbour seal are an Annex II species and qualifying feature of the Dornoch Firth and Morrich More SAC, which is located 46 km from the Development Site. Although there is no direct effect within the SAC area, there is the potential to affect harbour seal from the SAC if they are foraging or moving through the Development Site during the UXO clearance works.

The total population of harbour seals in Scotland was 26,846 in 2016-2019. Tagging studies (Graham *et al*., 2017) show there is connectivity between the two MUs and as such it is most appropriate to consider that the relevant population against which to assess impacts on the Dornoch Firth and Morrich More SAC population is the combined Moray Firth and North Coast and Orkney MUs. Combining the most recent haul-out count for the Moray Firth MU (1,077) with the most recent haul-out count for the North Coast and Orkney MU (1,405), results in a total August haul-out count of 2,482 harbour seals (SCOS, 2020).

6.3.1 Screening for LSE

Table 6-4 Screening of impacts with the potential for LSE in the Dornoch Firth and Morrich More SAC			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Harbour seal ***Phoca vitulina***	As a precautionary approach it has been assumed that foraging harbour seal within or near the area of UXO clearance could be from Dornoch Firth and Morrich More SAC, therefore the assessments have also been presented in the context of the harbour seal	**Yes** - assessed in **Section 6.3.2.**	No (see **Section 6.6**).

Table 6-4 Screening of impacts with the potential for LSE in the Dornoch Firth and Morrich More SAC			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
	from The Wash and North Norfolk Coast SAC count. Therefore, there is the potential for: PTS and TTS from underwater noise during UXO detonations.		
	Disturbance from underwater noise during UXO clearance.	**Yes** – assessed further in **Section 6.3.2**	No (see **Section 6.6**)
	Disturbance from ADD use.	No (see **Section 4.5**)	No
	Increased collision risk and disturbance from vessels.	No (see **Section 4.5**)	No
	Changes to water quality.	No (see **Section 4.5**)	No
	Changes to prey resources.	No (see **Section 4.5**)	No
	Disturbance at seal haul-out sites.	No (see **Section 4.5**)	No

6.3.2 Information to inform Appropriate Assessment

There is the potential for the following effects on harbour seal from Dornoch Firth and Morrich More SAC as a result of the proposed UXO clearance:

1. PTS and TTS from underwater noise during UXO detonations.
2. Disturbance resulting from the underwater noise associated with the clearance of UXO.

The MMMP (**Appendix B**) for UXO clearance will reduce the risk of any PTS in harbour seal and therefore there would be no potential for any significant effects.

The assessments in **Section 4.5** indicate that vessels during the proposed UXO clearance will not increase the collision risk or disturbance of harbour seal, therefore there is no potential for any significant effects.

The assessments in **Section 4.5,** indicate that any water quality or changes to prey resources as a result of the proposed UXO clearance work would be temporary and localised and will not result in significant adverse effects.

The assessment in **Section 4.5** indicates there would be no additional disturbance from ADDs as any disturbance as a result ADD activation is within the maximum range assessed for disturbance from UXO clearance.

There could be the potential for the proposed UXO clearance at the Development Site to disturb foraging harbour seal.

As a precautionary approach it has been assumed that any harbour seal in the Development Site could be from the Dornoch Firth and Morrich More SAC, therefore the assessments have been presented in the context of the harbour seal haul-out count for the Moray Firth MU combined with the most recent haul-out count for the North Coast and Orkney MU.

The assessment (**Section 4.5.2**) indicates that through the application of mitigation described in the MMMP (**Appendix B**) 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 (Table 6-5).

Table 6-5 The maximum number of harbour seal that could be disturbed during UXO clearance without mitigation based on maximum TTS ranges

Potential effect	Maximum number of animals and % of SAC reference population based on maximum potential impact area	Potential AEoSI
One UXO high-order UXO clearance located in the Development Site unmitigated TTS SEL (1110.365 km^2)	23 harbour seal (0.94% of the combined MUs), based on the density estimate of 0.021/km^2.	No Temporary effect with less than 1% of the population affected. This is a worst-case assessment assuming all individuals present are from the Dornoch Firth and Morrich More SAC which is unlikely given the distance to the SAC. With mitigation through the application of the MMMP the number of individuals at risk from TTS / potentially disturbed will be reduced. Therefore, there will be no potential AEoSI.
5 km EDR during one low-order UXO clearance, including vessels (78.54 km^2)	1.65 harbour seal (0.07% of the combined MUs), based on the worst-case density estimate of 0.021 /km^2.	No Temporary effect with less than 1% of the population affected. This is a worst-case assessment assuming all individuals present are from the Dornoch Firth and Morrich More SAC which is unlikely given the distance to the SAC. With mitigation through the application of the MMMP the number of individuals at risk from TTS / potentially disturbed will be reduced. Therefore, there will be no potential AEoSI.

There is no potential for any effects in relation to The Dornoch Firth and Morrich More SAC Conservation Objectives for harbour seal during the proposed UXO clearance in the nearshore area (Table 6-6).

Table 6-6 Potential effects in relation to the Conservation Objectives of the Dornoch Firth and Morrich More SAC for harbour seal	
Conservation Objective for harbour seal	**Potential Adverse Effect**
The population of the species a viable component of the site	No potential adverse effect There will be no potential for any increased risk that could result in an adverse effect on the site integrity.
The distribution of qualifying species within the site	No potential adverse effect There will be no potential for any change to the distribution of harbour seal within the Dornoch Firth and Morrich More SAC. There is no adverse effect as a result of underwater noise during UXO clearance to foraging harbour seal from Dornoch Firth and Morrich More SAC.
The distribution and extent of qualifying natural habitats and habitats of qualifying species.	No potential adverse effect There will be no potential for any change to the distribution and extent of the habitats for harbour seal.
The structure and function of the habitats supporting the species	No potential adverse effect There will be no potential for any change to the structure and function of the habitats supporting the species.
No significant disturbance of the species	No potential adverse effect There will be no potential for any change to the distribution of harbour seal within the Dornoch Firth and Morrich More SAC. There is no adverse effect as a result of underwater noise during UXO clearance to foraging harbour seal from the Dornoch Firth and Morrich More SAC.

6.4 Berriedale and Langwell Waters SAC, River Spey SAC, and River Thurso SAC

6.4.1 Screening for LSE

The Berridale and Langwell Waters SAC and River Thurso SAC lie 23.5 km northwest and 95.6 km (around the coast moving northwards from the Wind Farm) respectively of the Moray West Site. These sites cover an area of 0.58 km^2 and 5.78 km^2 respectively. The only qualifying feature for the designation of these SACs is their Atlantic salmon populations. **Table 6-7** and **Table 6-8** provides the LSE screening outcome of UXO clearance activities on Berriedale and Langwell Waters SAC and River Thurso SAC, respectively.

