Ardersier Port
Marine Mammal Risk Assessment

April 2024

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EnviroCentre Limited Office Locations:

Glasgow **Edinburgh** **Inverness** **Banchory**

Registered Office: Craighall Business Park 8 Eagle Street Glasgow G4 9XA
Tel 0141 341 5040 info@envirocentre.co.uk www.envirocentre.co.uk

EnviroCentre Limited is registered in Scotland under no. SC161777.

VAT no. GB 348 6770 57.

EXECUTIVE SUMMARY

EnviroCentre Limited was commissioned by Ardersier Port Ltd. to provide a Marine Mammal Risk Assessment (MMRA) to inform an extension/ renewal of the current European Protected Species (EPS) License Application in relation to proposed works at Ardersier Port.

It is considered that the following EPS species are present within the area and may be impacted by the proposed works; harbour porpoise, bottlenose dolphin, white-beaked dolphin and minke whale.

The Ardersier Port lies within the Moray Firth Special Area of Conservation (SAC) which is a statutory designated site with bottlenose dolphin listed as a qualifying feature.

Underwater noise is considered to be the main activity which could negatively impact marine EPS, with injury, death and disturbance of individuals being a possibility. Underwater noise modelling was commissioned as part of this assessment based on the construction methods associated with the works and most significant for generating underwater noise; vibration piling and dredging.

Vibration piling and dredging have shorter risk ranges for Permanent Threshold Shift (PTS) for minke whale (110m and 34m, respectively), bottlenose dolphin and short-beaked dolphin (21m and 20m, respectively), whilst porpoises are at a greater risk (280m and 330m respectively), if stationary over an 8 hour period. The noise from vibration piling and dredging presents a higher risk range for Temporary Threshold Shift (TTS) for minke whale (1.4km and 370m, respectively) and bottlenose dolphin and white-beaked dolphin (270m and 220m, respectively), whilst porpoise are at a greater risk (3.6km and 2.8km, respectively), if stationary over an 8 hour period. Assuming that animals will flee as soon as they hear the noise from the vibropiling or dredging, the PTS range for any species is a maximum of 2m (vibropiling) or 3m (dredging) from the source of the noise. The TTS range for porpoises associated with vibropiling is a maximum of 210m, with other species below 9m, whilst TTS ranges associated with dredging for all species are a maximum of 3m (dredging),

Mitigation in the form of a Marine Mammal Protection Plan (MMPP) outlined in Section 4 of this report, will be implemented and will reduce the risk of injury as well as limit the potential disturbance. The MMPP includes a Marine Mammal Observer (MMO) protocol with an exclusion zone of 500m and soft start construction methods. Even with mitigation in place, it is not considered possible to completely rule out disturbance to marine mammals as a result of works.

An updated derogation licence to permit disturbance of harbour porpoise, minke whale, bottlenose dolphin and white-beaked dolphin will therefore be required for imperative reasons of overriding public interest.

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1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Limited was commissioned by Ardersier Port Ltd. to provide a Marine Mammal Risk Assessment (MMRA) to inform an extension/ renewal of the current European Protected Species (EPS) License Application in relation to the proposed works at Ardersier Port.

1.2 Scope of Report

The aim of this report is to provide information required by Marine Scotland to determine whether an extension/ renewal of the current Marine EPS derogation licence can be issued. The objectives were as follows:

- Update existing and collate new data in relation to marine EPS (primarily cetaceans) to establish which species are likely to be present within the development site and the wider zone of influence.
- Identify potential impacts to cetaceans which could occur as a result of the proposed development; and
- Detail mitigation which will be employed to reduce the risk of negative impacts.

1.3 Site Location

The ‘Site’ is situated approximately 7.5km to the west of Nairn, 18km northeast of Inverness and 3km northeast of the village of Ardersier (grid reference: NH812 576). The Site is located on the former McDermott Fabrication Yard land and extends to 307 hectares. The Site has been a vacant brownfield site for approximately 17 years.

The Site is bound to the north by the Moray Firth. Whiteness Head is situated to the east. Carse Wood is located to the south of the Site and an area of sand dunes and tidal mudflats is situated to the west. Fort George is located to the south west of the Site boundary.

The site is relatively flat and benefits from an existing access road. The existing access road is 2.5km in length and connects the site to the B9092. The B9092 subsequently connects to the A96 which is the main transport route between Inverness and Aberdeen. The site includes an existing harbour which is protected by a naturally occurring sand and shingle spit, known locally as ‘Whiteness Head’.

1.4 Original Project Background and Overview

The original scope of works associated with the project which were included to support the EIA screening and EPS licence in 2019 included:

The proposed development includes the establishment of a port and port related services for offshore energy related uses. Works include marine channel dredging, quay realignment, repair and maintenance, erection of offices, industrial and storage buildings and associated infrastructure, delivery and export of port related cargo, associated new road access, parking, infrastructure, services, temporary stockpiling of dredged material, re-grading and upfilling of landward areas and landscaping. The construction phase will include:

Capital Dredge

- The Proposed Development allows for the construction of quay wall facilities and capital dredging to form an access channel for shipping and associated structures using the port facility.
- The capital dredge involves the dredging of the port entrance to -6.5m Chart Datum (CD). This will involve the removal of 2,300,000 m3 of sand by Cutter Suction dredger (CSD), with the material initially being deposited directly via a discharge pipeline to the inner channel as reinstatement to the inner spit (200,000 m3) and onshore storage at the site (2,100,000 m3). An area of the inner channel is proposed to be dredged to -3mCD and will be carried out by either plough dredging, backhoe dredger or land-based equipment. This element of the proposed dredge is minor and represents 2-3% by volume of the overall dredge.
- The CSD process involves a rotating cutter head that loosens rocks and seabed, then a suction inlet that sucks up the loosened material up onto the vessel.
- Dredging will last for two months, with the plant working up to 24 hours a day (therefore including night-time dredging), seven days a week between April and September 2024 (potentially into October with prior agreement from NatureScot).

Quay Wall Construction Works

- The quay wall works will comprise of a new sheet pile wall either along the quayside or as a new alignment.
- Only vibro-piling will be used, there will be no impact piling. The process of vibropiling involves installing tubular or sheet piles into the ground with a vibrating hammer rather than the high impact strike from the pile driving hammer used for impact piling.
- In the area of the new extension, a temporary access bund will be placed along the quay wall to allow piles to be driven through this bund. The method of constructing the quay will involve initial construction of bunds but it is envisaged that all this construction would be land based.
- Construction works are expected to take six months, with piling works expected to be up to three months in duration during normal working hours. Piling works can commence at any time of year and will be undertaken with the five year duration of the Marine Licence consent.

Surface Water Treatment

- The surface water system will incorporate appropriate SuDS (Sustainable Drainage System) measures to meet quality criteria for surface water discharge. Importantly, adequate land space will be identified to incorporate these measures within the detailed design of the development.
- In terms of quantity, the end discharge of the surface water system will be to the sea and therefore the control of peak runoff rates and runoff volumes will not be required as part of the system.

Vessel Movement

- The likely vessel requirements identified are detailed in Table 1.1.

Table 1.1: Vessel details and main activities (pre-contract award)

	Capital Dredging Works	Quay Construction
Vessel details & (Number of vessels)	Principal: Cutter Suction Dredger (1) Support: Multicat workboat (1) Crew vessel (1) Survey vessel (1)	Material delivery by ship (1) Survey vessel (1) Dredge vessel (1) [for final dredge to depth adjacent to quay wall]
Main Activities	Initial deployment would be for the workboat and survey vessel. The workboat will lay out required pipelines for pumping the dredged material to their designated locations and this would commence two to four weeks before arrival of the cutter suction dredger. The dredger, when it arrives on site, will connect to the pipelines and commence dredging operations. The dredger will commence from existing deep water in the South Channel and proceed inwards to the port, creating the dredged channel as it proceeds. Movement of the dredger is slow as it progresses in towards the main port area and will be serviced by the attendant support vessels.	It is envisaged that steel piles would be delivered to site by ship and would anticipate that this would be a low number of deliveries, perhaps two or three. The method of constructing the quay may involve initial construction of bunds but it is envisaged that all this construction would be land based with no requirement for vessels. However, at the end of quay construction there will be a requirement to reduce the existing dredge level on the seaward side of the quay to the required dredge depth to allow use of the quay. This would probably be carried out by a barge mounted backhoe dredger with associated split hopper barges to allow the material to be taken to the agreed disposal point – this would be in line with a future dredging licence application.

- The use of ducted propellers on vessels using the port will be allowed in accordance with the most recent guidance provided by NatureScot.
- All the vessels identified have ducted propellers fitted and which may be needed to manoeuvre in restricted waters, for navigational safety. However, it is to be highlighted that the principal vessel involved in the capital dredging operation, the dredger itself, will not use ducted propellers during the dredging operations. Movement of the cutter suction dredger is slow in progressing from the seaward end of the channel into the port and is controlled through a system of spuds and control wires.
- Vessel management will be under the control of the appointed contractor during dredging in consultation with Ardersier Port. Notice to Mariners will be published in advance of dredging works advising of dredging activity in the area.
- Vessels involved in undertaking the works at the port will be based at the port. Once on station, the cutter suction dredger should proceed with the dredging operation in a single transit of the channel, from the seaward end of the channel into the port area. The dredger will be attended by the support vessels.

1.5 Project Update March 2024

Capital Dredge

i. Increase the dredge depth from the approved -6.5m CD to -12.9m CD;
ii. Dredge Licence (MS-00010583) was granted March 2023 for dredging of 8,600,000 wet tonnes with 400,000 wet tonnes to be deposited below Mean High Water Springs as reinstatement of an inner section of Whiteness Head Spit and the remaining amount to be placed above MHWS.
iii. Previous plans were to pump all of the dredged material ashore for reuse, however following review it is now understood that this option presents a number of challenges. Following consultation with the Marine Directorate, NatureScot, Highland Council and other parties, it has been identified that a number of options including beneficial reuse and sea disposal will be required to manage the total volume. More detail on these options is provided within the March 2024 updated Best Practicable Environmental Option (BPEO) Report. A licence application with capacity to dispose of up to 3.7 million m^3 has been submitted to accommodate the material which cannot be accommodated within the reuse or beneficial reuse options available.

Quay Wall Construction

Recent redesign of the quay wall means that it will all be constructed above MHWS, in the ground prior to excavation/dredging of residual material to expose the new quay wall to the marine environment. As a result of this, which is subject to a marine construction licence variation, the vibropiling element will now be used only for the extraction of the existing sheetpiles within the Phase 1 development area, and there will be no installation of sheetpiles in the marine environment due to the change in the construction methods. The length of piles needing extracted is 322m, some 30% reduction in linear meterage of the previously approved pile installation for the quay wall.

Vessel Movements

As a result of the change in the construction methods there will be no shipping movements associated with the quay wall construction, only the capital dredge works with the key difference being the transportation of material to the two closest disposal sites Cromarty Sutors and Burghead. In addition to this, there will be the placement of dredged material at the restoration area on the spit as well as placement of material to the west of the channel as requested by NatureScot, and still to be formally agreed. There is also scope for pumping dredged material ashore for reuse. The associated vessels and outline of key activities is detailed below in

Table 1.2 below.

Table 1.2: Vessel details and main activities (pre-contract award)

	Capital Dredging Works
Vessel details & (Number of vessels)	Cutter Suction Dredger (1) Trailing Hopper Suction Dredger (1) Split Hopper Barges (SHB) – multiple up to 10 (TBC) Support: Multicat workboat (1) Crew vessel (1) Survey vessel (1)
Main Activities	Initial deployment would be for the workboat and survey vessel top undertake the preliminary bathymetric survey as starting reference point. The workboat will lay out required pipelines for pumping the dredged material to their designated locations and this would commence two to four weeks before arrival of the cutter suction dredger. The dredger, when it arrives on site and commence dredging operations. It is envisaged that the dredger will commence from existing deep water in the South Channel and proceed inwards to the port, creating the dredged channel as it proceeds. Movement of the dredger is slow as it progresses in towards the main port area and will be serviced by the attendant support vessels. Dredged material to be pumped ashore via pipeline until agreed volume met, with drained water from lagoon to discharge to the harbour; Replenishment of spit and placement of material to west of dredge channel. Exact methodology to be confirmed but is likely to involve either rainbowing of material directly into the area or pumping via pipeline. SHBs to transport dredged material to disposal site(s) with the current plan noted to involve vessels to travel in convoy to and from site.

1.6 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre Limited for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

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2 MARINE MAMMAL BASELINE

2.1 Desk Study

In order to anticipate the potential marine mammal ecological sensitivities at the site, a desk study including a review of existing information pertaining to marine mammals was obtained for the site in 2018 with updates in 2023 as required. The following sources were checked:

- NatureScot (NS) Sitelink[1] for designated sites;
- Commercially available records form the National Biodiversity Network (NBN)[2] within 5km of the development, and within the Moray Firth Special Area of Conservation (SAC);
- The Joint Nature Conservation Committee (JNCC) guidance relating to marine mammals and underwater noise risk[3] and Atlas of Cetacean Distribution [4];
- Sea Watch Foundation (SWF) website for recent sightings [5];
- NatureScot website for details of marine mammals in Scotland and the Moray Firth dolphin population[6 & 7];
- Whale and Dolphin Conservation (WDC) website for species guides[8];
- Scottish Marine Animal Stranding Scheme (SMASS)[9] for stranding records within 20km of the site;
- Marine Scotland Maps NMPI for species distributions[10]; and
- Marine Scotland regional baseline for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters[11].

2.1.1 Disclaimer

It should be noted that the baseline is limited by the reliability of third party information and the geographical availability of biological and/or ecological records and data. The absence of species from biological records cannot be taken to represent actual absence. Species distribution patterns should be interpreted with caution as they may reflect survey/reporting effort rather than actual distribution.

[1] NatureScot SiteLink available at: https://sitelink.nature.scot/map (Accessed January 2024)
[2] NBN Atlas available at: https://scotland.nbnatlas.org/ (Accessed January 2024)
[3] JNCC Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise (2010) available at: http://jncc.defra.gov.uk/pdf/JNCC_Guidelines_Piling%20protocol_August%202010.pdf (Accessed January 2024)
[4] Reid, J B, Evans, P G H, and Northridge, S P. JNCC Atlas of Cetacean Distribution in north-west European waters (2003) available at: http://jncc.defra.gov.uk/page-2713#download (Accessed January 2024)
[5] Sea Watch Foundation Cetaceans of Western Scotland available at: http://seawatchfoundation.org.uk/wp-content/uploads/2012/07/WesternScotland.pdf (Accessed January 2024)
[6] NATURESCOT About Scotland's Nature: Marine Mammals available at: http://www.NatureScot.gov.uk/about-scotlands-nature/species/mammals/marine-mammals/ (Accessed January 2024)
[7] Site Condition Monitoring of bottlenose dolphins within the Moray Firth SAC: 2014-2016 available at: https://www.nature.scot/sites/default/files/2018-04/Publication%202018%20-%20NATURESCOT%20Research%20Report%201021%20-%20Site%20Condition%20Monitoring%20of%20bottlenose%20dolphins%20within%20the%20Moray%20Firth%20Special%20Area%20of%20Conservation%202014-2016.pdf (Accessed January 2024)
[8] WDC species guides available at: http://uk.whales.org/species-guide (Accessed January 2024)
[9] Scottish Marine Animal Stranding Scheme (SMASS) available at: https://strandings.org/map/ (Accessed January 2024)
[10] Marine Scotland Map NMPI species distribution data, available at: https://marinescotland.atkinsgeospatial.com/nmpi/ (Accessed February 2024)
[11] E L Hague, R R Sinclair and C E Sparling. 2020. Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters. Scottish Marine and Freshwater Science Vol 11 No 12, available at: Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters | Marine Scotland Data Publications (Accessed February 2024)

2.2 Designated Sites

The Ardersier Port lies within the following designated sites:

- Moray Firth SAC
- Moray Firth Special Protected Area (SPA)
- Inner Moray Firth SPA
- Whiteness Head Special Site of Scientific Interest (SSSI)

The Moray Firth SAC is the only statutory designated site relating to marine EPS, with bottlenose dolphin (*Tursiops truncatus*) listed as a qualifying feature.

An assessment of the proposed works in relation to the designated site features are presented in the shadow Habitats Regulation Appraisal (HRA) in Appendix A.

2.3 Cetaceans

The cetacean fauna (whale, dolphins and porpoises) of Eastern Scotland (which includes the Moray Firth) is considered moderately rich, with eight cetacean species (just under 29% of the 28 UK species) having been regularly recorded since 1980, in waters off the Grampian and Highland coasts. Cetacean species regularly sighted in Eastern Scotland region include:

- Bottlenose dolphin
- Harbour porpoise (*Phocoena Phocoena*)
- Minke whale (*Balaenoptera acutorostrata*)
- White-beaked dolphin (*Lagenorhynchus albirostris*)
- Risso's dolphin (*Grampus griseus*)
- Atlantic white-sided dolphin (*Lagenorhynchus acutus*)
- Long-finned pilot whale (*Globicephala melas*)
- Killer whale (*Orcinus orca*).

Unusual cetacean sightings have included humpback whale (*Megaptera novaeangliae*), Sperm whale (*Physeter macrocephalus*), Beluga (*Delphinapterus leucas*), Northern bottlenose whale (*Hyperoodon ampullatus*), Sowerby's beaked whale (*Mesoplodon bidens*), short-beaked common dolphin (*Delphinus delphis*), False killer (*Pseudorca crassidens*) and striped dolphin (*Stenella coeruleoalba*).

2.3.1 Bottlenose Dolphins

Bottlenose dolphin are common in nearshore waters of the Moray Firth, particularly at the entrances to Cromarty Firth (around North & South Sutors), Inverness Firth (Chanonry Point & Fort George), and Beauly Firth (North & South Kessock) in Highland Region, all of which are to the west of the site. Bottlenose dolphins are present in all months of the year, with peak numbers recorded July to October.