The River Spey SAC lies 37.6 km south of the Moray West Site. The site covers an area of 5.78 km^2 and is a freshwater site. The qualifying features for which a pathway of effect from the UXO clearance activities has been identified to the SAC are as follows:

1. Sea lamprey *Petromyzon marinus*
2. Atlantic salmon *Salmo salar*
3. Freshwater pearl mussel (FWPM) *Margaritifera margaritifera* – as an indirect effect as part of the lifecycle of FWPM involves a larval stage attached to the gills of trout or salmon.

Table 6-9 provides the LSE screening outcome of UXO clearance activities on the River Spey SAC.

Table 6-7: Screening of impacts with the potential for LSE in the Berriedale and Langwell Waters SAC			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Atlantic salmon *Salmo salar*	The presence of vessels associated with UXO works has the potential to affect migratory salmon through the production of underwater noise. Vessel noise was assessed as being not significant in the Moray West EIA Report (Moray West, 2018). This conclusion was in relation to the operational phase and was, therefore, in relation to a continuous and long-term potential impact. In contrast, vessel noise associated with UXO clearance activity will be short term. In addition, vessel activity already occurs within the Moray West Site, this baseline will not be substantially altered by the presence of UXO clearance vessels.	No (see **Section 4.4**)	No (see **Section 6.6**)
	Physical disturbance of the seabed as a result of UXO clearance activity has no pathway of effect on migratory salmon. Whilst salmon may use the seabed as a source of prey during migrations, the temporally and spatially limited physical disturbance of the seabed as a result of UXO clearance will not alter prey availability for salmon. No LSE on the SAC is predicted from physical disturbance to the seabed.	No (see **Section 4.4**)	No (see **Section 6.6**)
	Disturbance from underwater noise due to UXO clearance. Smolt migration from rivers generally takes place between April and June (Moray West, 2018), peaking during the latter half of April and in May. UXO clearance activities are scheduled to occur from February 2023 to 31st May 2023. Therefore, there is the potential for adult salmon to be affected during their migrations, although it is unlikely that smolts will be present in the Firth during UXO clearance activity. Whilst there is potential for the noise from detonation to disturb migratory salmon, this will be of short duration and of limited extent during each of the individual detonations. The potential for impacts on salmon due to noise disturbance will be limited and significantly less than anticipated during the offshore construction phase. No LSE on the SAC is predicted from disturbance from underwater noise due to UXO clearance.	No (see **Section 4.4**)	No (see **Section 6.6**)

Table 6-8 Screening of impacts with the potential for LSE in the River Thurso SAC			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Atlantic salmon *Salmo salar*	The presence of vessels associated with UXO works has the potential to affect migratory salmon through the production of underwater noise. Vessel noise was assessed as being not significant in the Moray West EIA Report (Moray West, 2018). This conclusion was in relation to the operational phase and was, therefore, in relation to a continuous and long-term potential impact. In contrast, vessel noise associated with UXO clearance activity will be short term. In addition, vessel activity already occurs within the Moray West Site, this baseline will not be substantially altered by the presence of UXO clearance vessels.	No (see **Section 4.4**)	No (see **Section 6.6**)
	Physical disturbance of the seabed as a result of UXO clearance activity has no pathway of effect on migratory salmon. Whilst salmon may use the seabed as a source of prey during migrations, the temporally and spatially limited physical disturbance of the seabed as a result of UXO clearance will not alter prey availability for salmon. No LSE on the SAC is predicted from physical disturbance to the seabed.	No (see **Section 4.4**)	No (see **Section 6.6**)
	Disturbance from underwater noise due to UXO clearance. Smolt migration from rivers generally takes place between April and June (Moray West, 2018), peaking during the latter half of April and in May. UXO clearance activities are scheduled to occur from February 2023 to 31st May 2023. Therefore, there is the potential for adult salmon to be affected during their migrations, although it is unlikely that smolts will be present in the Firth during UXO clearance activity. Whilst there is potential for the noise from detonation to disturb migratory salmon, this will be of short duration and of limited extent during each of the individual detonations. The potential for impacts on salmon due to noise disturbance will be limited and significantly less than anticipated during the offshore construction phase. No LSE on the SAC is predicted from disturbance from underwater noise due to UXO clearance.	No (see **Section 4.4**)	No (see **Section 6.6**)

Table 6-9 Screening of impacts with the potential for LSE in the River Spey SAC			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Atlantic salmon *Salmo salar*	The presence of vessels associated with UXO works has the potential to affect migratory salmon through the production of underwater noise. Vessel noise was assessed as being not significant in the Moray West EIA Report (Moray West, 2018). This conclusion was in relation to the operational phase and was, therefore, in relation to a continuous and long-term potential impact. In contrast, vessel noise associated with UXO clearance activity will be short term. In addition, vessel activity already occurs within the Moray West Site, this baseline will not be substantially altered by the presence of UXO clearance vessels. No LSE on the Atlantic salmon qualifying feature is predicted from vessels associated with the UXO clearance activities.	No (see **Section 4.4**)	No (see **Section 6.6**)
	Physical disturbance of the seabed as a result of UXO clearance activity has no pathway of effect on migratory salmon. Whilst salmon may use the seabed as a source of prey during migrations, the temporally and spatially limited physical disturbance of the seabed as a result of UXO clearance will not alter prey availability for salmon. No LSE on the Atlantic salmon qualifying feature is predicted from physical disturbance to the seabed.	No (see **Section 4.4**)	No (see **Section 6.6**)
	Disturbance from underwater noise due to UXO clearance. Smolt migration from rivers generally takes place between April and June (Moray West, 2018), peaking during the latter half of April and in May. UXO clearance activities are scheduled to occur from February 2023 to 31st May 2023. Therefore, there is the potential for adult salmon to be affected during their migrations, although not during the peak migration period, and it is unlikely that smolts will be present in the Firth during UXO clearance activity. Whilst there is potential for the noise from detonation to disturb migratory salmon, this will be of short duration and of limited extent during each of the individual detonations. The potential for impacts on salmon due to noise disturbance will be limited and significantly less than anticipated during the offshore construction phase. No LSE on the Atlantic salmon qualifying feature is predicted from disturbance from underwater noise due to UXO clearance.	No (see **Section 4.4**)	No (see **Section 6.6**)