Bottlenose dolphin have a varied diet, taking a wide variety of benthic and pelagic fish (both solitary and schooling species), as well as cephalopods and shellfish. Haddock (*Melanogrammus aeglefinus*), saithe (*Pollachius virens*), cod (*Gadus morhua*), hake (*Merluccius merluccius*), blue whiting (*Micromesistius poutassou*), snipefish (*Macroramphosus scolopax*), mullet (*Mugil cephalus*), silvery pout (*Gadiculus argenteus*), eels (*Anguilla sp.*), salmon (*Salmo salar*), trout (*Salmo trutta*), bass (*Micropterus salmoides*), sprat (*Sprattus sprattus*) and sandeels (*Ammodytes tobianus*), as well as octopus and other cephalopods can comprise the diet of bottlenose dolphin, who feed solitarily or more commonly in groups.

As a qualifying feature of the Moray Firth SAC monitoring is undertaken to determine the condition of bottlenose dolphin, which are currently considered in Favourable (maintained) condition according to the last assessment in 2016.

Monitoring using timing porpoise detectors (T-PODs[12]) between 2004-2008 to assess the baseline activity of bottlenose dolphins and harbour porpoise associated within the Moray Firth. Bottlenose dolphin were detected regularly at the entrance to Cromarty Firth, only rarely in the outer Moray Firth, and at an intermediate level at Lossiemouth[13].

Photo-identification surveys and Passive Acoustic Monitoring (PAM) studies in core sampling areas within the Moray Firth SAC during the summers (May to September) 2014-2016 were undertaken by Cheney *et al*. (2018)[14], which estimated 85 individual dolphins used the SAC during the summer of 2014, 104 in 2015 and 103 in 2016, indicating numbers of dolphins using the SAC has remained stable. Chelonia PODs (CPODs)[15] were also deployed to the west (Lossiemouth), north (Sutors) and east (Chanonry) of Whiteness Head (2011-2016), with data confirming there remains a peak in dolphin detections during the summer months but also suggests that dolphins may use certain areas of the SAC outside the summer months (high numbers recorded in April and December). The maps provided in Cheney *et al* (2018), Figure 2-1 shows the locations of encounters with groups of dolphins during surveys conducted in a) 2014, b) 2015 and c) 2016, where it is clear that the deep water channel immediately adjacent/north of Whiteness Head is an important area for bottlenose dolphin.

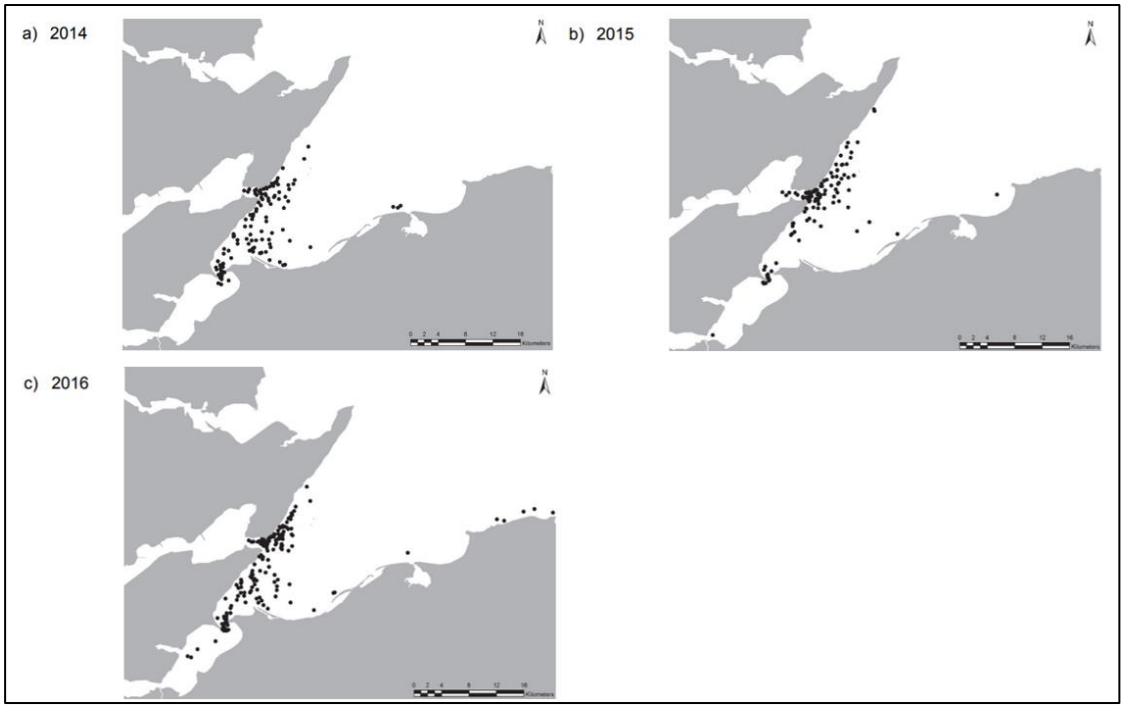

Figure 2-1: Maps showing the location of encounters with groups of dolphins during photo-identification surveys in 2014 (a), 215 (b) and 2016 (c) undertaken by Cheney *et al* (2018)

[12] T-PODS are autonomous data recorders for detecting cetacean echolocation clicks and potentially provide cost-impactive opportunities for monitoring cetacean activity.
[13] Bailey, H., Clay, G., Coates, E.A., Lusseau, D., Senior, B. and Thompson, P.M., 2010. Using T-PODs to assess variations in the occurrence of coastal bottlenose dolphins and harbour porpoises. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *20*(2), pp.150-158, available at: https://www.abdn.ac.uk/sbs/documents/Bailey2010.pdf (Accessed January 2024)
[14] Cheney, B., Graham, I.M., Barton, T.R., Hammond, P.S. & Thompson, P.M. 2018. Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation: 2014-2016. Scottish Natural Heritage Research Report No. 1021, available at: https://www.nature.scot/sites/default/files/2018-04/Publication%202018%20-%20SNH%20Research%20Report%201021%20-%20Site%20Condition%20Monitoring%20of%20bottlenose%20dolphins%20within%20the%20Moray%20Firth%20Special%20Area%20of%20Conservation%202014-2016.pdf (Access January 2024)
[15] Similar to T-PODs but a different patent

Annual distribution and relative abundances of bottlenose dolphin based on data obtained between 1979-1997 show the waters surrounding the site to host 1.65-3.65 individuals on average, as per Figure 2-2. In addition, Bottlenose dolphin abundance and density (animals/km2) estimates from SCANS-III data show an abundance of 151 and a density of 0.004, with mean group size being 2, in Block S which includes the area around Ardersier port.

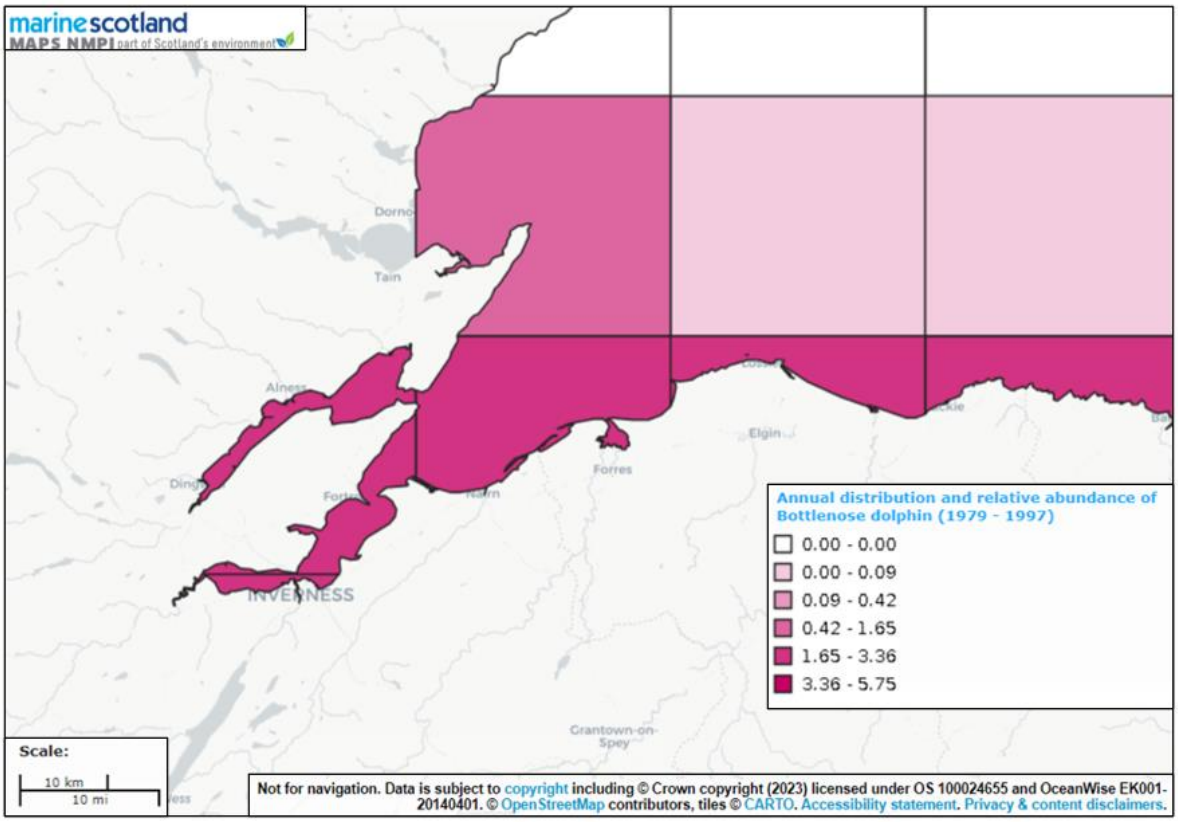

Figure 2-2: Map showing annual distribution and relative abundance of bottlenose dolphin (1979-1997) obtained via National Marine Plan interactive (NMPi)

Between March and December 2023 SWF received 26 sightings of bottlenose dolphin within the North East, consisting of 162 individuals. The nearest was sighted off the coast of Cromarty, approximately 7.6km north (shortest route by water) of the site. 31 records of bottlenose dolphins within 20km of the site (via shortest water route) have been submitted to SMASS between 1992-2021, with two records associated with the site in 2001 and 2021. Seven commercially available records were returned from NBN Atlas of bottlenose dolphin within a 5km radius of the site between 2011-2011, predominantly associated with Chanonry Point[16] approximately 5.2km south west (shortest route by water) of the site.

2.3.2 Harbour Porpoise

Harbour porpoise are fairly common in nearshore waters throughout the north east region, with peak numbers recorded between July and February. However, the west of Scotland is home to a higher density of harbour porpoise than is found elsewhere.

Harbour porpoise diet comprises a wide variety of small fish species, including small gadoids such as whiting (*Merlangius merlangus*), poor cod (*Trisopterus minutus*) and Norway pout (*Trisopterus*

[16] Data obtained via NBN Atlas, from data resource: Highland Biological Recording Group (2023). HBRG Vertebrates (not Badger) Dataset. Occurrence dataset https://doi.org/10.15468/vaassa accessed via GBIF.org on 2024-01-25.

esmarkii), with herring (*Clupea harengus*), sandeels and gobies also being important at certain times or locations.

Harbour porpoises were detected regularly during the T-POD monitoring[17] in the outer Moray Firth, only rarely off the coast of Lossiemouth, and at an intermediate level at the entrance to the Cromarty Firth.

Annual distribution and relative abundances of harbour porpoise based on data obtained between 1979-1997 show the waters surrounding the site to host 0.00 - 0.09 individuals on average, as per Figure 2-2. In addition, Bottlenose dolphin abundance and density (animals/km^2) estimates from SCANS-III data show an abundance of 6147 and a density of 0.152, with mean group size being 1.35, in Block S which includes the area around Ardersier port.

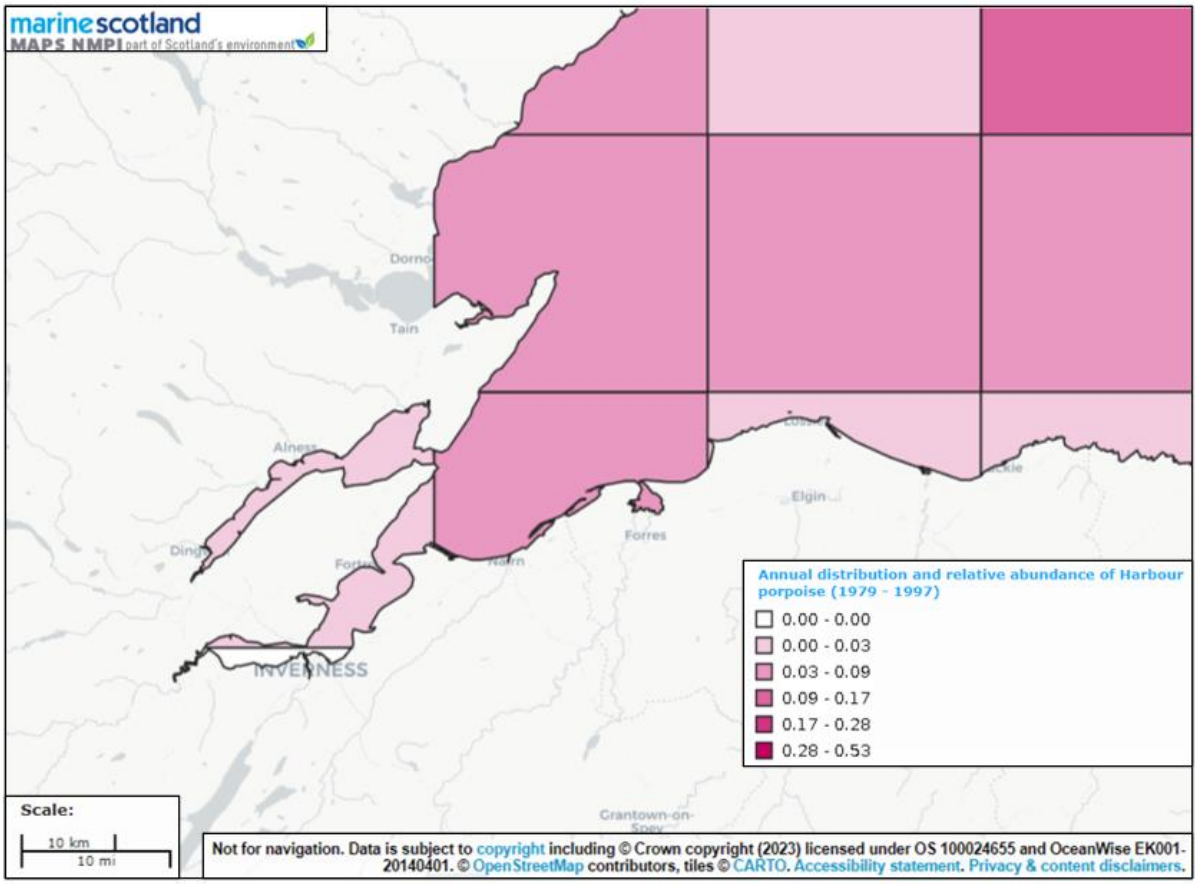

Figure 2-3: Map showing annual distribution and relative abundance of harbour porpoise dolphin (1979-1997) obtained via National Marine Plan interactive (NMPi)

Between March and December 2023 SWF received 16 sightings of harbour porpoise within the North East, consisting of 39 individuals. The nearest was sighted off the coast of Chanonry Point, (approx. 5.2km south west). One commercially available record was returned from NBN Atlas of harbour porpoise, associated with Chanonry Point in 2007[14].131 records of harbour porpoise within 20km of the site (via shortest water route) have been submitted to SMASS between 1992-2021, with one record associated with the site in 2016.

[17] T-PODS are autonomous data recorders for detecting cetacean echolocation clicks and potentially provide cost-impactive opportunities for monitoring cetacean activity.

2.3.3 Minke Whale

Minke whales are the most commonly seen baleen whale in Scotland and sightings are frequent and widespread from May to October, peaking in July. The southern and Outer Moray Firth are thought to be particularly important areas for minke whales, with the coastal waters of the Moray Firth providing rich, inshore feeding grounds for minke whales during the summer and autumnal months.

Minke whale diet comprises of a wide variety of fish such as herring, cod, capelin (*Mallotus villosus*), haddock (*Melanogrammus aeglefinus*), saithe, and sandeel, as well as euphausiids and pteropods. Sandeels are highly targeted by minke whales in the Moray Firth.

A study undertaken by Robinson *et al* (2023)[18] examined the distribution and feeding behaviours of adult versus juvenile minke whales using data from long-term studies in the Moray Firth. Data collected during dedicated boat surveys between 2001 and 2022 (inclusive), from which 784 encounters with 964 whales of confirmed age-class (471 juveniles and 493 adults) were recorded. Adults and juveniles were occasionally seen together, but in general juveniles preferred shallower, inshore waters with sandy-gravel sediments, and adults preferred deeper, offshore waters with greater bathymetric slope.

The closest recorded sightings of minke whales, submitted to Seawatch Foundation since June 2018, to the proposed Ardersier Port are off the coast off Covesea, approximately 40km to the east.

Observed adjusted densities of minke whale from 2000-2012, show the waters surrounding the site to host between 0.00-2.00 densities of mink whale as per Figure 2-4. In addition, minke whale abundance and density (animals/km^2) estimates from SCANS-III data show an abundance of 383 and a density of 0.010, with mean group size being 1, in Block S which includes the area around Ardersier port.