Table 6-9 Screening of impacts with the potential for LSE in the River Spey SAC			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Sea lamprey *Petromyzon marinus*	The presence of vessels associated with UXO works has the potential to affect sea lamprey through the production of underwater noise. Vessel noise was assessed as being not significant in the Moray West EIA Report (Moray West, 2018). This conclusion was in relation to the operational phase and was, therefore, in relation to a continuous and long-term potential impact. In contrast, vessel noise associated with UXO clearance activity will be short term. In addition, vessel activity already occurs within the Moray West site, this baseline will not be substantially altered by the presence of UXO clearance vessels. No LSE on the sea lamprey qualifying feature is predicted from vessels associated with the UXO clearance activities.	No (see **Section 4.4**)	No (see **Section 6.6**)
	Physical disturbance of the seabed as a result of UXO clearance activity has no pathway of effect on sea lamprey. The temporally and spatially limited physical disturbance of the seabed as a result of UXO clearance will not alter prey availability for sea lamprey. No LSE on the sea lamprey qualifying feature is predicted from physical disturbance to the seabed.	No (see **Section 4.4**)	No (see **Section 6.6**)
	Disturbance from underwater noise due to UXO clearance. There is a lack of information about key migration times for sea lamprey however, they are thought to spawn in the River Spey, meaning their spawning grounds would not overlap with the Development Site. The potential for impacts on sea lamprey due to noise disturbance will be limited and significantly less than anticipated during the offshore construction phase. Sea lamprey are considered less sensitive to sound than Atlantic salmon (Popper, 2014) and, therefore, will receive impacts less than or equal to that of Atlantic salmon. No LSE on the sea lamprey qualifying feature is predicted from disturbance from underwater noise due to UXO clearance.	No (see **Section 4.4**)	No (see **Section 6.6**)
Freshwater pearl mussel *Margaritifera margaritifera*	The lifecycle of FWPM is very unusual and complex. FWPM larvae (glochidia) are washed downstream the river where they attach themselves to the gills of young Atlantic salmon or brown trout. The larvae live as parasites on the gills of these fish for approximately nine months before dropping off the fish and settling onto the river gravel. Therefore, any adverse effects on Atlantic salmon will have an indirect effect on FWPM populations of the SAC.	No	No (see **Section 6.6**)

Table 6-9 Screening of impacts with the potential for LSE in the River Spey SAC			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
	It has been determined that the UXO clearance activities will not have LSE on Atlantic salmon; therefore, there will be no LSE on FWPM.		

6.5 East Caithness Cliff, North Caithness Cliff, Moray Firth, and Troup, Pennan and Lion's Head SPA

6.5.1 Screening for LSE

For the areas covered by the following SPA's, and their distances to the closest point of the Development UXO clearance area, see **Section 4.11**. The potential for LSE of UXO clearance activity on SPA's is screened below in **Table 6-10**(East Caithness Cliff SPA), **Table 6-11**(North Caithness Cliff SPA), **Table 6-12** (Moray Firth SPA), and **Table 6-13** (Troup, Pennan and Lion's Head SPA). The tables below list all the SPAs designated for breeding and migratory seabird features that may be affected by the UXO clearance activities.

Table 6-10 Screening of impacts with the potential for LSE in the East Caithness Cliff SPA			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Migratory species during breeding season: guillemot *Uria aalge*, herring gull *Larus argentatus*, kittiwake *Rissa tridactyla*, razorbill *Alca torda* and shag *Phalacrocorax aristotelis*	Noise disturbance. The detonation of UXO within the Development Site has the potential to cause disturbance or displacement to birds in the vicinity of the detonation. Underwater sound does not transfer efficiently to air, rather it reflects from the water-air boundary layer, so noise associated with the UXO detonation will be underwater and not expected to lead to airborne noise above ambient noise levels. The potential for impact will, therefore, be limited to diving birds that are underwater at the time of each individual detonation.	No (see **Section 4.6**)	No (see **Section 6.6**)

Table 6-10 Screening of impacts with the potential for LSE in the East Caithness Cliff SPA			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Birds present during breeding season: great black-backed gull *Larus marinus*, cormorant *Phalacrocorax carbo*, fulmar *Fulmarus glacialis*, razorbill *Alca torda*, guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, herring gull *Larus argentatus* and shag *Phalacrocorax aristotelis*.	Any impacts resulting from disturbance and displacement from UXO clearance activities will be short-term, temporary, and reversible in nature, lasting only for the duration of EOD operations, with birds expected to return to the area once clearance activities have ceased. No LSE on the SPA is predicted from noise disturbance.		
	Indirect disturbance due to reduced presence of prey. Given that no significant potential impacts to benthic ecology and fish and shellfish ecology have been (see **Section 5.4** and **Section 5.5**) it is reasonable to conclude that the indirect impact on seabirds occurring in or around the Development Site during the UXO clearance activities would be negligible. No LSE on the SPA is predicted due to a reduced presence of prey.	No (see **Section 4.6**)	No (see **Section 6.6**)

Table 6-11 Screening of impacts with the potential for LSE in the North Caithness Cliff SPA			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Migratory species during breeding season: guillemot *Uria aalge* Birds present during breeding season: puffin *Fratercula arctica*,	Noise disturbance. The detonation of UXO within the Development Site has the potential to cause disturbance or displacement to birds in the vicinity of the detonation. Underwater sound does not transfer efficiently to air, rather it reflects from the water-air boundary layer, so noise associated with the UXO detonation will be underwater and not expected to lead to airborne noise above ambient noise levels. The potential for impact will, therefore, be limited to diving birds that are underwater at the time of each individual detonation.	No (see **Section 4.6**)	No (see **Section 6.6**)

Table 6-11 Screening of impacts with the potential for LSE in the North Caithness Cliff SPA			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
fulmar *Fulmarus glacialis*, razorbill *Alca torda*, guillemot *Uria aalge*, and kittiwake *Rissa tridactyla.*	Any impacts resulting from disturbance and displacement from UXO clearance activities will be short-term, temporary, and reversible in nature, lasting only for the duration of EOD operations, with birds expected to return to the area once clearance activities have ceased. No LSE on the SPA is predicted due to a reduced presence of prey.		
	Indirect disturbance due to reduced presence of prey. Given that no significant potential impacts to benthic ecology and fish and shellfish ecology have been (see **Section 5.4** and **Section 5.5**) it is reasonable to conclude that the indirect impact on seabirds occurring in or around the Development Site during the UXO clearance activities would be negligible. No LSE on the SPA is predicted due to a reduced presence of prey.	No (see **Section 4.6**)	No (see **Section 6.6**)

Table 6-12 Screening of impacts with the potential for LSE in the Moray Firth SPA			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Annex I species: great northern diver *Gavia immer*, red-throated diver *Gavia stellata*, and Slavonian grebe *Podiceps auritus* Migratory species during breeding and non-breeding season: European shag *Phalacrocorax aristotelis*	Noise disturbance. The detonation of UXO within the Development Site has the potential to cause disturbance or displacement to birds in the vicinity of the detonation. Underwater sound does not transfer efficiently to air, rather it reflects from the water-air boundary layer, so noise associated with the UXO detonation will be underwater and not expected to lead to airborne noise above ambient noise levels. The potential for impact will, therefore, be limited to diving birds that are underwater at the time of each individual detonation. Any impacts resulting from disturbance and displacement from UXO clearance activities will be short-term, temporary, and reversible in nature, lasting only for the duration of EOD operations, with birds expected to return	No (see **Section 4.6**)	No (see **Section 6.6**)

Table 6-12 Screening of impacts with the potential for LSE in the Moray Firth SPA			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Migratory species during non-breeding season: greater scaup *Aythya marila*, common eider *Somateria mollissima*, long-tailed duck *Clangula hyemalis*, common scoter *Melanitta nigra*, velvet scoter *Melanitta fusca*, common goldeneye *Bucephala clangula*, and red-breasted merganser *Mergus serrator*	to the area once clearance activities have ceased. No LSE on the SPA is predicted from noise disturbance.		
	Indirect disturbance due to reduced presence of prey. Given that no significant potential impacts to benthic ecology and fish and shellfish ecology have been (see **Section 5.4** and **Section 5.5**) it is reasonable to conclude that the indirect impact on seabirds occurring in or around the Development Site during the UXO clearance activities would be negligible. No LSE on the SPA is predicted due to a reduced presence of prey.	No (see **Section 4.6)**	No (see **Section 6.6**)

Table 6-13 Screening of impacts with the potential for LSE in the Troup, Pennan and Lion's Head SPA			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Migratory species during breeding season: guillemot *Uria aalge* Species present during the breeding season: razorbill	Noise disturbance. The detonation of UXO within the Development Site has the potential to cause disturbance or displacement to birds in the vicinity of the detonation. Underwater sound does not transfer efficiently to air, rather it reflects from the water-air boundary layer, so noise associated with the UXO detonation will be underwater and not expected to lead to airborne noise above ambient noise levels.	No (see **Section 4.6**)	No (see **Section 6.6**)

Table 6-13 Screening of impacts with the potential for LSE in the Troup, Pennan and Lion's Head SPA			
Feature	**Potential Impacts and Rationale for LSE decision**	**Potential for LSE alone**	**Potential for LSE in-combination**
Alca torda, kittiwake *Rissa tridactyla*, herring gull *Larus argentatus*, fulmar *Fulmarus glacialis,* and guillemot *Uria aalge*.	The potential for impact will, therefore, be limited to diving birds that are underwater at the time of each individual detonation. Any impacts resulting from disturbance and displacement from UXO clearance activities will be short-term, temporary, and reversible in nature, lasting only for the duration of EOD operations, with birds expected to return to the area once clearance activities have ceased. No LSE on the SPA is predicted from noise disturbance.		
	Indirect disturbance due to reduced presence of prey. Given that no significant potential impacts to benthic ecology and fish and shellfish ecology have been (see **Section 5.4** and **Section 5.5**) it is reasonable to conclude that the indirect impact on seabirds occurring in or around the Development Site during the UXO clearance activities would be negligible. No LSE on the SPA is predicted due to a reduced presence of prey.	No (see **Section 4.6**)	No (see **Section 6.6**)

6.6 In-combination effects

6.6.1 SPAs

In relation to the features of the SPAs considered above, **Table 6-10** to **Table 6-13** have concluded no LSE for the alone assessment. There is the potential for horizontal directional drilling (HDD) for the export cables to occur in the same period as the UXO clearance works. Underwater noise modelling undertaken for an application to the National Oceanographic and Atmospheric Administration (NOAA) in relation to the Port Dolphin Energy LLC Deepwater port (2011), considered HDD drilling and estimated a maximum SEL of 154 dB @ 250 Hz. As there is limited potential for high order UXO clearance in the nearshore region (with micrositing and low order deflagration being the preferred options) and disturbance from any UXO clearance being temporary and for a short duration (i.e. the detonation) it is considered there would be no cumulative impacts with HDD operations (for a more detailed assessment of HDD in-combination effects, see **EPS Risk Assessment** (8460005-DG0207-MWW-REP-000002)). Given the small-scale nature of the disturbance arising from the UXO clearance works, both spatially and temporally, and no LSE for the alone assessment, it has been concluded that there is no potential for an in-combination LSE for any of the SPA sites considered.

6.6.2 SACs

6.6.2.1 Migratory fish

In relation to the features of the SACs considered above, **Table 6-7** to **Table 6-9** have concluded no LSE for the alone assessment. There is the potential for horizontal directional drilling (HDD) for the export cables to occur in the same period as the UXO clearance works. Underwater noise modelling undertaken for an application to the National Oceanographic and Atmospheric Administration (NOAA) in relation to the Port Dolphin Energy LLC Deepwater port (2011), considered HDD drilling and estimated a maximum SEL of 154 dB @ 250 Hz. As there is limited potential for high order UXO clearance in the nearshore region (with micrositing and low order deflagration being the preferred options) and disturbance from any UXO clearance being temporary and for a short duration (i.e. the detonation) it is considered there would be no cumulative impacts with HDD operations (for a more detailed assessment of HDD in-combination effects, see **EPS Risk Assessment** (8460005-DG0207-MWW-REP-000002)). Given the small-scale nature of the disturbance arising from the UXO clearance works, both spatially and temporally, and no LSE for the alone assessment, it has been concluded that there is no potential for an in-combination LSE for any of the SAC sites with migratory fish as qualifying features.

6.6.2.2 Marine mammals

There could be the potential for the proposed UXO clearance to contribute to in-combination underwater noise impacts that could result in the disturbance of harbour porpoise, bottlenose dolphin and foraging grey and harbour seals from the relevant SACs.

Based on information currently available other activities that could be undertaken during the proposed UXO clearance in February 2023 to May 2023 include:

- Piling:
  - Seagreen Alpha and Bravo Offshore Wind Farms (optimised project);
  - Inch Cape Offshore Windfarm Revised Design; and
  - Neart na Gaoithe Offshore Wind Farm (revised design).
- Geophysical surveys
- Seismic survey
- HDD for export cables

There is no known spatial overlap of piling and geophysical and seismic surveys, and the clearance works at the Development Site and all the projects take place outwith designated sites. Construction activities at the OWFs may still be taking place at the time of the UXO clearance, but it is not expected that there will be any concurrent piling and UXO clearance based on publicly available information.

There is the potential for horizontal directional drilling (HDD) for the export cables to occur in the same period as the UXO clearance works. Underwater noise modelling undertaken for an application to the National Oceanographic and Atmospheric Administration (NOAA) in relation to the Port Dolphin Energy LLC Deepwater port (2011), considered HDD drilling and estimated a maximum SEL of 154 dB @ 250 Hz.

As there is limited potential for high order UXO clearance in the nearshore region (with micrositing and low order deflagration being the preferred options) and disturbance from any UXO clearance being temporary and for a short duration (i.e. the detonation) it is considered there would be no cumulative impacts with HDD operations (for a more detailed assessment of HDD in-combination effects, see **EPS Risk Assessment** (8460005-DG0207-MWW-REP-000002)).