[18] Robinson KP, MacDougall DAI, Bamford CCG, Brown WJ, Dolan CJ, Hall R, Haskins GN, Russell G, Sidiropoulos T, Sim TMC, Spinou E, Stroud E, Williams G, Culloch RM. Ecological habitat partitioning and feeding specialisations of coastal minke whales (Balaenoptera acutorostrata) using a recently designated MPA in northeast Scotland. PLoS One. 2023 Jul 19;18(7):e0246617. doi: 10.1371/journal.pone.0246617. PMID: 37467252; PMCID: PMC10355456, available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10355456/ (Accessed January 2024)

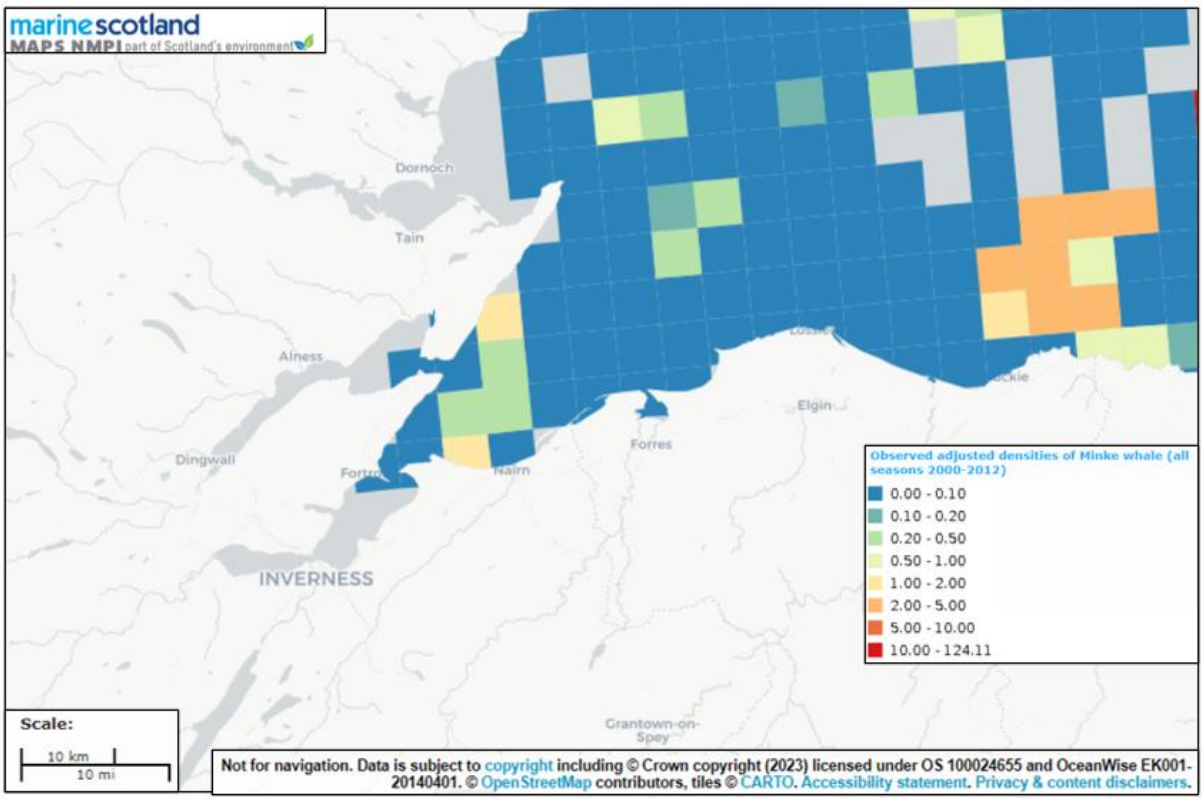

Figure 2-4: Map showing observed adjusted densities of minke whale (2000-2012) obtained via National Marine Plan interactive (NMPi)

Between March and December 2023 SWF received 8 sightings of harbour porpoise within the North East, consisting of 9 individuals. The nearest was sighted off the coast of Culbin, approximately 17km east (shortest route by water) of the site. 7 records of minke whale within 20km of the site (via shortest water route) have been submitted to SMASS between 1992-2020, with one record associated with the site in 1995. No records were returned from NBN Atlas of minke whale within a 5km radius of the site.

2.3.4 White-beaked dolphin

White-beaked dolphin is considered the commonest dolphin off the north coast of Scotland, and offshore in the northern North Sea, with peak numbers and frequency of sightings occurring between June and September (particularly August). However, the majority of records are associated with the inner Hebrides along the west coast of Scotland.

White-beaked dolphin diet consists of a variety of fish including mackerel, herring, cod, capelin, whiting, haddock, Trisopterus spp., navaga, hake, scad (*Trachurus trachurus*), snow crab (*Chionoecetes opilio*), and various species of sandeels, gobies, flatfishes, and scaldfishes; and amongst cephalopods, the octopus (Eledone cirrhosa).

Annual distribution and relative abundances of white-beaked dolphin based on data obtained between 1979-1997 show the waters surrounding the site to host 0.00 individuals on average, as per Figure 2-4. In addition, white-beaked dolphin abundance and density (animals/km^2) estimates from SCANS-III data show an abundance of 868 and a density of 0.007 – 0.03, with mean group size being 3, in Block S which includes the area around Ardersier port.

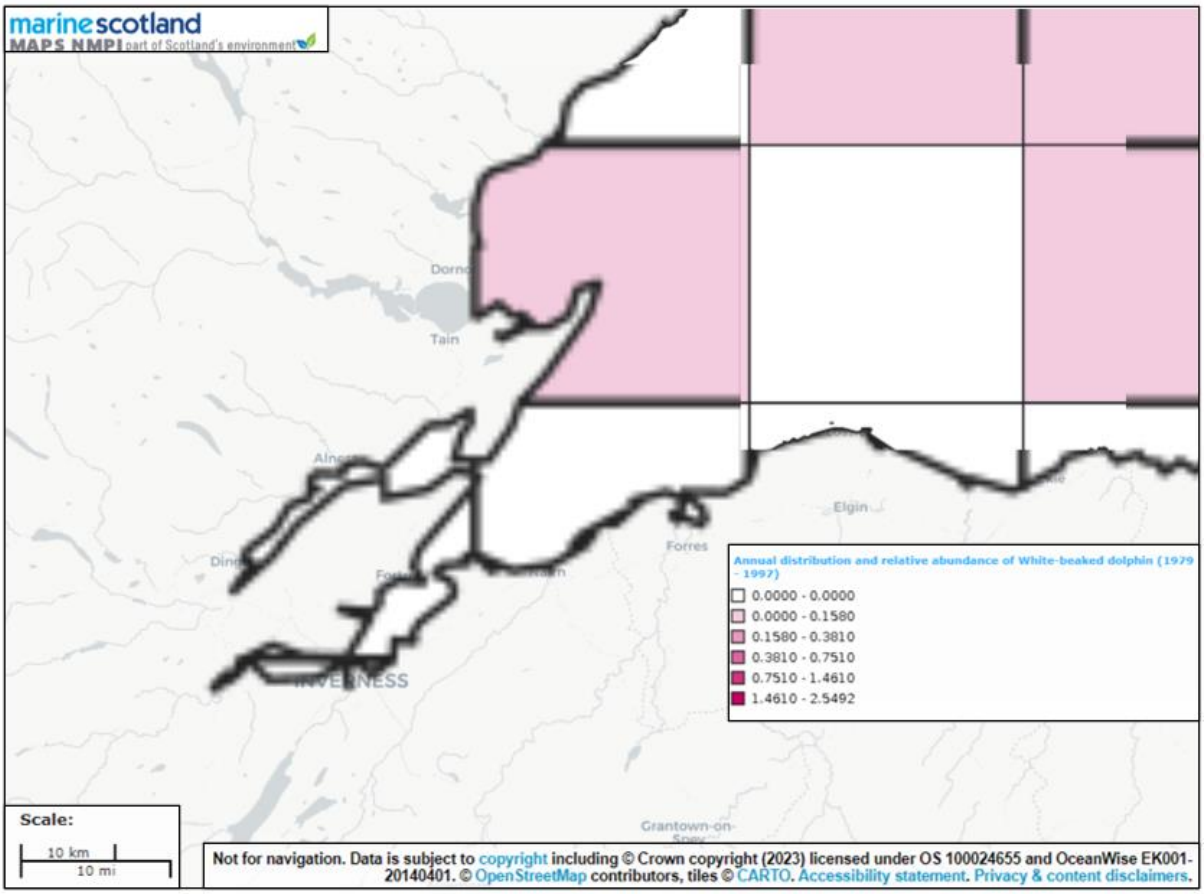

Figure 2-5: Map showing annual distribution and relative abundance of white beaked dolphin (1979-1997) obtained via National Marine Plan interactive (NMPi)

No records of white-beaked dolphin were reported to SWF in 2023. Five records of white-beaked dolphin within 20km of the site (via shortest water route) have been submitted to SMASS in 2012, with the nearest record being approximately 4km south west of the site. Three records of white-beaked dolphin were returned from NBN Atlas within a 5km radius of the site in 2012, with the nearest located 4km south of the site[14 & 19].

2.3.5 Risso's dolphin

Risso's dolphin are widely distributed, usually comprising of groups of 5-20 individuals. They are recorded annually, between April and September (mainly after July), mainly off the north Caithness coast and in the Pentland Firth.

Risso's dolphins have been reported to feed predominantly on cephalopods, although small fish have also been noted to be taken.

Density (animals/km^2) estimates from SCANS-III data show a density of 0 in Block S which includes the area around Ardersier port.

Between March and December 2023 SWF received 11 sightings of Risso's dolphin within the North East, consisting of 64 individuals. The nearest was sighted off the coast of Dunbeth, Caithness,

[19] Data obtained via NBN Atlas, from data resource: National Museums Scotland (2021). National Museums Scotland marine strandings Z.2014.21. Occurrence dataset https://doi.org/10.15468/6ioqfr accessed via GBIF.org on 2024-01-25.

approximately 78km north (shortest route by water) of the site. No records of Risso's dolphin have been submitted to SMASS or NBN Atlas.

2.3.6 Atlantic white-sided dolphin

White-sided dolphins are a pelagic species often found in continental shelf waters and deep water to the north of Scotland throughout the year. Although they could occasionally be present in the Moray Firth, they are unlikely to utilise the shallow waters in proximity to Ardersier.

The diet of Atlantic white-sided dolphins consists of a wide variety of fish, particularly gadoids such as blue whiting, whiting, Trisopterus spp., cod and hake, clupeids, particularly herring, and silvery pout, lantern fishes, pearlsides, mackerel, horse mackerel and salmonids.

Density (animals/km^2) estimates from SCANS-III data show a density of 0 in Block S which includes the area around Ardersier port.

Six records of Atlantic white-sided dolphin within 20km of the site (via shorted water route) have been submitted to SMASS between 1994-2007, with the nearest record being approximately 6.5km south of the site at Ardersier. No records of Atlantic wite-sided dolphin were returned from SWF or NBN Atlas.

2.3.7 Long-finned pilot whale

Long-finned pilot whale are considered common and widely distributed offshore in the northern North Sea throughout the year, occasionally coming into coastal waters, being most frequently observed between June and January.

Long-finned pilot whale diets are considered diverse, with a total of 12 genera of cephalopods, 15 genera of fish, and 3 species of crustaceans being recorded in the same study. The commonest two fish types were mid-water shoaling species occurring off the continental shelf, namely blue whiting and greater Argentine *(Argentina silus*).

Density (animals/km^2) estimates from SCANS-III data show a density of 0 – 0.003 in Block S which includes the area around Ardersier port.

In August 2017, a pod of 30 long-finned pilot whales travelled up the Moray Firth to North Kessock, approximately 5km west of Ardersier, meaning they would have swum within approximately 500m of Ardersier Port. The sighting was extremely rare, however important to note, as if they become stressed, entire pods of pilot whales are known to beach themselves.

Four records of long-finned pilot whale within 20km of the site (via shorted water route) have been submitted to SMASS between 2015-2017, with the nearest being recorded approximately 2km east off the coast of Delnies. No records of long-finned pilot whale were returned from SWF or NBN Atlas.

2.3.8 Killer whale

Killer whale have been recorded annually in the northern North Sea, mainly between June and September, and occasionally in the Firth of Forth between March and June. Killer whales may come close to the coast anywhere in the region, often in response to aggregations of breeding seals upon which the species sometimes feeds. Killer whales often occur offshore particularly in winter months.

Killer whales have one of the most varied diets of all cetaceans, ranging from fish and squid to birds, turtles, seals and other cetaceans.

Density estimates for Killer whale are not available from SCANS III data.

A pod of six orca were identified in the Moray Firth in 2016, approximately 11km north west of Findhorn (and approximately 24km north east of Ardersier Port).

Between March and December 2023 SWF received 23 sightings of killer whale within the North East, consisting of 89 individuals. The nearest was sighted off the coast of Rosemarkie Beach, Fortrose, approximately 5.5km south west (shortest route by water) of the site. No records of killer whale were returned from NBN Atlas.

2.4 Occasional Cetacean Visitors

2.4.1 Common Dolphin

Common dolphins are thought to prefer deeper, continental shelf waters and are occasionally seen in the North Sea between June and September. Although they could occasionally be present in the Moray Firth, they are unlikely to utilise the shallow waters in proximity to Ardersier.

Between March and December 2023 SWF received three sightings of common dolphin within the North East, consisting of 46 individuals. The nearest was sighted off the coast of Dunbeath, Caithness approximately 78km north of the site. 16 records of common dolphin within 20km of the site (via shorted water route) have been submitted to SMASS between 1997-2020, with the nearest being recorded approximately 6.5km south of the site at Ardersier. One record of common dolphin was returned from NBN Atlas within a 5km radius of the site in 2011, located 6.5km south of the site[20].

2.4.2 Humpback Whale

Humpback whales were observed in the Moray Firth in 2016 and 2017. In 2016, one individual was identified from Cromarty Sutors, approximately 13km north east of Ardersier; and in 2017 two individuals were observed from between Hopeman and Burghead, approximately 42 km east along the Moray coast.

Between March and December 2023 SWF received six sightings of humpback whale within the North East, consisting of 7 individuals. The nearest was sighted off the coast of Chanonry Point, approximately 5.2km south west of the site. No records of humpback whale have been returned from NBN Atlas of SMASS.

2.5 Conclusion

Based on the above information, it has been assessed that the most frequently observed species in the site locale, and therefore the species considered to be of most concern within the zone of influence of the proposed works are:

- Bottlenose dolphin
- Harbour porpoise
- Minke whale
- White beaked dolphin

[20] Data obtained via NBN Atlas, from data source: National Museums Scotland (2021). National Museums Scotland marine strandings Z.2014.21. Occurrence dataset https://doi.org/10.15468/6ioqfr accessed via GBIF.org on 2024-01-25.

The other species are less frequently observed within the Moray Firth waters and/or the habitat within and adjacent to the site is sub-optimal and so it is highly unlikely that they will be affected by the proposed works.

3 MARINE MAMMAL RISK ASSESSMENT

3.1 Activities Affecting Marine Mammals

3.1.1 Underwater Noise Producing Activities

The main risk to marine EPS from the proposed development is considered to be the generation of underwater noise which can cause injury, disturbance or, in extreme circumstances, death to individuals. Both vibro-piling and dredging have been identified as sources of underwater noise into the marine environment which have potential to cause disturbance, injury or in extreme circumstances death.

Vibropiling operations tend to generate underwater noise at a large range of levels unlike, for example, impact piling, where each strike is more or less the same level unless conditions change.

There can be considerable variation in the noise levels and frequency components of noise from the suction dredger, which may be due to variations in engine speed as the vessel maintains its course, or in the suction force applied or there is change in the material being dredged.

3.1.2 Increased Vessel Movement

During dredging, there will be an increase in vessel movement in and out of Ardersier Port relating to the transportation of dredge spoil to the disposal sites at Sutors (CR019) and Burghead (CR030) and offsite beneficial reuse sites to the east should the option be online during dredge campaign; the increase in vessel capacity will also lead to an increase in vessel traffic post-construction.

3.2 Impact Assessment

3.2.1 Underwater Noise

Cetaceans rely on their hearing for foraging, navigation and mating. The impact of noise to a population level is difficult to determine, however the expected impact on an individual animal's hearing ability and potential damage that could be caused by noisy activities during construction is assessed by modelling representative scenarios, taking into account environmental variables and the animal's hearing capabilities.

The Marine Scotland 'Guidance for Scottish Inshore Waters: The Protection of Marine European Protected Species from Injury and Disturbance' defines what disturbance means to cetaceans as: 'Changes in behaviour which may not appear detrimental in the short-term but may have significant long-term consequences. Additionally, the effects may be minor in isolation, but may become more significant in accumulation'. Disturbance may be identified via the following behaviour:

- Changes in (direction or speed of) swimming or diving behaviour;
- Bunching together or females shielding calves;
- Certain surface behaviours such as tail splashes and trumpet blows; and
- Moving out of a previously occupied area.

The following negative effects are linked to disturbance:

- Displacement from important feeding areas;
- Disruption of feeding;
- Disruption of social behaviours such as communication, calving, breeding, nursing, resting and feeding; and
- Increased risk of injury or mortality;
- Increased vulnerability of an individual or population to predators or physical stress; and
- Changes to regular migration pathways to avoid human interaction.

The way in which noise affects marine mammals is dependent on several factors, including the type of noise generated, the noise level, the species of marine mammal and the distance between the animal and the source of the noise. The National Oceanic and Atmospheric Administration (NOAA) describes how different groups of marine mammals hear and are affected by sounds, which can be found in the *'Guidance for Assesing the Effects of Anthropogenic Sound on Marine Mammal Hearing'*[21]. The effects can be described as either a Permanent Threshold Shift (PTS), where an animal experiences irreversible damage to their hearing which can in turn affect their ability to forage and reproduce and in extreme circumstances result in death; or a Temporary Threshold Shift (TTS) which an animal can recover from, but may experience 'masking' which reduces its ability to communicate with other animals and locate prey, resulting in fatigue[22].