No AEoSI was identified for any sites screened into the assessment.

There is no potential for the proposed UXO clearance in the Development Site to contribute to any potential in-combination effects to result in the disturbance of marine mammals, as any disturbance from the proposed UXO detonations in the Development Site would be temporary and for a short-duration (i.e., the detonation).

7 European Protected Species

All species of cetacean (whale, dolphin, and porpoise) occurring in UK waters and otters are listed in Annex IV of the Habitats Directive as European Protected Species (EPS), meaning that they are species of community interest in need of strict protection, as directed by Article 12 of the Directive.

This protection is afforded in Scottish territorial waters (out to 12 nautical miles (nm)) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Regulation 39(1) of these Regulations make it anoffence to:

1. Deliberately or recklessly capture, injure or kill a wild animal of an EPS;
2. Deliberately or recklessly:
    a. Harass a wild animal or group of wild animals of an EPS;
    b. Disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;
    c. Disturb such an animal while it is rearing or otherwise caring for its young;
    d. Obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;
    e. Disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs;
    f. Disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed, or reproduce, or rear or otherwise care for its young; or
    g. Disturb such an animal while it is migrating or hibernating.

Further protection is afforded through an additional disturbance offence given under Regulation 39(2) which states that "*it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)*".

Outside of 12 nm, the extent of legislative protection against injury is the same as within 12 nm. However, the definition of disturbance outside of 12 nm does not extend to individual animals. Therefore, whilst disturbance of a single animal within 12 nm may be considered an offence and thus require an EPS licence, for an EPS licence to be required outside of 12 nm there must be disturbance of a significant group of animals.

A MMMP (**Appendix B**) has been established to mitigate any potential injury impact during UXO clearance. After mitigation, the potential for any physical injury would be minor and not significant at a population level.

Taking into account the proposed mitigation and the very low number of harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale that could be at potential risk of PTS

(residual impact), based on the worst-case scenarios, maximum potential range and maximum number of individuals, it is proposed that an EPS licence would not be required for risk of injury.

Taking into account the proposed mitigation there is unlikely to be any risk of injury and any disturbance is unlikely to significantly affect the local distribution or abundance of harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale. However, as a precautionary approach an EPS licence application will be submitted to cover the potential, although unlikely, for risk of injury and significant disturbance.

8 Summary

Moray West is undertaking surveys for UXO prior to commencement of construction to identify any potential UXO on the seabed. Selected potential UXO identified (that cannot be avoided during construction and operation and maintenance activities) will then be targeted for a detailed survey by ROV to confirm whether or not any objects are UXO hazards and, therefore, represent a risk to those activities.

If identified as a UXO hazard, Moray West's preference is to avoid the UXO where practicable by micrositing around it. However, if avoidance is not possible, the target will be subject to EOD operations.

Detonation by controlled explosion to destroy the UXO hazard will be used as a last resort should avoidance not be possible. As outlined in **Section 2.3.1**, the hierarchy of steps is as follows:

- UXO will avoided through re-routing and micro siting of subsurface structures
- UXO will be cleared using low order deflagration
- UXO will be cleared using high order detonation

UXO detonation removes any further risk to subsequent construction activities.

This Environmental Report has been prepared in support of a Marine Licence application for the proposed UXO clearance activities and has provided an assessment of the potential environmental impacts of the licensable activities.

Receptors that may be affected by the UXO clearance works have been identified and assessed. No significant effects (alone or cumulatively) are predicted to occur given the small scale and temporary duration of the works, and when considering the mitigation proposed and that already in place for the Project.

The LSE assessment, and where necessary consideration of potential adverse effects on integrity, presented within this document has been established through a review of the following:

• The nature of the effects predicted (both in magnitude and duration);

• The scale of the features present; and

• The existing activity levels taking place in the area.

No LSE is concluded for the SPA sites considered. For the SAC sites with marine mammal features, LSE is identified but when considering the mitigation proposed it has been concluded that there will be no AEoSI.

Embedded mitigation measures are proposed for a number of receptors, namely marine mammals, fish and shellfish, infrastructure and other users, shipping and navigation, commercial fisheries, archaeology and cultural heritage.

The following mitigation will be adopted in relation to the UXO clearance works:

- advanced warning of activities through the promulgation of Notice to Mariners, VHF radio transmissions and direct communication with relevant infrastructure owners;
- implementation of 1,500 m safety exclusion zones around clearance activities;
- vessels will be lit appropriately (i.e., they will display lights and signals in accordance with the UK Standard Marking Schedule for Offshore Installations, and in accordance with the requirements of the International Regulations for the Prevention of Collisions at Sea);
- compliance with agreed archaeological AEZs and adherence to the WSI at all times during the seabed preparation works;
- leave in situ or avoid the UXO wherever possible;
- the use of MMOs and PAM; and
- the use of ADDs.

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Appendix A – Defined Terms

Term	Description
Design Envelope	The range of design parameters used to inform the assessment of impacts.
Marine Licence for the Generating Station	Marine Licence for the Moray West Offshore Wind Farm - Licence Number: MS-00008731 - granted under the Marine and Coastal Access Act 2009, Part 4 Marine Licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the UK Marine Licensing Area granted to Moray West on 14 June 2019 and varied on 7 March 2022 and 11 April 2022.
Marine Licence for the Transmission Works	Marine Licence for the Offshore Transmission Infrastructure – Licence Number MS-00009813 – granted under the Marine and Coastal Access Act 2009, & Marine (Scotland) Act 2010, Part 4 Marine Licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the UK Marine Licensing Area (referred to as the "OfTI Marine Licence"), granted to Moray West on 14 June 2019 and varied on 11 April 2022.
Moray Offshore Windfarm (West) Limited	The legal entity submitting this environmental report supporting the marine licence application for UXO clearance activities.
Moray West EIA Report	The Environmental Impact Assessment Report for the Moray West Offshore Wind Farm and Associated Transmission Infrastructure, submitted July 2018. Additional information was provided in the Moray West Report to Inform an Appropriate Assessment (RIAA) July 2018 and Moray West Application Addendum Document November 2018.
Moray West Offshore Wind Farm	The wind farm to be developed in the Moray West site (also referred as the Wind Farm).
Offshore Consents	Collective term for the two Marine Licences and the Section 36 consent.
Offshore Consent Conditions	Collective term for the conditions attached to the Section 36 Consent and Marine Licences.
Offshore Transmission Infrastructure (OfTI)	The offshore elements of the transmission infrastructure.
OfTI Corridor	The export cable route corridor, i.e., the OfTI area excluding the Moray West site.
Section 36 Consent	Section 36 consent under Section 36 of the Electricity Act 1989 for the construction and operation of the Moray West Offshore Wind Farm was granted on 14 June 2019 and varied on 7 March 2022.
The Development	The Moray West Offshore Wind Farm and OfTI.
The Development Site	The area outlined in Figure 1 attached to the Section 36 Consent Annex 1, Figure 2-1 attached to the two Marine Licences, and Figure 1 of this report.
The Moray West Site	The area in which the Moray West Offshore Wind Farm will be located. Section 36 Consents and associated Marine Licence to construct and operate generating stations on the Moray West site were granted in June 2019 and varied in March 2022.

The Works	The construction and O&M activities undertaken for the Development.
Transmission Infrastructure (TI)	Includes both offshore and onshore electricity transmission infrastructure for the consented wind farm. Includes connection to the national electricity transmission system near Broad Craig in Aberdeenshire encompassing Alternating Current (AC) Offshore Substation Platforms (OSPs), AC export cables offshore to landfall point at Broad Craig, near Sandend in Aberdeenshire continuing onshore to the AC collector station (onshore substation) at Whitehillock and the additional regional Transmission Operator substation at Blackhillock near Keith. A Marine Licence for the OfTI was granted in June 2019 and varied on 11 April 2022.

Appendix B Marine Mammal Mitigation Protocol

B.1 Introduction

This UXO Marine Mammal Mitigation Protocol (MMMP) has been prepared to support both the Marine License (ML) and EPS License application by Moray Offshore Windfarm (West) (the Development) for the mitigation of Explosive Ordnance Disposal (EOD) operations within the Development Site; comprised of the Moray West Site and the OfTI Corridor. Further details on the EOD operations planned, including the number and type expected to be found within the Development Site, can be found in **Section 2** of the Environmental Report. A worst-case of 30 UXO devices may require detonation, with up to 22 in the Moray West Site, and up to 8 in the OfTI Corridor. This is planned to take place with one detonation per day anytime from February 2023 to May 2023.

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 be 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[12]) 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 East and the Beatrice OWF UXO protocol included in the MMMP (Moray East, 2018).

The mitigation procedures outlined in this MMMP 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-detonation;
- the deployment of PAM devices, if required, and if the equipment can be safely deployed and retrieved;
- the activation of ADDs;
- all detonations to take place in daylight and, when possible, in favourable conditions with good visibility (sea state 3 or less);
- the controlled explosions of the UXO will be undertaken by specialist contractors, using the minimum amount of explosive required in order to achieve safe disposal of the device; and
- the fusing of multiple devices - if there are multiple UXO in close proximity (e.g., within 20 m of each other) then one may be moved to be detonated with the other. In this case, the

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

charges should be fused together, allowing for a millisecond of delay between the device detonations in order to reduce the cumulative impact of the shock wave.

B.2 UXO Clearance Techniques

Current mitigation methods, for the protection of mammals and fish, are well established and have been shown to be effective in removing mammals and fish from the areas where they would be negatively affected by UXO detonations, providing them with sufficient protection and safeguarding from the noise of EOD operations. Where possible and safe to do so the preferred options would be as follows, in order of preference:

1. UXO will be avoided and left in-situ.
2. Micrositing of infrastructure, if possible, to avoid any potential UXO, so clearance is not required.
3. Relocation of UXO to where it is not in close proximity to existing or planned infrastructure, so that the UXO can be cleared in a less sensitive area (i.e., outside of a designated site). If the UXO appears structurally sound and there is no risk, the UXO could potentially be moved to a location that is not in a sensitive area for subsequent clearance, subject to a proportional assessment of the risk posed to the vessel and staff from a health and safety perspective.

If these options are not possible, and UXO clearance is the only option, then low-order disposal (deflagration) will be the preferred clearance method. In the unlikely event that low-order clearance is not possible, for example, if the UXO specialist determines that it is not possible due to damage to the UXO, the final option would be the use of high-order detonation. The decision-making hierarchy when clearing a UXO will be as follows:

1. An agreed number of low-order disposal attempts at each UXO clearance will take place; the number is dependent on the surrounding environment and situation and will be determined by the UXO clearance contractor.
2. If none of the low-order disposal clearance attempts work, high-order detonation will take place.
3. If clearance of the UXO is unsuccessful, it will be declared safe, removed from the seabed and disposed of at a licenced facility onshore.

Acoustic and explosive deterrent methods have been seen to disperse mammals to a distance of 1 km from a scheduled detonation site (the mitigation zone), as shown below, as well as numerous reports from live operations where mammal observations are undertaken as standard procedure. In addition, it has been noted within JNCC literature (JNCC, 2010) that the limited exposure of noise and pressure caused by UXO detonations has not been seen to negatively affect marine mammals.

No marine mammal injuries or deaths have been observed or reported by UXO and EOD consultancies or contractors when not using bubble curtains, nor have any been reported within industry press (Ordtek, 2019). In addition, the cost and time associated with bubble curtain use should be considered against any merits to ensure the mitigation is reasonable in relation to the risk presented. The deployment of bubble curtains is costly, due to the requirement of an additional vessel, as well as being highly weather sensitive,

which can cause delays to operations preventing additional stages of development progressing (Ordtek, 2019).

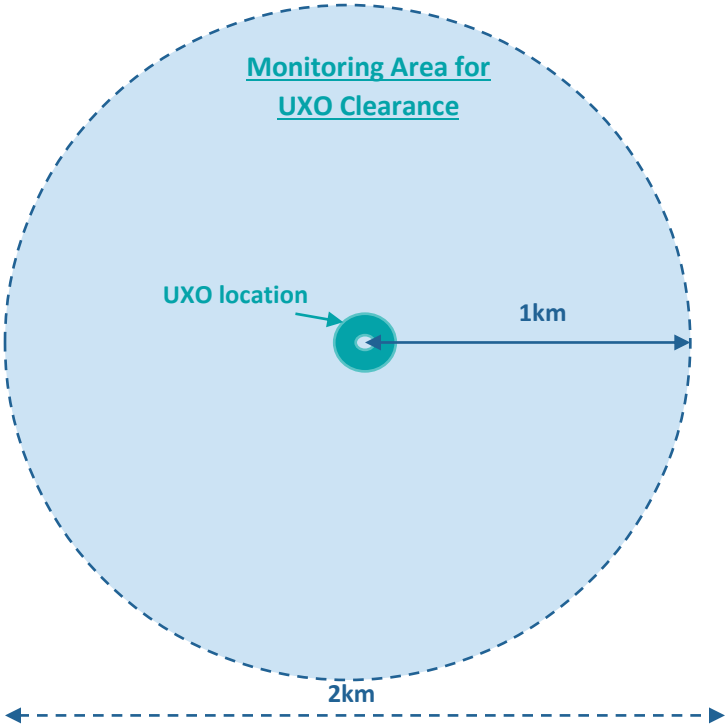
In light of the foregoing together with the conclusion that there are no LSE or significant effects predicted where the proposed mitigation without the use of bubble curtains is adopted, then it is considered that the proposed mitigation is adequate to reduce the risk to marine mammals.