Underwater noise modelling was originally commissioned to support the 2018 EIA for the project, however, is still considered relevant to the activities still to be completed and was used to inform this document. Please refer to Appendix B for the full underwater noise report.

The underwater noise model was run using three assumptions: vibropiling/dredging continuously for eight hours, 12 hours and a worst case scenario of 24 hours. The results are used to determine an appropriate mitigation zone in order to provide effective mitigation for marine mammals during underwater noise producing activities, i.e. the distance that is required between the noise source and the animal to prevent the risk of PTS. Although piling works are anticipated to be 09.00-17.00, the 12 hour assumption was used to determine the impacts, to account for any overrunning works and to reflect a worst-case scenario. The 24 hour scenario was used to determine the impacts from dredging.

Vibration Piling

The risk of PTS onset would only be present if a harbour porpoise were to stay within 500m of the vibropiling works over a 24 hour period, which is highly unlikely. The risk of PTS for low frequency cetaceans (minke whale) would be onset if they were to stay within 190m of the vibropiling works over a 24h period and for mid frequency cetaceans (bottlenose dolphin and white-beaked dolphin) it would be 38m over a 24h period. Assuming that animals will flee as soon as they hear the noise from the vibropiling, the PTS range for any species is a maximum of 2m from the source of the noise. Whilst following the MMO protocol, an animal should not be this close to the vibropiling activities when they commence.

The TTS limits for harbour porpoise are between 200- 210m from noise over 8-24 hours, when assuming animals will flee from the noise source. Harbour porpoise could experience TTS out to ranges of 3.6km, 4.4km or 6.5km (8, 12 and 24 hours respectively), however this is only if they remain stationary, which is unlikely. TTS for minke whale ranges from 1.4km at 8 hours increasing to 2.5km for 24hours, whilst bottlenose dolphin and white-beaked dolphin have lower TTS limits; 270m, 350m and 490m for 8, 12 and 24 hours respectively. However, again this is assuming that an animal is stationary

[21] NOAA guidance available at: http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm (Accessed January 2024)
[22] JNCC UK Marine Noise Registry: Information Document available at: http://jncc.defra.gov.uk/pdf/MNR__Draft_InfoDoc_V1_20160808.pdf (Accessed January 2024)

for the duration of the noise, which is unlikely and therefore fleeing distances are all below 9m for low and mid frequency cetaceans.

By implementing the MMO protocol (to determine no marine mammals are present within the mitigation zone prior to vibropiling commencing) and assuming a maximum (worst-case scenario) 12 hour working day, there will be no risk of PTS to marine mammals, once they have vacated the mitigation zone.

Dredging

The risk of PTS onset would only be present if a harbour porpoise were to stay within 570m of the dredging works for a 24 hour period, which is highly unlikely. The risk of PTS for low frequency cetaceans (minke whale) would be onset if they were to stay within 61m of the dredging works over a 24h period and for mid frequency cetaceans (bottlenose dolphin and white-beaked dolphin) it would be 36m over a 24h period. Assuming that animals will flee as soon as they hear the noise from the dredging, the PTS range for any species is a maximum of 3m from the source of the noise.

The TTS limits for harbour porpoise are 230m from noise over 8-24 hours, when assuming animals will flee from the noise source. Harbour porpoise could experience TTS out to ranges of 2.8km, 3.3km or 4.3km (8, 12 and 24 hours respectively), however this is only if they remain stationary, which is unlikely. TTS for minke whale ranges from 370m at 8 hours increasing to 640m for 24hours, whilst bottlenose dolphin and white-beaked dolphin have lower TTS limits; 220m, 280m and 390m for 8, 12 and 24 hours respectively. However, again this is assuming that an animal is stationary for the duration of the noise, which is unlikely and therefore fleeing distances are all 2m for low and mid frequency cetaceans.

By implementing the MMO protocol and assuming a maximum (worst-case scenario) 24 hour working day, there will be no risk of PTS to marine mammals once they have vacated the mitigation zone.

3.3 Effects of Increased Vessel Movement

Bottlenose dolphins and white-beaked dolphins are regularly seen approaching vessels or bow-riding. These dolphins are fast, powerful swimmers and are manoeuvrable in water.

Harbour porpoises often live in the vicinity of vessel traffic and reactions by porpoises to various types of vessel showed only short-term negative effects from speedboats and large ferries in a study by the Sea Watch Foundation[23]. HWDC[24] indicate that as harbour porpoise are naturally shy of boats, they will for the most part avoid them, and so for most types of marine traffic the risk of collision is minimal. There is more potential for collision with fast-moving engine-powered vessels due to their speed and ability to change direction quickly.

Minke whale may experience negative effects as a result of increased vessel movements, in part as the low frequency noise generated may interfere with their communication. Unlike some other species, minke whale are less able to adapt their vocalisations to adapt to increased background noise[25]. They are also less able to manoeuvre away from vessels to avoid vessel strike.

[23] Sea Watch Foundation: The Harbour Porpoise in UK Waters available at: http://seawatchfoundation.org.uk/wp-content/uploads/2012/07/Harbour_Porpoise.pdf last accessed 13/12/2022
[24] HWDC Harbour Porpoise information available at: https://hwdt.org/harbour-porpoise last accessed 12/12/2022
[25] Helble, T.A., Guazza R.A., Martin, C.R., Durbach, Alongi, G.C., Martin, S.W., Boyle, J.K. and Henderson, E.E (2020) Lombard effect: Minke whale boing call source levels vary with natural variations in ocean noise. The Journal of Acoustical Society of America Vol 147 (2).

3.4 Conclusion

It has been assessed that the primary risk from the works is to harbour porpoise, with consideration given to bottlenose dolphin, minke whale and white-beaked dolphin (although not considered at risk due to infrequent sightings, killer whale, common dolphin and humpback whale are covered by the groups assessed at risk). Works may result in **temporary disturbance** from underwater noise associated with vibropiling and dredging. The noise is not predicted to cause long term negative effects on the local populations of the aforementioned species due to its short duration and to adherence to the detailed Marine Mammal Observation Protocol (MMOP) in section 4.

Given the mitigation which will be employed and the short term nature of the works producing underwater noise, the number of individuals affected will be negligible and any disturbance which may occur will not fall under the JNCC (2008) definition of significant disturbance. Therefore, it is considered that the MMOP will be sufficient to prevent short term negative effects.

4 MARINE MAMMAL PROTECTION PLAN

The marine mammal mitigation will comprise a standard MMO protocol as per JNCC guidance which will be implemented during vibration and dredging operations in optimal sea states and during times of optimal visibility, and avoidance of works commencing during low hours of visibility and when sea state exceeds 2. f) [26] [27].

Marine mammal observation will also be undertaken at the sea deposit site(s) based on conditions included within licenses for material deposited at sea deposit sites within the Moray Firth as detailed in section 4.6.2.

4.1 The MMO

A suitably qualified Marine Mammal Observer (MMO), competent in the identification of marine mammals at sea, will be present during the vibratory piling, dredging and sea deposit activities. The MMO will undertake observation for marine mammals within the mitigation zone before and during vibratory piling, dredging and sea deposit activities and will be dedicated to that one task for the duration of any watch. The MMO will advise the contractors and crews on the implementation of the procedures set out in the agreed protocol, to ensure compliance with those procedures.

The JNCC guidance provides the following definitions:

Marine Mammal Observer (MMO): Individual responsible for conducting visual watches for marine mammals. It may be requested that observers are trained, dedicated and/or experienced.

Trained MMO: Has been on a JNCC recognised course.

Dedicated MMO: Trained observer whose role on board is to conduct visual watches for marine mammals.

Experienced MMO: Trained observer with three years of field experience observing for marine mammals, and practical experience of implementing the JNCC guidelines.

4.2 MMO Equipment

MMOs will be equipped with binoculars and/or spotting scopes, a copy of the agreed protocol and the Marine Mammal Recording Form, which is a Microsoft Excel spreadsheet containing embedded worksheets named Cover Page, Operations, Effort and Sightings. A Microsoft Word document named Deck forms is also available, and MMOs may prefer to use this when observing before transferring the details to the Excel spreadsheets. Although these forms were developed for seismic surveys, they can be used for piling operations, although many columns will not be applicable. The ability to determine the range of marine mammals is a key skill for MMOs, therefore a hand-held or boat-mounted GPS device or rangefinder will be used to verify the range.

All MMO forms, including a guide to completing the forms, are available on the JNCC website: http://jncc.defra.gov.uk/marine/seismic_survey

[26] https://data.jncc.gov.uk/data/31662b6a-19ed-4918-9fab-8fbcff752046/JNCC-CNCB-Piling-protocol-August2010-Web.pdf

[27] It should be noted that these protocols do not document measures to mitigate disturbance effects but have been developed to reduce to negligible levels of risk of injury or death to marine mammals in close proximity to piling operations.

4.3 Communication

The contractor will be responsible for the communication channels between those providing the mitigation service and the crews working on the piling or on the dredger or split hopper barges used for sea deposit. The MMO Operatives will have a workable communication procedure established at the outset, so that any visual and acoustic detections can be corroborated by both. A formal chain of communication from the MMO Operative to the contractor, who will start/stop piling, dredging or disposal activities, will be established. In order to confirm the chain of communication and command MMO Operatives will attend any relevant pre-mobilisation meetings. The ECoW will be informed of all communication.

4.4 Mitigation Zone

The JNCC guidance defines the mitigation zone as the area where a MMO keeps watch for marine mammals (and delays the start of activity should any marine mammals be detected). The extent of this zone represents the area in which a marine mammal could be exposed to sound that could cause injury and will be determined by factors such as the pile diameter, the water depth, the nature of the activities and the effect of the substrate on noise transmission.

Upon interpolation of the underwater modelling data, it is considered that the standard, minimum 500m mitigation zone would be sufficient to mitigate against PTS/TTS during vibropiling and dredging noise on all marine mammal species. This is because, when fleeing (the likely reaction of any marine mammal to disturbance), the maximum TTS limit for any species is 230m.

The MMO will be located on the most appropriate viewing platform (e.g. vessel or elevated location within the surrounding landscape) to provide effective coverage of the mitigation zone and a good all-round view of the sea.

4.5 MMO Protocol

4.5.1 Dredging and Vibropiling Activities

The standard JNCC protocol is outlined below[28] which will be used to provide effective mitigation for all species during vibropiling and dredging activities:

1. Vibropiling or dredging will not commence during periods of darkness or poor visibility (such as fog) or during periods when the sea state is not conducive to visual mitigation (above sea state 4 is considered not conducive) as there is a greater risk of failing to detect the presence of marine mammals. Harbour porpoise have small dorsal fins, therefore the MMO shall take additional precautions if the sea state exceeds 2[29]. During the winter months it is likely that sea state 2 will be exceeded on a regular basis. An elevated platform for the MMO to monitor from, such as a cherry picker for example, would be beneficial when the sea state is between 2 and 4.

2. The mitigation zone will be monitored visually by the MMO for an agreed period prior to the commencement of piling and, dredging. This will be a minimum of 30 minutes.

3. The MMO will scan the waters using binoculars or a spotting scope and by making visual observations. Sightings of marine mammals will be appropriately recorded in terms of date, time,

[28] There is a 'variation of standard piling protocol' allowed in the guidance if required.
[29] Detection of marine mammals, particularly porpoises, decreases as sea state increases. According to the JNCC guidance ideally sea states of 2 or less are required for optimal visual detection.

position, weather conditions, sea state, species, number, adult/juvenile, behaviour, range etc. on the JNCC standard forms. Communication between the MMO and the contractor and the start/end times of the activities will also be recorded on the forms.

4. Piling or, dredging will not commence if marine mammals are detected within the mitigation zone or until 20 minutes after the last visual detection. The MMO will track any marine mammals detected and ensure they are satisfied the animals have left the mitigation zone before they advise the crew to commence piling or dredging activities.

5. A soft-start will be employed, with the gradual ramping up of piling power incrementally over a set time period until full operational power is achieved. The soft-start duration will be a period of not less than 20 minutes. This will allow for any marine mammals to move away from the noise source. The MMO should monitor any seals that are hauled-out at the adjacent haul-out site during the soft-start, to identify any signs of disturbance (increased alertness, agitation and stampeding into the water). If this behavior is observed, the MMO should inform contractors to cease using the piling rig until the seals have returned to the water.

6. If a marine mammal enters the mitigation zone during the soft-start then, whenever possible, the piling operation will cease, or at least the power will not be further increased until the marine mammal exits the mitigation zone and there is no further detection for 20 minutes.

7. When piling or dredging at full power this will continue if a marine mammal is detected in the mitigation zone (as it is deemed to have entered voluntarily[30]).

8. If there is a pause in the piling or dredging operations for a period of greater than 10 minutes, then the pre-piling and pre-dredging search and pre-piling soft-start procedure will be repeated before piling or dredging recommences. If a watch has been kept during the piling operation, and MMO is able to confirm the presence or absence of marine mammals, it may be possible to commence the soft-start immediately. If there has been no watch, the complete pre-piling search and soft-start procedure will be undertaken.

9. Where night time dredging works are required, these can only be undertaken following a MMO pre-dredging search being undertaken during daylight hours and constant dredging from this point through the night. If a pause in the dredging operations (dredging rather than transport of dredged materials) for a period for greater than 10 minutes during night time, then works must cease until daylight hours, when another MMO search can be undertaken.

4.5.2 Sea Deposit of Dredged Material

Based on other dredge licenses for deposition of dredged material within the Moray Firth SPA/SAC the following is proposed for the sea deposit element:

A watch will be undertaken by a trained Marine Mammal Observer (MMO) or someone following the general guidance for and acting in the role of an MMO. A watch must be undertaken prior to the deposit of dredged substances or objects to ensure no marine mammals are within 200m of the deposit activity. If marine mammals are observed within this area, then the deposit activity must stop until the area has been clear for at least 20 minutes.

[30] The guidance states that there is no scientific evidence for this voluntary hypothesis; instead it is based on a common sense approach. Factors such as food availability may result in marine mammals approaching piling operations; in particular, the availability of prey species stunned by loud underwater noise may attract seals into the vicinity.

4.6 Reporting

As per the JNCC guidance, reports detailing the piling/dredging activity and marine mammal mitigation (the MMO reports) will be sent to MD/NatureScot via the EMG at the conclusion of piling/dredging activity. Reports will include:

- Completed Marine Mammal Reporting Forms (MMRFs);
- Date and location of the piling/dredging activities;
- A record of all occasions when piling occurred, including details of the duration of the pre-piling search and soft-start procedures, and any occasions when piling activity was delayed or stopped due to presence of marine mammals;
- A record of all occasions when dredging occurred, including details of the duration of the pre-dredging search, and any occasions when dredging activity was delayed or stopped due to presence of marine mammals;
- Details of watches made for marine mammals, including details of any sightings and details of the piling/dredging activity during the watches;
- Details of any problems encountered during the piling/dredging activities including instances of non-compliance with the agreed piling/dredging protocols; and
- Any recommendations for amendment of the protocols.

4.7 Vessel Movement Mitigation Plan

The following guidelines will be adhered to in order to minimise any potential risk to marine mammals.

- All vessels during sea deposit activities will comply with the measures set out in the MMPP;
- All vessels will adhere to instructions and guidance from the Harbour Master;
- All vessels will comply with the International Maritime Organisation (IMO)/Maritime Coastguard Agency (MCA) codes for the prevention of oil pollution;
- All vessels must have on-board Ship Oil Pollution Emergency Plans (SOPEPs);
- Vessels must comply with the protocols outlined in the Invasive Non-Native Species (INNS) Management Plan; and
- All movements of vessels, which also include site deliveries, will be coordinated with the Harbour Master.
- Keep a safe distance. Never get closer than 100m (200m if another boat is present) if within 100m, switch the engine to neutral;
- Never drive head on to, or move between, scatter or separate basking sharks. If unsure of their movements, simply stop and put the engine into neutral;
- Spend no longer than 15 minutes near the animals;
- Special care must be taken with mothers and young;
- Maintain a steady direction and a slow ‘no wake’ speed; and
- Avoid sudden changes in speed.

Wildlife code of conduct methods have been created by NatureScot and are available on their website.

4.8 Additional Good Practice Recommendations

If any dead marine mammals are anecdotally observed during construction or operation, it should be reported to the Scottish Marine Animal Stranding Scheme (SMASS) (www.strandings.org) and live marine mammal strandings will be reported to British Divers Marine Live Rescue (www.bdmlr.org.uk).

The MMO should keep a record of all marine mammal sightings, whether in the mitigation zone or not, to be issued to NatureScot. An understanding of the location of species is essential to appropriately assess the impacts of a proposed development and plan and target effective mitigation, therefore this data could be used to inform future projects. Biodiversity data are extremely important as, aside from use in planning and decision making, they are key to delivering state of environment reporting, education, modelling trends in species and habitat distribution, and research and policy making.

5 MARINE MAMMAL LICENSING

European Protected Species (EPS) are animals and plants (species listed in Annex IV of the Habitats Directive) that are afforded protection under The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017. All cetacean species (whales, dolphins and porpoise) are European Protected Species. If any activity is likely to cause disturbance to a European Protected Species a licence is required to undertake the activity legally.

The licensing of Marine European Protected Species in Scotland is shared between several regulators depending on the purpose and location of the activity in question. For activities taking place within 12 nautical miles of the coast (the Scottish Territorial Sea), EPS are protected under the 1994 Regulations. For commercial activities, including geophysical or seismic surveys (including those related to oil and gas), port and harbour developments and the installation of renewable energy devices Marine Directorate (on behalf of the Scottish Ministers) is the licensing authority under the 1994 Regulations: Regulation 39 (1) (a).

A licence may be granted to undertake such activities if certain strict criteria are met:

- There is a licensable purpose.
- There are no satisfactory alternatives.
- The actions authorised will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status[31] in their natural range.

The flowchart in Figure 5-1 below shows the decision-making process for licensing, taken from the Marine Directorate guidance[32].

Vibropiling and dredging have the potential to produce underwater noise at levels which could cause injury and disturbance to cetaceans. If the mitigation in section 5 is employed effectively, it is predicted that there will be no risk of injury, however, the mitigation measures cannot fully protect against disturbance from underwater noise. As highlighted in section 3 the risk of disturbance is greater than that of injury, with TTS (disturbance) occurring over a much wider area than PTS (injury). **Therefore, an EPS licence will be required for potential disturbance from vibropiling and dredging.**

[31] The ultimate objective of the Habitats Directive is to ensure that the species covered reach what is called a 'Favourable Conservation Status' and that their long-term survival is deemed secure across their entire natural range within Europe. Article 1(i) of the Habitats Directive defines Favourable Conservation Status (FCS) of a species as follows:
"Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within its natural range.
The conservation status will be taken as 'favourable' when:
- population dynamics data on the species concerned indicates that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."

[32] Guidance for Scottish Inshore Waters: The Protection of Marine European Protected Species from injury and disturbance. Marine Scotland 2014.

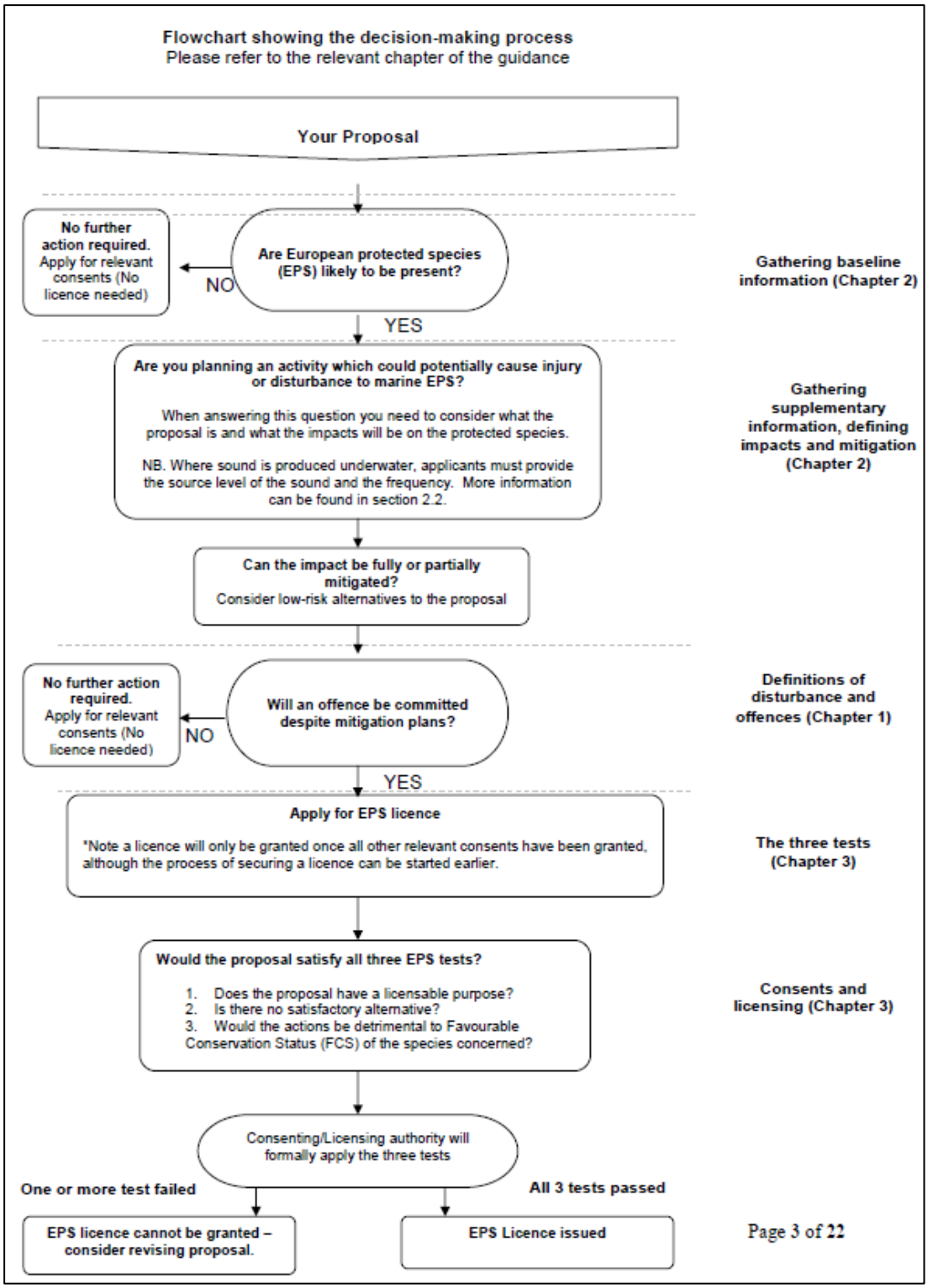

Figure 5-1: EPS Licencing Procedure

APPENDICES

A SHADOW HABITATS REGULATIONS APPRAISAL

Haventus Limited

envirocentre

Ardersier Port – Deeper Dredge
Habitat Regulations Appraisal

April 2024

CONTROL SHEET

Client: Haventus Ltd
Project Title: Ardersier Port – Deeper Dredge
Report Title: Habitat Regulations Appraisal
Document number: 13679
Project number: 676693

Issue Record

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EnviroCentre Limited Office Locations:

Glasgow **Edinburgh** **Inverness** **Banchory**

Registered Office: Craighall Business Park 8 Eagle Street Glasgow G4 9XA
Tel 0141 341 5040 info@envirocentre.co.uk www.envirocentre.co.uk

EnviroCentre Limited is registered in Scotland under no. SC161777.

VAT no. GB 348 6770 57.

EXECUTIVE SUMMARY

EnviroCentre was commissioned by Haventus Ltd to undertake a Habitat Regulation Appraisal (HRA) to support a marine licence for disturbance activities (MS-00009936), requested by Marine Scotland.

The consented dredge activity is provided in ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001 P01, where the consented increase to the dredge is as follows:

i. Increase the dredge depth from the approved -6.5m CD to -12.9m CD; and
ii. Increase the associated dredging volume from the approved quantity of 4,600,000 wet tonnes (wt) (comprising 4,000,000 wt for beneficial reuse and 600,000 wt to form the permanent dredge spoil storage bund) to 8,600,000 wet tonnes (increasing the volume identified for beneficial reuse by 4,000,000 wt to 8,000,000 wt), with 400,000 wet tonnes to be deposited below Mean High Water Springs as reinstatement of an inner section of Whiteness Head Spit and the remaining amount to be placed above MHWS.
iii. Previous plans were to pump all of the dredged material ashore for reuse, however following review it is now understood that this option presents a number of challenges. Following consultation with the Marine Directorate, NatureScot, Highland Council and other parties, it has been identified that a number of options including beneficial reuse and sea disposal will be required to manage the total volume. More detail on these options is provided within the March 2024 updated Best Practicable Environmental Option (BPEO) Report. A licence application with capacity to dispose of up to 3.7 million m3 has been submitted to accommodate the material which cannot be accommodated within the reuse or beneficial reuse options available.

The dredging of Ardersier Port is in the proximity of European designated sites, therefore a Habitats Regulations Appraisal (HRA) is required to determine the effects of the deeper dredge works on the qualifying features of the designated sites.

Likely Significant Effects (LSE) of the following designated features could not be scoped out during the screening stage and where therefore taken through to Appropriate Assessment (AA):

- Inner Moray Firth SPA (Common Tern, Red Breasted Merganser, Waterfowl assemblages)
- Moray Firth SAC (Bottlenose dolphin)
- Dornoch Firth and Morrich More SAC (Harbour seal)
- Cromarty Firth SPA (Common Tern)

During the AA process it was possible to rule out adverse effects from impacts to the assessed designated sites. Mitigation to be enacted includes:

- Adherence to the site-specific Marine Mammal Protection Plan.
- Adherence to the site specific Construction Environmental Management Document (CEMD) detailing pollution prevention measures.
- The following good practice guidelines will be adhered to and incorporated into the CEMD:
    - GGP5: Works and maintenance in or near water;
    - PPG 6: Working at construction and demolition sites;
    - PPG 7: Safe Storage – The safe operation of refuelling facilities;
    - GPP21: Pollution and incident response planning; and
    - PPG22: Incident response – dealing with spills.
- An Ecological Clerk of Works (ECoW) will be employed throughout the construction phase to audit adherence to the mitigation outlined in the CEMD.
- The existing Habitat Management Plan which sets out compensatory and enhancement actions for the site should be updated to reflect the loss of bird nesting and roosting habitat on the spit.

Contents

Appendices

Tables

1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre was commissioned by Haventus Ltd to undertake a Habitat Regulation Appraisal (HRA) to support a marine licence for disturbance activities (MS-00009936), requested by Marine Scotland.

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iii. Previous plans were to pump all of the dredged material ashore for reuse, however following review it is now understood that this option presents a number of challenges. Following consultation with the Marine Directorate, NatureScot, Highland Council and other parties, it has been identified that a number of options including beneficial reuse and sea disposal will be required to manage the total volume. More detail on these options is provided within the March 2024 updated Best Practicable Environmental Option (BPEO) Report. A licence application with capacity to dispose of up to 3.7 million m3 has been submitted to accommodate the material which cannot be accommodated within the reuse or beneficial reuse options available.

A HRA is required to assess whether the deeper dredging work, alone or in combination with other projects, will have an adverse impact on the integrity of the European designated site. It is the responsibility of the competent authority to conduct the HRA. This document aims to provide the information necessary for them to carry out the HRA assessment by:

- Providing a description of the proposed works;
- Identifying those European designated sites which are connected to and/or could potentially be affected by the proposed works;
- Identifying how the proposed works may impact on the qualifying features of the designated site(s);
- Considering other projects which may have “in combination” effects on the European designated sites; and
- Recommending the designated sites which need to be taken forward for further assessment if impacts on their qualifying features cannot be ruled out.

1.2 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre Limited for review to ensure that any relevant

changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

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2 METHODOLOGY

2.1 The Habitats Regulations Appraisal Process

The HRA is a four-stage process. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. The stages are summarised in Table 2-1. It is stated within the EU guidelines that "where, without any detailed assessment at the screening stage, it can be assumed (because of the size or scale of the project or the characteristics of the national site network) that significant effects are likely, it will be sufficient to move directly to the appropriate assessment (Stage Two) rather than complete the screening assessments explained below."

Table 2-1 Key Stages in the HRA Process

Stage 1	
Screening for Likely Significant Effect (LSE)	- Identify international sites in and around the project area. - Examine conservation objectives of the interest feature(s) (where available). - Review plan policies and proposals and consider potential effects on UK sites (magnitude, duration, location, extent). - Examine other plans and programmes that could contribute to 'in combination' effects.
	- If no effects likely – report no likely significant effect. - If effects are judged likely or uncertainty exists – the precautionary principle applies, proceed to Stage 2. - If following screening the project is reviewed and includes integral mitigation which will ensure no likely significant effects, then no further Appropriate Assessment needed.
Stage 2	
Appropriate Assessment (AA)	- Complete additional scoping work including the collation of further information on sites as necessary to evaluate impact in light of conservation objectives. - Agree scope and method of AA with the competent authority. - Consider how the project 'in combination' with other projects will interact when implemented (the Appropriate Assessment). - Consider how effects on integrity of the site could be avoided by changes to the project and the consideration of alternatives. - Develop mitigation measures (including timescale and mechanisms). - Report outcomes of AA including mitigation measures.
	- If the project will not adversely affect European site integrity proceed with plan. - If effects or uncertainty remain following the consideration of alternatives and development of mitigation proceed to Stage 3.
Stage 3	
Alternative Solutions	- Consider alternative solutions, delete from project or modify. - Consider if priority species/habitats affected - identify 'imperative reasons of overriding public interest' (IROPI), economic, social, environmental, human health, public safety (only applicable in highly exceptional circumstances).
Stage 4	
Imperative Reasons of Overriding Public Interest (IROPI)	- Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a UK site to proceed in cases where it has been established that no less damaging alternative solution exists. - The extra protection measures for Annex I priority habitats come into effect when making the IROPI case. Compensatory measures must be proposed and assessed. The Commission must be informed of the compensatory measures.

	Compensatory measures must be practical, implementable, likely to succeed, proportionate and enforceable, and they must be approved by the Minister.

2.2 Screening

Screening determines whether or not the project is likely to (or potentially could) have significant effects on the national site network. A list of all SACs, cSACs, SPAs and potential SPAs (pSPAs) that are within proximity to the site, or sites designated for mobile species which have the potential to be affected by the proposed development, was compiled and the qualifying interest features noted. Following this, the key environmental conditions (conservation objectives) needed to support site integrity were detailed for each site.

With reference to the NatureScot guidance[1]the screening stage determines whether Appropriate Assessment is required, by:

- Determining whether a project (or plan) is directly connected with or necessary to the conservation management of any European sites;
- Describing the details of the project (or plan) proposals and other projects that may cumulatively affect any European sites;
- Describing the characteristics of relevant European sites; and
- Appraising likely significant effects of the proposed project on relevant European sites.

The guidance gives the following definition of LSE:

"The test of significance is where a plan or project could undermine the site's conservation objectives. The assessment of that risk (of 'significance') must be made in the light, amongst other things, of the characteristics and specific environmental conditions of the site concerned."

*"A likely effect is one that cannot be ruled out on the basis of objective information. The test is a 'likelihood' of effects rather than a 'certainty' of effects. Although some dictionary definitions define 'likely' as 'probable' or 'well might happen', in the Waddenzee case the European Court of Justice ruled that a project should be subject to Appropriate Assessment "**if it cannot be excluded, on the basis of objective information, that it will have a significant effect on the site, either individually or in combination with other plans and projects**". Therefore, 'likely', in this context, should not simply be interpreted as 'probable' or 'more likely than not', but rather whether a significant effect can objectively be ruled out."*

2.3 Appropriate Assessment

The Appropriate Assessment establishes whether or not a project's LSE identified during the screening stage will have an adverse effect on the integrity of the affected site with regard to its conservation objectives. Based on the guidance provided by NatureScot guidance the effects of the proposal on the designated sites' qualifying features will be determined by:

- Gathering information required to assess impacts (from site documents, scientific literature, EU and UK guidance on impact assessment and impact assessments from similar projects);
- Predicting the type and nature of impacts e.g. direct or indirect, short or long term;
- Assessing whether there will be adverse effects on the integrity of the site as defined by the conservation objectives and the status of the site. The precautionary principle must be applied

[1]NatureScot, formerly SNH guidance available at : https://www.nature.scot/sites/default/files/2019-07/Habitats%20Regulations%20Appraisal%20of%20Plans%20-%20plan-making%20bodies%20in%20Scotland%20-%20Jan%202015.pdf (Accesses 20/12/2022)

at this stage. If it cannot be demonstrated with supporting evidence that there will be no adverse effects, then adverse effects will be assumed; and

- Ascertaining if it is possible to mitigate adverse effects.

2.4 In-Combination Effects

Under Regulation 43(1)(a) of the Habitats Regulations 1995 (as amended) it is necessary to consider whether a plan or project is likely to have a significant effect on a national site network site "either alone or in combination with other plans or projects."

These should include:

- Approved but as yet uncompleted plans or projects;
- Plans and projects for which an application has been made and which are currently under consideration but not yet approved by the competent authorities; and
- Permitted ongoing activities such as discharge consents, abstraction licences or consecutive/simultaneous maintenance activities.

3 PROJECT AND PROPOSED WORKS DESCRIPTION

3.1 Site Location and Project Background

Ardersier Port is within the Inner Moray Firth Special Protection Area ("SPA"), Moray Firth SPA, and Whiteness Head Site of Special Scientific Interest ("SSSI"). Ardersier Port was originally developed to service the offshore oil and gas industry in 1972. Initial construction of the yard area saw the formation of the navigation channel and harbour with the dredged material being pumped ashore for land reclamation purposes to create the main yard area. Subsequent maintenance dredging operations were carried out at typically 18-24 month intervals up until 2001.

A dredging licence was consented as part of plans to re-open Ardersier Port in 2014, which included a navigation channel width of 120 m and a dredge to -8.5 mCD. The planned dredging did not take place at that time and a subsequent dredging licence was consented in 2018 which included a navigation channel width of 120 m and a dredge to -6.5 mCD. Dredging of the harbour and navigation channel commenced under this consent in 2022.

3.2 Proposed Dredge Activity

The consented dredge activity is provided in ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001 P01, where the consented increase to the dredge is as follows:

i. Increase the dredge depth from the approved -6.5m CD to -12.9m CD; and
iv. Increase the associated dredging volume from the approved quantity of 4,600,000 wet tonnes (wt) (comprising 4,000,000 wt for beneficial reuse and 600,000 wt to form the permanent dredge spoil storage bund) to 8,600,000 wet tonnes (increasing the volume identified for beneficial reuse by 4,000,000 wt to 8,000,000 wt), with 400,000 wet tonnes to be deposited below Mean High Water Springs as reinstatement of an inner section of Whiteness Head Spit and the remaining amount to be placed above MHWS.
v. Previous plans were to pump all of the dredged material ashore for reuse, however following review it is now understood that this option presents a number of challenges. Following consultation with the Marine Directorate, NatureScot, Highland Council and other parties, it has been identified that a number of options including beneficial reuse and sea disposal will be required to manage the total volume. More detail on these options is provided within the March 2024 updated Best Practicable Environmental Option (BPEO) Report. A licence application with capacity to dispose of up to 3.7 million m3 has been submitted to accommodate the material which cannot be accommodated within the reuse or beneficial reuse options available.