B.3 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.

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 during daylight hours and suitable visibility and sea states[13] prior to UXO clearance, regardless of clearance method, 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.

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

The pre-clearance search will commence at least one hour prior to the start of the clearance event and continue until the clearance event takes place, with dedicated and trained MMOs positioned so the entire MA can be monitored at all times. For low order clearance a pre-clearance search will last at least one hour (with the ADD activated after 37 minutes) for high order clearance the pre-clearance search will last at least 1.5 hours (with the ADD activated after 30 minutes). The MMOs will be in close contact with each other to ensure any sighting of a marine mammal within the MA is communicated.

Where possible as best practice PAM should be employed for all pre-clearance searches. In the event of periods of low visibility (due to adverse weather and/or sea states of 4 or higher), the use of PAM will be required as a measure to monitor the mitigation zone. The PAM hydrophones should be located as close as possible to the detonation 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 detonation site at point of explosion to provide effective monitoring of the entire mitigation zone. Preference will be given to clearance operations to take place in good viewing conditions during daylight.

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 individual/s is within the mitigation zone or 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 or high-order detonation.

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. Timing of ADD activation is dependent on the time required for the UXO clearance method and size of UXO (see **Section A.4**)[14]. 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.

[14] For example, if the ADD activation time is 25 minutes, the pre-watch will be undertaken for 35 minutes, then the ADD activated, and the remaining 25 minutes pre-watch time is undertaken simultaneously to the ADD activation period.

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.

B.4 Acoustic Deterrent Device

ADD will be activated prior to any UXO low-order or high-order detonation 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, 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 (if the ADD activation period is greater than one hour, both the ADD activation and the pre-watch will commence at the same time, for the required ADD activation time).

If more than one UXO clearance is required in a 24 hour period the ADD will not be activated during transit to another clearance event, and will be activated prior to all clearance events or sequences.

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 and high-order detonation are based on swim speed of 1.5m/s are presented in **Table 9.1** and **Table 9.2.**

The ADD activation times have been based on a swim speed of 1.5 m/s for harbour porpoise, 1.52 m/s dolphin species (Bailey and Thompson, 2010), 1.8m/s seal species (Thompson, 2015), and of 2.3m/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.

ADD will not be activated for longer than 60 minutes, regardless of the size of the UXO and maximum predicted PTS range.

Table 9.1 ADD activation times for low-order clearance

Mitigation	Low-order clearance
Maximum PTS range (worst-case of harbour porpoise)	**Up to 2 km**
ADD activation	23 minutes = 2.07 km

Table 9.2 ADD activation times for high-order clearance				
Mitigation	**High-order clearance**			
Maximum PTS range (worst-case of harbour porpoise)	**25 kg**	**166 kg**	**309 kg**	**364 kg**
	4.96 km	*8.86 km*	*10.85 km*	*12.20 km*
ADD activation (for harbour porpoise swim speeds)	60 minutes = 5.4 km High-order detonation of large UXO is only undertaken if low-order clearance is not possible.			

B.5 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.

B.6 Roles and Responsibilities

There are a number of people that would be required in the compliance with this MMMP for UXO detonation 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-detonation and for the post-detonation 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.

If only a limited view of the mitigation zone is possible due to the use of a smaller vessel with lower elevation the use of an additional non-dedicated observer on the main UXO clearance vessel will be used.

The main UXO clearance vessel will be positioned at the opposite side of the mitigation zone boundary to provide improved confidence in the MMO mitigation.

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

There will be clear communication channels between the MMOs, the PAM-Op (if present), 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 any clearance by low-order disposal (deflagration); or
- 3.5 hours prior to UXO clearance, for any clearance by high-order detonation.

The MMOs will record all periods of marine mammal observations, including start and finish time of pre-detonation searches, ADD activation, use of PAM (if required), 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.

“Non-dedicated” is a trained MMO who may undertake other roles on the vessel when not conducting their mitigation role. This person can be a member of vessel’s crew providing they do not undertake other roles during mitigation periods.

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

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 will be required in periods of low visibility 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.

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 B.4**, 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 B.8** to ensure compliance reporting to the Marine Scotland – Licensing Operations Team (MS-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 detonation operation, 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 (if present) 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 detonation activities.

B.7 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[15] 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 each 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 MS-LOT on a monthly basis.

In addition to the weekly reports, a final report will be provided which will be submitted to the MS-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.

B.8 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.

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

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.

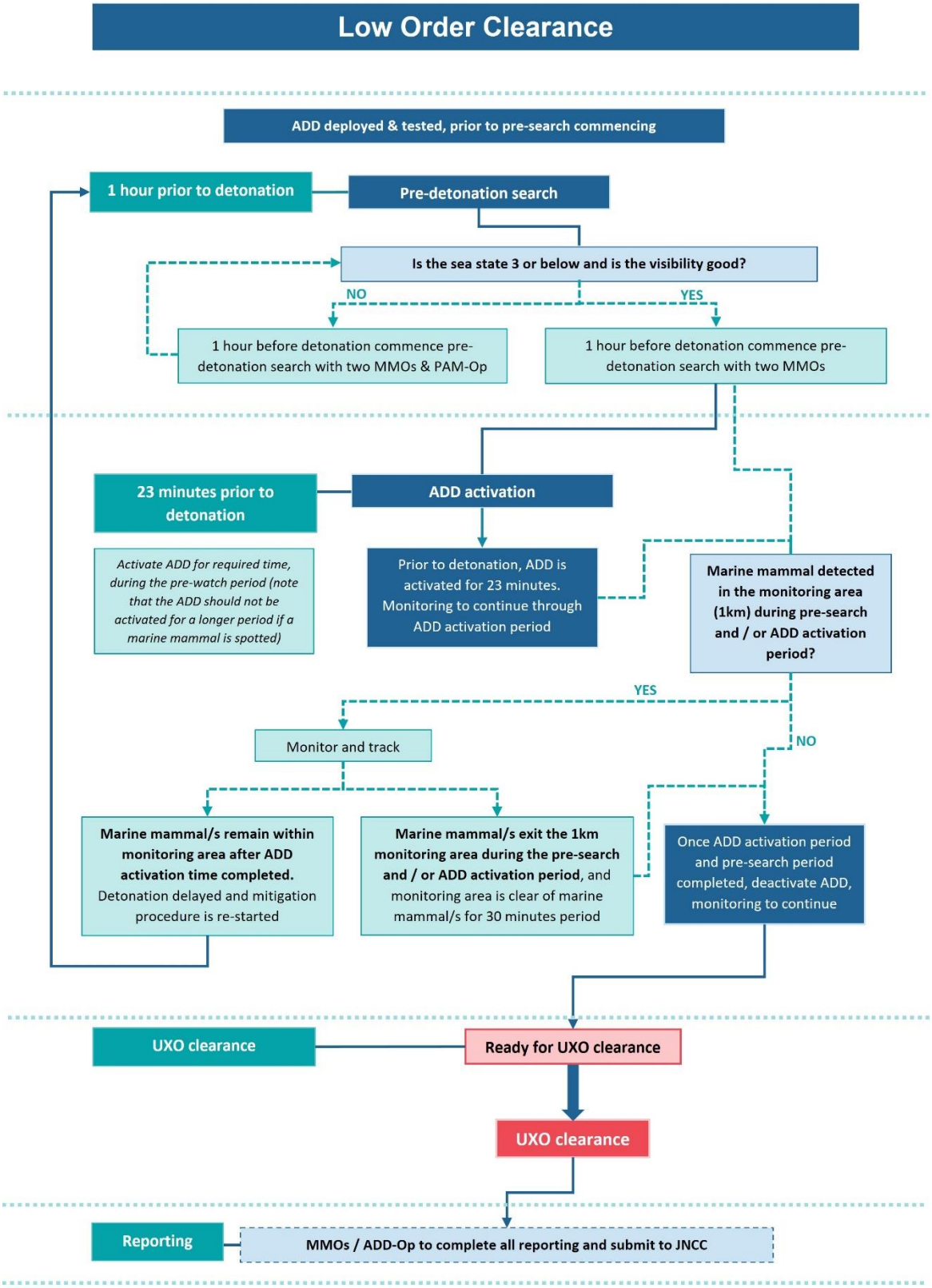
A communications protocol will be developed between the mitigation team and the Nominated Contact.

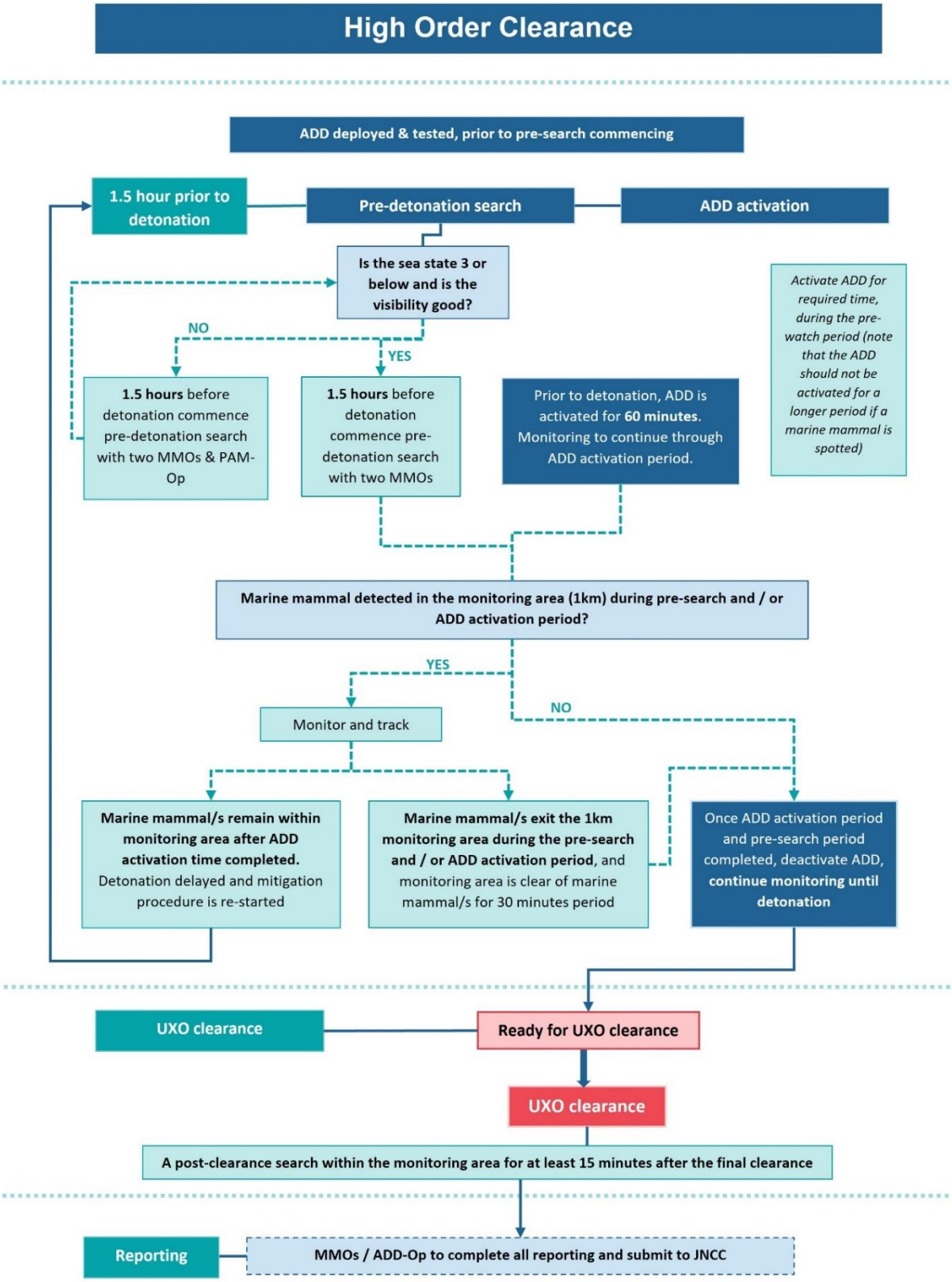
This communications protocol will include, but not be limited to:

- 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.

B.9 Summary of Mitigation Procedures

The outline mitigation procedure (as outlined above) is summarised below in the respective flow charts.


Low Order Clearance
ADD deployed & tested, prior to pre-search commencing
1 hour prior to detonation
Pre-detonation search
Is the sea state 3 or below and is the visibility good?
NO
YES
1 hour before detonation commence pre-detonation search with two MMOs & PAM-Op
1 hour before detonation commence pre-detonation search with two MMOs
23 minutes prior to detonation
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 detonation, 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. Detonation 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


High Order Clearance
ADD deployed & tested, prior to pre-search commencing
1.5 hour prior to detonation
Pre-detonation search
ADD activation
Is the sea state 3 or below and is the visibility good?
NO
YES
1.5 hours before detonation commence pre-detonation search with two MMOs & PAM-Op
1.5 hours before detonation commence pre-detonation search with two MMOs
Prior to detonation, ADD is activated for 60 minutes. Monitoring to continue through ADD activation period.
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)
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. Detonation 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, continue monitoring until detonation
UXO clearance
Ready for UXO clearance
UXO clearance
A post-clearance search within the monitoring area for at least 15 minutes after the final clearance
Reporting
MMOs / ADD-Op to complete all reporting and submit to JNCC

B.11 References

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