The proposal increases the previously consented dredge depth in 2018 by 6.4 m within the eastern extent and the earlier consented dredge depth in 2014 by 4.4 m. The navigation channel width now varies (130 – 150 m at the outer approach, 150 – 278 in the mid-channel and 102 – 168 m in the inner harbour approach), compared to the previously consented 120 m width. The dredge profiles have a slope of 1v:6h to maintain a 25m buffer between the dredging and the edge of the spit (dimensions from ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001 P01). It is anticipated the western end of the spit will be removed, although a small predator free island will be retained. A cutter suction dredger will be used to minimise sediment suspension for all dredging.

The key difference in the dredging amendment and the previous dredge plan is that the footprint of the dredge area will be larger (additional 20.74 ha). The footprint of the consented dredge area compared to the original application is depicted in figure 3-1 below 676693-GIS002 in Appendix A.

4 SCREENING FOR LIKELY SIGNIFICANT EFFECT

4.1 Likely Significant Effect

For significant effects to arise, there must be a risk enabled by having a 'source' (e.g. construction works at a proposed development site), a 'receptor' (e.g. a European site or its qualifying interests), and a pathway between the source and the receptor (e.g. mobile marine species travelling between the proposed development site and the designated site). The identification of a pathway does not automatically mean that significant effects will arise. The likelihood for significant effects will depend upon the characteristics of the source (e.g. duration of construction works), the characteristics of the pathway (e.g. what species and the number of individuals travelling between the two sites) and the characteristics of the receptor (e.g. the sensitivities of the European site and its qualifying interests).

NatureScot (2015) guidance states that sites with mobile species should be considered within the screening process where there is a significant ecological link between the designated site and the proposed development site. It also states that for developments which could increase recreational pressures on designated sites, all sites within reasonable travel distance of the development should be considered for screening. It is also necessary to consider sites which are part of the same coastal ecosystem, where the proposed development may affect coastal processes.

4.1 Relevant European Sites

The following sites have been scoped in for assessment due to them being within proximity to the site and/ or considered connected to the site via dispersal of designated mobile species:

The sites are listed in Table 4-1, along with their screening assessment The location of the designated sites in relation to the proposed development is shown in Appendix A.

4.2 In- Combination Effects

No significant cumulative impacts were identified within the original EIA and given the highly localised nature of the additional impacts identified for the consented deeper dredge, it is considered that this is still likely to be the case.

Table 4-1: List of European Designated Sites within proximity to the site along with their Qualifying Features and Screening Assessment for Likely Significant Effects

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
Moray Firth proposed SPA (within the site boundary)	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species. This contribution will be achieved through delivering the following objectives for each of the site's qualifying features: a) Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term; b) maintain the habitats and food resources of the qualifying features in favourable condition.	Common eider (*Somateria mollissima*) Common goldeneye (*Bucephala clangula*) Common scoter (*Melanitta nigra*) Great northern diver (*Gavia immer*) Greater scaup (*Aythya marila*) Long-tailed duck (*Clangula hyemalis*) Red-breasted merganser (*Mergus serrator*) Red-throated diver (*Gavia stellate*) Slavonian grebe (*Podiceps auritus*)	Pathway for LSE identified. All of the qualifying species can be found in the adjacent open water of the Moray Firth. They are wintering populations and do not breed on site. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging grounds. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. Overwintering surveys in 2019/2020 highlighted very few numbers of these qualifying species within or in the vicinity of the dredge site, with the majority present in Dornoch Firth. With the works having a very limited zone of influence, and the qualifying species found some distance away in their preferred marine foraging habitat, any impact is considered unlikely.	Screened out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
		Velvet scoter (*Melanitta fusca*)		
		European shag (*Phalacrocorax aristotelis*)	Pathway for LSE identified. European shag could make use of both the sand habitat within the site and the open water, or exclusively open water. They are present year round within the pSPA as well as over-wintering. They could be impacted directly by habitat loss or deterioration during the dredging. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. During breeding bird surveys in 2018 and overwintering survey in 2019/20, very small numbers of Shags were present within or in the vicinity of the dredge area (a peak count of 3 birds), indicating that this area is not a main foraging area for this species. With the works having a very limited zone of influence, any impact is considered unlikely.	Screened out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
Inner Moray Firth SPA (within the site boundary)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are 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 No significant disturbance of the species	Common tern (*Sterna hirundo)*	Pathway for LSE identified. Common Tern use the coast for foraging and roosting opportunities. They could be impacted directly by habitat loss or deterioration during the dredging works. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability. And possibly failed nest attempts.	**Scoped in**
		Osprey (*Pandion haliaetus*)	Pathway for LSE identified. Osprey may utilise the channel and the shallow coastal waters to forage during the breeding season and on passage. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			These impacts could result in injury or death of individuals as well as reduced prey availability. However there is no suitable breeding locations around the dredge area, and they are rarely recorded in the vicinity compared to their preferred foraging grounds along the Moray Coast. No LSE is predicted.	
		Bar-tailed godwit (*Limosa lapponica)*	Pathway for LSE identified. Bar-tailed Godwit overwinter in the SPA. They could make use of the sand habitat within the site. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. There has been a shift in foraging and roost locations in recent years, with numbers declining from Whiteness Head. further west to Whiteness Sands, approximately 500m away.	Screened out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			This distance is considered to be outside the distance for disturbance for this species[2].	
		Greylag goose (*Anser anser*)	Pathway for LSE identified. Greylag Goose may be present in the open water within the Inner Moray Firth during the winter months (September – April). The distance between the site and suitable agricultural foraging grounds is approximately 10km, but it is unlikely that the site or surrounding area will be used for roosting as roost sites are typically on inland freshwater bodies, and Greylag geese are not known to frequent the area around Whiteness Sands. The geese could be impacted directly in the short term if pollutants are released into the water during the dredging phase of the development. These pollutants could impact birds in the open water or potentially at roost sites if they are carried there through dispersal. These impacts could result in injury or death of individuals but given the scope of works and the typical location of congregating geese, any LSE is considered unlikely. No LSE is predicted.	Screened Out
		Red-breasted merganser	Pathway for LSE identified.	**Screened in**

[2] Disturbance Distances in selected Scottish Bird Species – NatureScot Guidance | NatureScot (Accessed 12/10/23)

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			There is potential for red-breasted merganser to utilise the open water habitat within the site for foraging whilst they are present over-winter. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during deeper dredging or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability.	
		Redshank (*Tringa totanus*)	Pathway for LSE identified. Redshank may use the surrounding sand habitats and rocky shores for foraging and roosting over-winter. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			Overwintering surveys in 2019/2020 show that Redshank almost exclusively forage and roost within he Delnies saltmarsh habitat, considered to be outside the distance of disturbance for non- breeding redshank (200m)[3]. No LSE identified.	
		Scaup	Pathway for LSE identified. Scaup may be present in the open water within the Inner Moray Firth during the winter months (September – April). They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability. The great rafts of overwintering Scaup are found in the Cromarty Firth, or in the Inner Moray Firth between Castle Stuart and the Kessock Bridge in Inverness and are very rarely seen around Whiteness. No LSE identified.	Screened Out

[3] Disturbance Distances in selected Scottish Bird Species – NatureScot Guidance | NatureScot (Accessed 14/09/2023)

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
		Waterfowl assemblage Qualifying species additionally include: curlew (*Numenius arquata),* goosander (*Mergus merganser),* goldeneye (*Bucephala clangula),* teal (*Anas crecca),* wigeon (*Anas Penelope),* cormorant (*Phalacrocorax carbo).*	Pathway for LSE identified. Species in this assemblage are predominantly found foraging on Whiteness Sands <500m west of the site, and away from any dredging activity, or in the Moray Firth. This distance is considered to be mostly outside the distance for disturbance for non-breeding aggregates of these species. However, +100 curlew have been recorded on site during monitoring surveys and all species could make use of the sand habitat within the site. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability.	**Screened in**
Moray Firth SAC (within site boundary)	To avoid deterioration of the habitats of bottlenose dolphin or significant disturbance to this species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to	Bottlenose dolphin (*Tursiops truncates*)	LSE pathway identified. Bottlenose dolphin may be subject to increased underwater noise from the deeper dredging. High levels of underwater noise have the potential to cause injury to marine mammals via temporary or permanent threshold shifts (TTS or PTS) in hearing. In extreme circumstances, loud noises generated in close proximity to individuals can cause death due to pressure	**Screened in**

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	achieving favourable conservation status; and To ensure 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 • No significant disturbance of the species		changes. In lower levels, noise can cause disturbance and changes in behaviour through masking (where man-made noise drowns out natural noises, affecting communication between individuals, ability to hunt and/or navigate) or displacement from habitats. During the dredging pollutants may be released into the water or through increased noise and machinery movement during dredging could have temporary impacts on bottlenose dolphin either directly, or indirectly, if prey items are affected. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability leading to loss of condition. Prolonged vessel use as a result of deeper dredging could increase the risk of collision, resulting in death or injury to individuals.	
	To avoid deterioration of the qualifying habitat thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and	Subtidal sandbanks	Pathway for LSE identified. Subtidal sandbanks will not be directly affected by the prosed deeper dredge. It is possible that pollutants released during dredging could reach the habitats within the designated site through dispersion.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	To ensure for the qualifying habitat that the following are maintained in the long term: • Extent of the habitat on site • Distribution of the habitat within site • Structure and function of the habitat • Processes supporting the habitat • Distribution of typical species of the habitat • Viability of typical species as components of the habitat • No significant disturbance of typical species of the habitat		However, as the deeper dredge works has a very limited zone of influence from the approved. Therefore, no LSE are predicted.	
River Moriston SAC (55km south-west)	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and	Atlantic Salmon (*Salmo salar)*	Pathway for LSE identified. Atlantic salmon returning to the river Moriston from the sea will have to pass through the Moray Firth. As Atlantic salmon enter the Firth they tend to follow the coastline and could be present within the water near the dredge area. However, it is likely that numbers of fish migrating/emigrating past the development site will do so in areas of deeper water i.e. along the contours of the navigation channel, and where tidal flows, local currents and sediment movement, will be unaffected by the development.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	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 site; • Distribution and extent of habitats supporting the species; • Structure, function and supporting processes of habitats supporting the • species; • No significant disturbance of the species; • Distribution and viability of freshwater pearl mussel host species; • Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species.		Disturbance-related impacts (noise/ sediments) during dredging has the potential to result in the displacement of fauna from using habitats. These impacts could result in disturbance, injury or in extreme circumstances death to individuals. However, as the deeper dredge works has a very limited zone of influence from the approved. Therefore, no LSE are predicted.	
		Freshwater pearl mussel (*Margaritifera margaritifera*)	No LSE identified. The site is located c. 55km form the dredge works. Given the very limited and localised zone of influence of the dredge works, no LSE are predicted.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
Dornoch Firth and Morrich More SAC (24km north)	To avoid deterioration of the qualifying habitat thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitat that the following are maintained in the long term: • Extent of the habitat on site; • Distribution of the habitat within site; • Structure and function of the habitat; • Processes supporting the habitat; • Distribution of typical species of the habitat; • Viability of typical species as components of the habitat; and • No significant disturbance of typical species of the habitat.	• Coastal dune heathland • Atlantic salt meadows • Dunes with juniper thickets • Lime-deficient dune heathland with crowberry • Shifting dunes • Estuaries • Dune grassland • Humid dune slacks • Intertidal mudflats and sandflats • Reefs • Glasswort and other annuals colonising mud and sand • Subtidal sandbanks Maintained • Shifting dunes with marram	Pathway for LSE identified. The distance between the dredge site and Dornoch Firth and Morrich More SAC is c.24km and the deeper dredge works has a very limited zone of influence from the approved. Therefore, no LSE are predicted. any materials reaching the designated site would be dilute and the effects on the habitats would be negligible.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	Otter (*Lutra lutra)*	LSE pathway identified. Otters are mobile animals and can range over 50km (Chanin, 2003). It is feasible that otters within the SAC could utilise the habitats within and adjacent to the dredge area for foraging and commuting and the spit area for resting. During the dredging otter could be impacted temporarily by noise and vehicle movements. This could result in displacement and a temporary reduction in the availability of habitat outside of the SAC. Pollutants/ sediments released into the water during dredging could have temporary impacts on otter either directly, or indirectly, if prey items are affected. Toxic pollutants could result in avoidance of supporting habitat out with the SAC, injury or death of individuals and/or reduced prey availability outside of the SAC, leading to loss of condition. No impacts on the structure, function or supporting processes of habitats within the SAC are predicted due to the distance between the proposed development and the designated site. Otter are highly mobile and there is extensive suitable foraging, commuting and resting habitat in the local landscape. Therefore, no LSE from deeper dredge activities is predicted.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
		Harbour seal (*Phoca vitulina*)	Pathway for LSE identified. Harbour seal is a mobile species which will travel in order to find prey and move between haul out sites. Seals from the Dornoch Firth and Morrich More SAC could be present within the water near the proposed development and at the designated haulout site at Whiteness sands. During the dredging works otter could be impacted temporarily by noise and vessel movements. This could result in displacement and a temporary reduction in the availability of habitat outside of the SAC. Harbour seal could be impacted directly in the short term if any pollutants are released into the water. They could be impacted indirectly if pollutants affect their food source (mainly small fish). Any pollutants dispersing to the site would be dilute and have insignificant effects on the seals and their prey. These impacts could result in disturbance, injury or in extreme circumstances death to individuals. According to NatureScot (2018) harbour seals are found throughout the wider Moray Firth and may range widely in search of prey (up to 50km). However, they have high fidelity to their favoured haul out sites and they tend to remain close to the sites. There is a designated haulout site in close proximity to the proposed development site, at Whiteness Sands, west of the dredge area.	**Screened In**

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			The deeper dredge works has a very limited zone of influence from the approved. Therefore, no LSE are predicted.	
Cromarty Firth SPA (9km north)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species	Common tern	Pathway for LSE identified. Common Tern use the coast for foraging and roosting opportunities. They could be impacted directly by habitat loss or deterioration during the dredging works. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability. And possibly failed nest attempts.	**Screened in**

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	• Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	Osprey	Pathway for LSE identified. Osprey may utilise the channel and the shallow coastal waters to forage during the breeding season and on passage. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water or through increased noise and machinery movement during dredging leading to disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability. However there is no suitable breeding locations around the dredge area, and they are rarely recorded in the vicinity compared to their preferred foraging grounds along the Moray Coast. No LSE is predicted.	Screened Out
		Bar-tailed godwit Whooper swan Greylag goose Waterfowl	Pathway for LSE identified. Bar-tailed godwit, whooper swan and greylag goose overwinter within the SPA but do not breed. They could be impacted directly in the short term if pollutants are released into the water during dredging and through increased noise and machinery movement leading to disturbance or displacement from their preferred foraging or roosting grounds. They could be impacted indirectly during	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			dredging if pollutants affect their food source within the intertidal mud habitat. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. Bar -tailed Godwit predominantly feed on Whiteness Sands, to the west of the site. Whooper swan and greylag goose are rarely recorded in the vicinity, although both may forage on Whiteness Sands, or use the lagoon in the west of the site occasionally on passage or during the winter. The deeper dredge has a very limited zone of influence from the approved, therefore no LSE is predicted.	
Moray and Nairn Coast SPA (9km east)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term:	Osprey	Pathway for LSE identified. Osprey may utilise the channel and the shallow coastal waters to forage during the breeding season and on passage. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during the dredging or through increased noise and lighting during dredging leading to disturbance or displacement from their preferred foraging or roosting grounds.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	• Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species		These impacts could result in injury or death of individuals as well as reduced prey availability. However there is no suitable breeding locations around the dredge area, and they are rarely recorded in the vicinity compared to their preferred foraging grounds along the Moray Coast. No LSE is predicted.	
		Bar-tailed godwit Greylag goose Pink-footed goose Redshank Waterfowl	Pathway for LSE identified. Bar-tailed godwit, waterfowl and geese overwinter within the Moray Firth but do not breed. They could be impacted directly in the short term if pollutants are released into the water or through increased noise and machinery movement during dredging leading to disturbance or displacement from their preferred foraging or roosting grounds. They could be impacted indirectly during dredging if pollutants affect their food source within the intertidal mud habitat. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. Godwit predominantly feed on Whiteness Sands, to the west of the site. Geese are rarely recorded in the vicinity, although may forage on Whiteness Sands, or use the lagoon or adjacent fields occasionally on passage or during the winter. The waterfowl assemblage is predominantly found on the	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			Moray Firth. Bird accumulations around Whiteness Head are not as rich as those within the Moray and Nairn Coast designation which includes Findhorn Bay, Lossie Estuary and Spey Bay. The deeper dredge has a very limited zone of influence from the approved, therefore no LSE is predicted. No LSE identified.	
Loch Flemington (6km south)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of	Slavonian grebe	Pathway for LSE identified. Slavonian grebe breeds at Loch Flemington. They are likely to mainly remain at the loch but may forage in the open waters by the proposed development. They could be impacted directly in the short term if pollutants are released into the water or through increased noise and machinery movement during dredging leading to disturbance or displacement from their preferred foraging grounds. They may also be impacted by pollutants indirectly, if prey species (mainly fish) are affected. The structure and function of their habitat at Loch Flemington will not be affected by the development and there will be no significant disturbance to the species, which is occasionally recorded offshore from Whiteness in winter. The deeper dredge has a very limited zone of influence from the approved, therefore no LSE is predicted.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	habitats supporting the species • No significant disturbance of the species			
Culbin Bar SAC (9km east)	To avoid deterioration of the qualifying habitats (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitats that the following are maintained in the long term: • Extent of the habitat on site • Distribution of the habitat within site • Structure and function of the habitat • Processes supporting the habitat • Distribution of typical species of the habitat • Viability of typical species as components of the habitat	Perennial vegetation of stony banks Atlantic salt meadows Embryonic shifting dunes	Pathway for LSE identified. The distance between the proposed development site and Culbin Bar SAC is c.24km and the deeper dredge has a very limited zone of influence from the approved. Any materials reaching the designated site would be dilute and the effects on the habitats would be negligible. No LSE is identified	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	• No significant disturbance of typical species of the habitat			

4.3 Screening Conclusion

The outcome of screening for appropriate assessment is to reach one of the following determinations:

a) A stage 2 AA of the proposed development is required if it is concluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.
b) A stage two AA of the proposed development is not required if it can be concluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will not have a significant effect on a European site.

Following an examination, analysis and evaluation of the relevant information including, in particular, the nature of the proposed development and the likelihood of significant effects on scoped in designated sites

- Inner Moray Firth SPA
    - Common Tern
    - Red Breasted Merganser
    - Waterfowl assemblages
- Moray Firth SAC
    - Bottlenose dolphin
- Dornoch Firth and Morrich More SAC
    - Harbour seal
- Cromarty Firth SPA
    - Common Tern

5 APPROPRIATE ASSESSMENT INNER MORAY FIRTH SPA

Conservation Objectives:

To ensure for the qualifying species that the following are maintained in the long term:

1. Population of the species as a viable component of the site
2. Distribution of the species within the site
3. Distribution and extent of habitats supporting the species
4. Structure, function and supporting processes of habitats supporting the species

5.1 Common Tern

The Inner Moray Firth SPA qualifies under Article 4.1 by regularly supporting populations of European importance of Common Tern (310 pairs, 2% of the GB population).

At Ardersier/Whiteness Head, Common Terns no longer breed, but post-breeding tern flocks (including Common Tern) do roost at Whiteness Head during late summer (July-August).

5.1.1 Assessment of Potential Impacts on Conservation Objectives

They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

Permanent loss of roosting habitat and temporary disturbance during dredging is also a potential impact. It is considered that the birds have access to alternative roosting and feeding habitat and the loss of the habitat proposed during the deeper dredge will not impact on the conservation status of the wider population. There will be an overall reduction of habitat available for roosting within the development area and so the effects will be significant at a site level. It is considered that the existing Habitat Management Plan which sets out compensatory and enhancement actions for the site will be updated to reflect the loss of habitat within the spit/ island.

The population and distribution of the species should be maintained, and the overall distribution and function of supporting habitat should not be adversely impacted.

5.2 Red-breasted Merganser

The Inner Moray Firth SPA further qualifies under Article 4.2 by regularly supporting populations of European importance of the migratory (1992/93 to 1996/97 winter peak means) red-breasted merganser (1,184 individuals, 1% of the NW & Central Europe biogeographic population).

Surveys undertaken at Ardersier/Whiteness Head indicate that occasionally larger numbers of this species are present, with a peak count of 92 in August 2021 and 47 in February 2020. The peak count of 92 represents nearly 8% of the SPA population.

5.2.1 Assessment of Potential Impacts on Conservation Objectives

Red-breasted Merganser could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

Temporary disturbance during dredging is also a potential impact. It is considered that the birds have access to alternative foraging habitat within the Inner Moray Firth itself. Disturbance effects will not result in barriers to movement, so there would be no significant energy expenditure and possible reduction in body condition required for survival and subsequent migration. Therefore, there will not be an impact on the conservation status of the wider population.

The population and distribution of the species should be maintained, and the overall distribution and function of supporting habitat should not be adversely impacted.

5.3 Waterfowl Assemblages

The Inner Moray Firth SPA qualifies under Article 4.2 by regularly supporting in excess of 20,000 individual waterfowl. Between 1992/93 to 1996/97 a winter peak mean of 26,800 individual waterfowl comprising 16,800 wildfowl and 10,000 waders including nationally important populations of the following species: scaup (118 individuals, 1% of the GB population); curlew Numenius arquata (1,262 individuals, 1% of the GB population); goosander (325 individuals, 4% of the GB population); goldeneye (218 individuals, 1% of the GB population); teal (2,066 individuals, 1% of the GB population); wigeon (7,310 individuals, 3% of the GB population); cormorant (409 individuals, 3% of the GB population); redshank (1,621 individuals, 1% of the GB population); red-breasted merganser (1,184 individuals, 12% of the GB population); greylag goose (2,651 individuals, 3% of the GB population) and bar-tailed godwit (1,090 individuals). In the five-year period 1991/92 to 1995/96, a winter peak mean of 33,148 individual waterfowl was recorded with the assemblage additionally including a nationally important population, greater than 2,000 individuals, of oystercatcher (3,063 individuals, 0.9% of the GB population).

5.3.1 Assessment of Potential Impacts on Conservation Objectives

Waterfowl assemblages could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

Permanent loss of roosting habitat and temporary disturbance during dredging is also a potential impact. It is considered that the birds have access to alternative roosting and feeding habitat and the loss of the habitat proposed during the deeper dredge will not impact on the conservation status of the wider population. There will be an overall reduction of habitat available for roosting within the development area and so the effects will be significant at a site level. It is considered that the existing Habitat Management Plan which sets out compensatory and enhancement actions for the site will be updated to reflect the loss of some habitat within the spit/ island.

The population and distribution of the species should be maintained, and the overall distribution and function of supporting habitat should not be adversely impacted.

5.4 Appropriate Assessment Conclusion

Assuming GPP are in place and the site Habitat Management Plan is implemented then no adverse effects on the integrity of the Inner Moray Firth SPA are predicted in relation to the conservation objectives for Common Tern, Red-breasted Merganser and Waterfowl assemblages.

6 APPROPRIATE ASSESSMENT FOR THE MORAY FIRTH SAC

Conservation Objectives:

1. To maintain site integrity and ensure the site continues to make a contribution to bottlenose dolphin remaining at favourable conservation status in UK waters.
2. To ensure for the qualifying species that the following is maintained in the long term; population of the species as a viable component of the site.
3. To ensure for the qualifying species that the following is maintained in the long term; distribution of the species within the site.
4. To ensure for the qualifying species that the following is maintained in the long term; distribution and extent of habitats supporting the species.
5. To ensure for the qualifying species that the following is maintained in the long term; structure, function and supporting processes of habitats supporting the species.
6. To ensure for the qualifying species that the following is maintained in the long term; no significant disturbance of the species.

6.1 Bottlenose Dolphin

Bottlenose dolphin live predominantly in inshore coastal water within 10km of land but may range further. They usually live in small groups of up to 20 individuals and can live for 20 to 50 years. Calves can be born any time of year but typically between March and September. They eat a wide range of fish species including cod, saithe, whiting, salmon and haddock (Santos et al., 2001) as well as squid, crabs and shrimp. They are present in the Moray Firth SAC all year round.

The Moray Firth supports the only known resident population of bottlenose dolphin in the North Sea and is one of only two UK sites designated for the species as a primary qualifying feature. The northeast of Scotland population is estimated to comprise approximately 195 individuals. Between 1990 and 2013, annual estimates of the number of dolphins using the SAC ranged between 43 and 134. The main sensitivities bottlenose dolphin as identified in the site designation consultation document (SNH, 2018) are as follows:

- Removal of non-target and target species (i.e. entanglement of bottlenose dolphin in fishing gear and removal of their prey species);
- Contaminants (e.g. through effects on water quality and bioaccumulation of contaminants that in turn affect the survival and productivity rates of bottlenose dolphin);
- Underwater noise from vessels (recreational and commercial);
- Underwater noise from development activity (e.g. piling, blasting, dredging, seismic survey and general engine noise); and
- Death or injury by collision (predominantly in relation to collision with various types of fast-moving vessels from commercial shipping to personal leisure craft and potentially from tidal turbines).

Due to recognised declines and threats to the species all bottlenose dolphins are European Protected Species (EPS), protected under the Conservation (Natural Habitats, &c.) Regulations 1994.

6.1.1 Assessment of Potential Impacts on Conservation Objectives

The proposed works will occur within The Moray Firth SAC boundary. There is the potential for bottlenose dolphin to be disturbed, injured or, in extreme circumstances, killed as a result of equipment movements underwater noise or pollution generated during dredging.

The main impact predicted to arise from the dredging, in relation to marine mammals, is the generation of underwater noise. Underwater noise modelling undertaken to inform the 2018 EIA included modelling of noise which would be generated by dredging using a cutter suction dredger. The consented deeper dredge won't alter the parameters of the modelling (e.g. noise generated by the vessel will not be different) Figure 3-1 below shows the results of the modelling with regards to distances for Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) thresholds for different hearing groups. It is assumed that marine mammals will swim away from any noises which are causing them disturbance or are harmful, the shorter exposure periods for the modelling are therefore the most likely to be experienced.

Assuming that animals will flee as soon as they hear the noise from the dredging, the PTS range for any species is a maximum of 3m from the source of the noise. The TTS limits are all within 230m (within 2m for all species when excluding harbour porpoise) when assuming animals will flee from the noise source. The expected disturbance is therefore highly localised to the dredge site, with individuals present within the wider Moray Firth unlikely to be impacted. There is only considered to be a risk to marine mammals if they are in close proximity to the dredge vessel when dredging is commencing. The modelling also shows that there is no difference to the TTS and PTS threshold distances regardless of if the activity continues for 8 hours or 24 (as long as they do not remain stationary). In order to avoid and minimise the risk of injury and disturbance to marine mammals, a Marine Mammal Protection Plan (MMPP) is in place and key mitigation is outlined in section 9 of this report.

In terms of habitat loss it is considered that there is sufficient alternative foraging habitat for bottlenose dolphin such that there would be no loss in individual condition, breeding success or long-term population viability as a result of displacement.

During dredging works there is the potential for pollutants to be released into the water. This could have temporary impacts on the function and supporting processes of bottlenose dolphin foraging habitat, which could lead to reduced prey availability in the short term. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

No changes to the distribution or extent of habitats supporting bottlenose dolphin within or out with the SAC are predicted as a result of the deeper dredging. No impacts to the structure, function and processes of habitats supporting bottlenose dolphin are predicted within the designated site. Disturbance will be temporary and the favourable conservation status of bottlenose dolphin in UK waters will not be impacted by the dredging works.

6.2 Appropriate Assessment Conclusion

If the mitigation presented in the MMPP and section 9 of this report are adhered to then no significant effects on the integrity of The Moray Firth SAC are predicted in relation to the conservation objectives for bottlenose dolphin.

7 APPROPRIATE ASSESSMENT FOR THE DORNOCH FIRTH AND MORRICH MORE SAC

Conservation Objectives

To ensure for the qualifying species that the following is maintained in the long term; population of the species as a viable component of the site:

1. To ensure for the qualifying species that the following is maintained in the long term; distribution of the species within the site.
2. To ensure for the qualifying species that the following is maintained in the long term; distribution and extent of habitats supporting the species.
3. To ensure for the qualifying species that the following is maintained in the long term; structure, function and supporting processes of habitats supporting the species.
4. To ensure for the qualifying species that the following is maintained in the long term; no significant disturbance of the species.

7.1 Harbour Seal

The harbour or common seal (*Phoca vitulina*) occurs in the North Atlantic and North Pacific. There are about 83,000 harbour seals in Europe. About 35% of this population is found in UK waters, and 83% of these in Scottish waters. Harbour seals prefer more sheltered waters and have a more restricted range than grey seals. Harbour seals are found throughout the wider Moray Firth and may range widely in search of prey (up to 50km).

Harbour seals are typically found hauled out on sandbars and shores at the mouth of the estuary which are used habitually as favoured locations by the same groups of individuals. Notable haul-out sites include the intertidal sandflats of Dornoch and Whiteness Sands and the intertidal sand bars of the Gizzen Briggs which consistently support around 600 seals. These areas are also used as breeding sites, including locations which are inundated by the tide as pups can swim within an hour after birth with pupping typically occurring in early to mid-June/July. Adult seals undergo an annual moult between August and September during which they spend extended period out of the water.

Harbour seals are present within the Dornoch Firth year-round. The harbour seal breeding season is from June to August inclusive.

The main sensitivities for harbour seal as identified in the site designation consultation document (NatureScot, 2018) are as follows:

- underwater noise from vessels (recreational and commercial);
- development activity (e.g. piling, blasting, dredging, seismic survey and general engine noise);
- recreational disturbance – particularly at haul out sites;
- potential persecution from fisheries;
- marine pollution;
- capture in fishing nets; and potentially tidal turbines.

7.1.1 Assessment of Potential Impacts on Conservation Objectives

The proposed works are approximately 24km outside Dornoch Firth and Morrich More SAC boundary. The majority of the potential impacts listed in Table 4.1 are therefore not expected to impact on harbour seal nor the habitat supporting them within the designated site.

During dredging there is the potential for pollutants to be released into the water. This could have temporary impacts on the function and supporting processes of a harbour seal foraging habitat out with the SAC which could lead to reduced prey availability in the short term. It is predicted that the risk of such an event occurring will be minimal if the mitigation and relevant GPP, detailed in section 9 of this report, is adhered to.

There is also the potential for harbour seal utilising the habitats within and adjacent to the deeper dredge site to experience disturbance during dredging. There is a designated seal haulout site[4] at Whiteness Sands, <500m west of the proposed development site. The location has also been used for pupping. Seals that are on land are usually resting to conserve energy or may be nursing young. Disturbing seals into the water costs them energy, creates stress and can lead to impacts on health[5]. Stampeding adults can also injure pups. The disturbance arising from the deeper dredge will be temporary and therefore will not result in long term disturbance. Disturbance during construction will be minimised by adherence to the mitigation outlined in the MMPP and section 9 of this report.

The dredge works are not predicated to affect the integrity of the site or its contribution to maintaining the favourable conservation status of harbour seal in UK waters. No processes of habitats supporting the species or alterations to the long-term distribution of the species within the site are therefore anticipated.

7.2 Appropriate Assessment Conclusion

If the mitigation presented in the MMPP and section 9 of this report are adhered to then no significant effects on the integrity of Dornoch Firth and Morrich More SAC are predicted in relation to the conservation objectives for harbour seal.

[4] MF001 - Ardersier: Intertidal sandbanks west of Whiteness Head and north of Kirkton within the MoD Danger Area.
[5] Scottish Natural Heritage: A Guide to Best Practice for Watching Marine Wildlife available online at: https://www.nature.scot/sites/default/files/2017-06/Publication%202017%20-%20A%20Guide%20to%20Best%20Practice%20for%20Watching%20Marine%20Wildlife%20SMWWC%20-%20Part%202%20-%20April%202017%20%28A2263517%29.pdf last accessed 13/06/2018

8 APPROPRIATE ASSESSMENT CROMARTY FIRTH SPA

Conservation Objectives:

To ensure for the qualifying species that the following are maintained in the long term:

1. Population of the species as a viable component of the site
2. Distribution of the species within site
3. Distribution and extent of habitats supporting the species
4. Structure, function and supporting processes of habitats supporting the species

8.1 Common Tern

Cromarty Firth SPA qualifies under Article 4.1 by regularly supporting populations of European importance of the species Common Tern (1989 to 1993 mean of 294 pairs; 2% of the GB population).

At Ardersier/Whiteness Head, Common Terns no longer breed, but post-breeding tern flocks (including Common Tern) do roost at Whiteness Head during late summer (July-August).

8.1.1 Assessment of Potential Impacts on Conservation Objectives

They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

Permanent loss of roosting habitat and temporary disturbance during dredging is also a potential impact. It is considered that the birds have access to alternative roosting and feeding habitat and the loss of the habitat proposed during the deeper dredge will not impact on the conservation status of the wider population. There will be an overall reduction of habitat available for roosting within the development area and so the effects will be significant at a site level. It is considered that the existing Habitat Management Plan which sets out compensatory and enhancement actions for the site will be updated to reflect the loss of habitat within the spit/ island.

The population and distribution of the species should be maintained, and the overall distribution and function of supporting habitat should not be adversely impacted.

8.2 Appropriate Assessment Conclusion

Assuming GPP are in place and the site Habitat Management Plan is implemented then no adverse effects on the integrity of the Cromarty Firth SPA are predicted in relation to the conservation objectives for Common Tern.

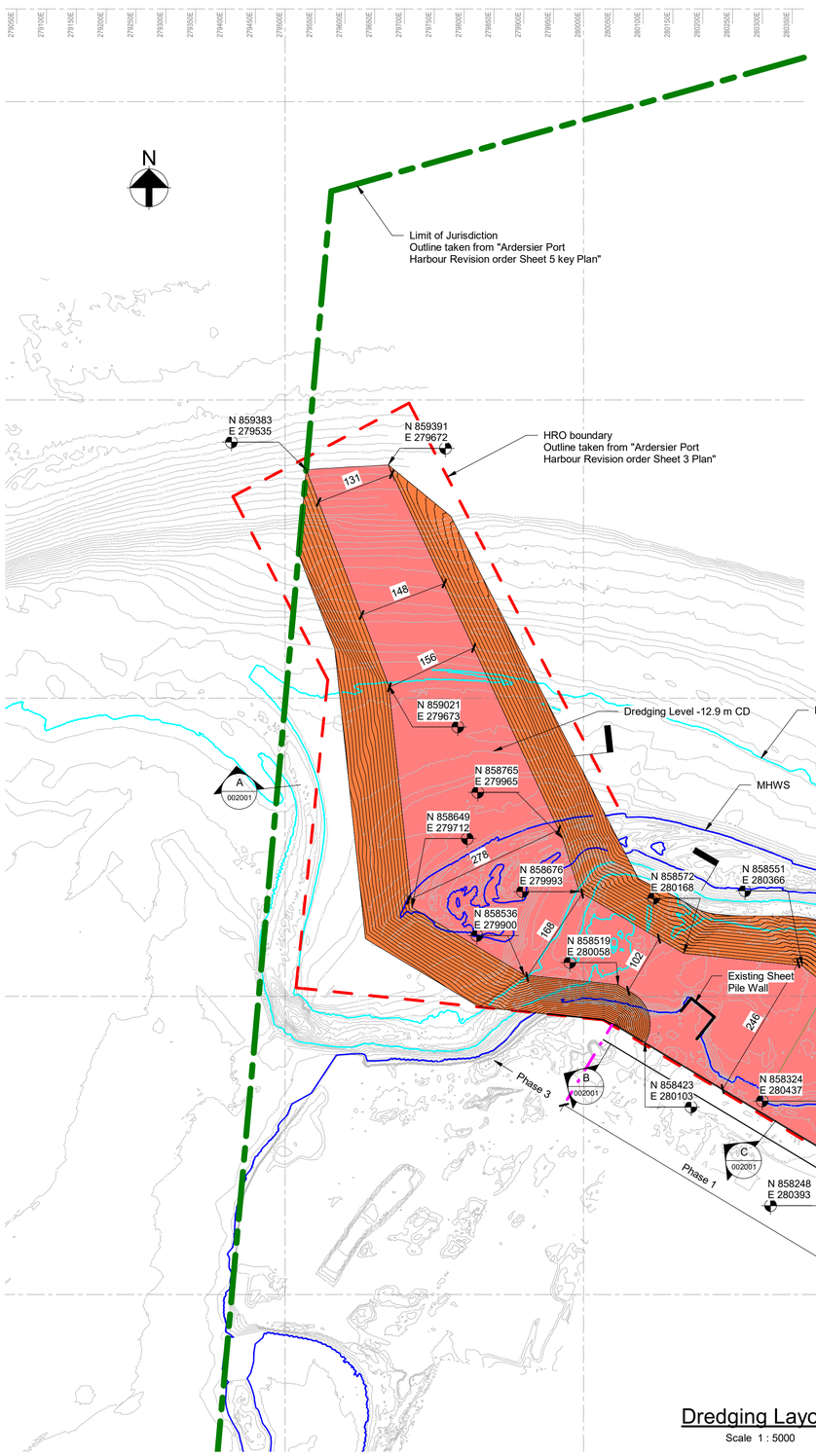
9 MITIGATION.

The following mitigation will be employed to avoid and minimise any impacts occurring both during the dredging works:

- Adherence to the site-specific Marine Mammal Protect Plan (MMPP);
- Adherence to the site-specific Construction Environmental Management Document (CEMD) detailing pollution prevention measures.
- The following good practice guidelines will be adhered to and incorporated into the CEMD:
    - GGP5: Works and maintenance in or near water;
    - PPG 6: Working at construction and demolition sites;
    - PPG 7: Safe Storage – The safe operation of refuelling facilities;
    - GPP21: Pollution and incident response planning; and
    - PPG22: Incident response – dealing with spills.
- An Ecological Clerk of Works (ECoW) will be employed throughout the construction phase to audit adherence to the mitigation outlined in the CEMD.
- The existing Habitat Management Plan which sets out compensatory and enhancement actions for the site should be updated to reflect the loss of bird nesting and roosting habitat on the spit.

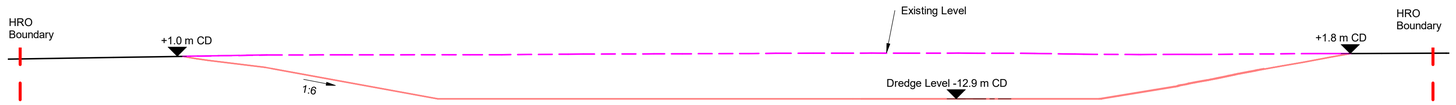
APPENDICES

A THE LOCATION OF DESIGNATED SITES IN RELATION TO THE PROPOSED DEVELOPMENT



Dredging Layout

Scale 1 : 5000



A Section A

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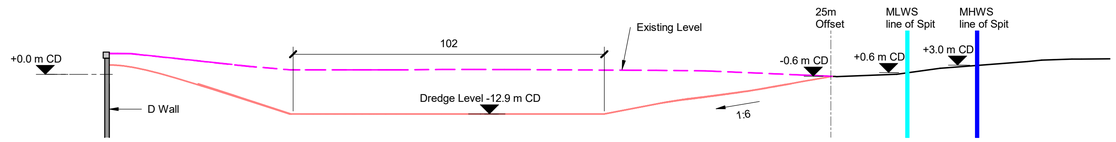

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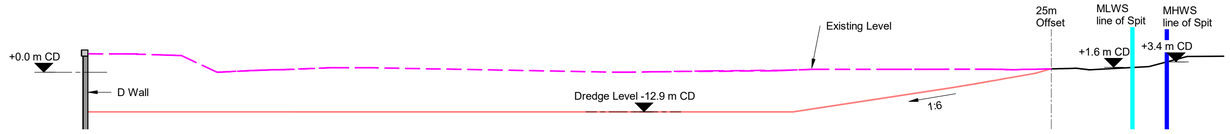

C Section C

1 : 1000

Legend

- Dredge Slope 1:6
- Spit Reinstatement area

Not for Construction

Notes:

1. All levels are in m above Chart Datum (mCD).
2. Coordinates are shwon to OS National Grid.

Issue	Date	
P01	12/05/2023	First Issue

ARUP

8 Fitzroy Street
London W1T 4BJ
Tel +44 (0)20 7636 1531 Fax +44 (0)20 7580 3924
www.arup.com

Client: Ardersier Port

Project Title: Ardersier Port

Drawing Title: Phase 1
Proposed Dredging Layout

Scale at A1	As indicated
By / Chkd / Appd	JDW/AR/PST
Role	Civil - Geotechnical
Status	S2 - Suitable for Information -
Arup Job No	294067-00
Rev	P01
ID	294067-ARUP-XX-XX-DR-CG-002001

Do not scale

15/05/2023 16:07:59

B UNDERWATER NOISE REPORT

Project title	Port of Ardersier: Additional underwater noise modelling
Project number	P239
Author(s)	<Redacted>
Company	Subacoustech Environmental Ltd.
Report number	P239R0101
Date of issue	18 July 2018

Introduction

In April 2013 Subacoustech Environmental undertook a study to model the likely subsea noise levels during the construction of a new offshore renewable manufacturing, assembly and port facility at the fabrication yard at Whiteness Head, Ardersier, northeast of Inverness, Scotland. The study covered noise from the dredging of a new channel leading into the port using a cutter-suction dredger and vibropiling to install the new quay wall.

Since the study was completed and included in the resulting environmental statement, new criteria have been introduced to assess anthropogenic underwater noise and its effect of marine species. This report presents the modelling results using assessment criteria for marine mammals from NMFS (2018) and for fish from Popper *et al*. (2014) and should be considered an addendum to the original report and environmental statement.

The modelling has been carried out using the same modelling methodology as the previous study using the SPEAR (Simple Propagation Estimator and Ranking) model, which is based on Subacoustech Environmental's substantial database of noise measurements from various noise sources and subsea activities.

Assessment criteria

Marine mammals

This assessment considers criteria defined by NMFS (2018) to assess the effects of impulsive noise on marine mammals.

The NMFS (2018) guidance puts marine mammal species into hearing groups and applies filters to the noise to approximate the hearing sensitivity of the receptor.

The hearing groups given in the NMFS (2018) guidance are summarised in Table 1. A further hearing group for Otariid Pinnipeds is also given for sea lions and fur seals, but this has not been used in this study as those species are not commonly found in the waters surrounding Great Britain.

Hearing group	Example species	Generalised hearing range
Low Frequency (LF) cetaceans	Baleen whales	7 Hz to 35 kHz
Mid Frequency (MF) cetaceans	Dolphins, toothed whales, beaked whales, bottlenose whales (including bottlenose dolphin)	150 Hz to 160 kHz
High Frequency (HF) cetaceans	True porpoises (including harbour porpoise)	275 Hz to 160 kHz
Phocid Pinnipeds (PW) (underwater)	True seals (including harbour seal)	50 Hz to 86 kHz

Table 1 Marine mammal hearing groups (from NMFS, 2018)

For non-impulsive noise like vibropiling and dredging, NMFS (2018) presents cumulative (i.e. noise received over a long period) 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 2 presents the NMFS (2018) criteria used in this study for each of the key marine mammal hearing groups.

Non-impulsive noise	PTS criteria	TTS criteria
Functional group	**SEL_{cum} (weighted) dB re 1 µPa²s**	**SEL_{cum} (weighted) dB re 1 µPa²s**
LF Cetaceans	199	179
MF Cetaceans	198	178
HF Cetaceans	173	153
PW Pinnipeds	201	181

Table 2 Assessment criteria for marine mammals from NMFS (2018) for non-impulsive noise

Fish

The Popper *et al*. (2014) criteria gives specific criteria for various stimuli, for which vibropiling and dredging fall into the 'Shipping and Other Continuous Noises' category. Species of fish are grouped by whether they have a swim bladder and whether that swim bladder is involved in its hearing. Unlike the marine mammal criteria defined in NMFS (2018), all values for fish have no frequency weighting for hearing sensitivity.

Where insufficient data is available (which is the case for most of effects from continuous noise sources), qualitative criteria have been given, summarising the effect of the noise as having either a high, moderate or low effect on an individual in either the near-field (tens of metres), intermediate-field (hundreds of metres), or far-field (thousands of metres). All the criteria are given in Table 3.

Type of animal	Mortality & potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: no swim bladder	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder not involved in hearing	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder involved in hearing	(N) Low (I) Low (F) Low	170 dB RMS for 48 hours	158 dB RMS for 12 hours	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Eggs and larvae	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) Moderate (I) Moderate (F) Low

Table 3 Assessment criteria for species of fish from Popper et al. (2014) for shipping and other continuous noises (for qualitative effects, N=Near-field, I=Intermediate-field, and F=Far-field)

The qualitative descriptions need not be considered further, but results are provided for the recoverable injury and TTS values for the most sensitive "fish with a swim bladder involved in hearing" category.

Modelling

The modelling has been carried out using the same methodology as the previous reporting included in the ES, however due to the new criteria being considered, several parameters have had to be introduced; these are discussed in the following section.

Modelling parameters

The source levels used for the modelling are summarised in terms of unweighted values and NMFS (2018) weighted values in Table 4 below.

	Dredging	Vibropiling
Unweighted RMS (1s SEL)	186.0 dB re 1 µPa @ 1 m	193.0 dB re 1 µPa @ 1 m
Low Frequency (LF) Cetaceans	183.5 dB re 1 μPa^2s @ 1 m	190.6 dB re 1 μPa^2s @ 1 m
Mid Frequency (MF) Cetaceans	178.1 dB re 1 μPa^2s @ 1 m	177.0 dB re 1 μPa^2s @ 1 m
High Frequency (HF) Cetaceans	176.4 dB re 1 μPa^2s @ 1 m	172.2 dB re 1 μPa^2s @ 1 m
Phocid Pinnipeds (PW)	181.8 dB re 1 μPa^2s @ 1 m	188.6 dB re 1 μPa^2s @ 1 m

Table 4 Summary of the source levels used for modelling

The NMFS (2018) criteria are based on cumulative received SELs, and as such an estimate must be made as to how long each noise source will be present in any 24-hour period. To cover all eventualities, 3 scenarios have been used for this assessment:

- A most-likely-case of 8 hours;
- A worst-case of 12 hours; and
- A maximum-case of 24 hours.

Most of these time periods are highly unlikely but have been included to show the most precautionary estimates for impact ranges.

Where the Popper *et al.* (2014) guidance gives specific criteria for continuous noise (Table 3), the criteria are stated as an SPL_{RMS}, and cumulative noise exposure calculations, as per SEL_{cum} for the NMFS criteria, are not required for comparative purposes.

The SEL_{cum} results have been calculated for both a fleeing animal, where the receptor swims away from the noise source, and a worst-case stationary animal model, where the receptor remains still throughout the noise activity, have been used. The fleeing animal model assumes the receptor flees at a constant speed away from the noise source, for this, a constant speed of 3.25 ms^{-1} has been assumed for the low frequency (LF) cetaceans group based on data for minke whale (Blix and Folkow, 1995), all other receptors, are assumed to swim at a constant speed of 1.5 ms^{-1} (Otani *et al*. 2000). These are considered worst-case speeds (i.e. relatively slow, leading to greater exposures) as most species are expected to be able to swim much faster under stress conditions.

The cumulative SEL range modelled is the distance that a receptor must be at the start of the vibropiling or dredging noise, at which point the receptor flees, progressively gaining exposure (in the case of the fleeing animal model, for the stationary animal model it is assumed that the receptor stays at the same range of the noise for the entire duration). Where a receptor is inside this range at the start of the noisy activity, the defined threshold will be exceeded.

The stationary animal model can be considered unrealistic, as no receptor would remain still for hours, but is included as a precautionary theoretical worst-case scenario.

Modelling results

The results from the modelling are summarised in Table 5 to Table 12 below, with impact ranges for dredging in Table 5 to Table 8 and vibropiling in Table 9 to Table 12.

Comparing like-for-like, vibropiling noise results in larger impact ranges than dredging, with the largest ranges expected for high frequency cetaceans. The ranges are exacerbated when considering long time periods or the case of a stationary animal.

It is also worth noting that the fleeing animal ranges barely change when comparing the different possible time periods. This is because after a certain point the receptor is at such a long range that the

additional noise from the source has either fallen below background or is sufficiently low as to not further add to the received noise.

Dredging NMFS (2018) - SEL_{cum} (8 hours)	**PTS criteria**		**TTS criteria**	
	Fleeing	**Stationary**	**Fleeing**	**Stationary**
Low Frequency (LF) Cetaceans	< 1 m	34 m	2 m	370 m
Mid Frequency (MF) Cetaceans	< 1 m	20 m	2 m	220 m
High Frequency (HF) Cetaceans	3 m	330 m	230 m	2.8 km
Phocid Pinnipeds (PW)	< 1 m	22 m	2 m	240 m

Table 5 Summary of the impact ranges for auditory injury using criteria from NMFS (2018) for dredging (non-impulsive) noise over 8 hours

Dredging NMFS (2018) - SEL_{cum} (12 hours)	**PTS criteria**		**TTS criteria**	
	Fleeing	**Stationary**	**Fleeing**	**Stationary**
Low Frequency (LF) Cetaceans	< 1 m	42 m	2 m	460 m
Mid Frequency (MF) Cetaceans	< 1 m	25 m	2 m	280 m
High Frequency (HF) Cetaceans	3 m	400 m	230 m	3.3 km
Phocid Pinnipeds (PW)	< 1 m	27 m	2 m	300 m

Table 6 Summary of the impact ranges for auditory injury using criteria from NMFS (2018) for dredging (non-impulsive) noise over 12 hours

Dredging NMFS (2018) - SEL_{cum} (24 hours)	**PTS criteria**		**TTS criteria**	
	Fleeing	**Stationary**	**Fleeing**	**Stationary**
Low Frequency (LF) Cetaceans	< 1 m	61 m	2 m	640 m
Mid Frequency (MF) Cetaceans	< 1 m	36 m	2 m	390 m
High Frequency (HF) Cetaceans	3 m	570 m	230 m	4.3 km
Phocid Pinnipeds (PW)	< 1 m	39 m	2 m	420 m

Table 7 Summary of the impact ranges for auditory injury using criteria from NMFS (2018) for dredging (non-impulsive) noise over 24 hours

Dredging Popper *et al*. (2014) - RMS	**Recoverable injury**	**TTS**
Fish: swim bladder involved in hearing	7 m (48 hours)	30 m (12 hours)

Table 8 Summary of the impact ranges for fish using criteria from Popper et al. (2014) for dredging (continuous) noise. Fish must remain within this range for the time in parentheses to reach threshold.

Vibropiling NMFS (2018) - SEL_{cum} (8 hours)	**PTS criteria**		**TTS criteria**	
	Fleeing	**Stationary**	**Fleeing**	**Stationary**
Low Frequency (LF) Cetaceans	< 1 m	110 m	9 m	1.4 km
Mid Frequency (MF) Cetaceans	< 1 m	21 m	< 1 m	270 m
High Frequency (HF) Cetaceans	2 m	280 m	200 m	3.6 km
Phocid Pinnipeds (PW)	< 1 m	62 m	8 m	800 m

Table 9 Summary of the impact ranges for auditory injury using criteria from NMFS (2018) for vibropiling (non-impulsive) noise over 8 hours

Vibropiling NMFS (2018) - SEL_{cum} (12 hours)	**PTS criteria**		**TTS criteria**	
	Fleeing	**Stationary**	**Fleeing**	**Stationary**
Low Frequency (LF) Cetaceans	< 1 m	130 m	9 m	1.7 km
Mid Frequency (MF) Cetaceans	< 1 m	26 m	< 1 m	340 m
High Frequency (HF) Cetaceans	2 m	340 m	200 m	4.4 km
Phocid Pinnipeds (PW)	< 1 m	77 m	8 m	1.0 km

Table 10 Summary of the impact ranges for auditory injury using criteria from NMFS (2018) for vibropiling (non-impulsive) noise over 12 hours

Vibropiling NMFS (2018) - SEL_{cum} (24 hours)	PTS criteria		TTS criteria	
	Fleeing	Stationary	Fleeing	Stationary
Low Frequency (LF) Cetaceans	< 1 m	190 m	9 m	2.5 km
Mid Frequency (MF) Cetaceans	< 1 m	38 m	< 1 m	490 m
High Frequency (HF) Cetaceans	2 m	500 m	210 m	6.5 km
Phocid Pinnipeds (PW)	< 1 m	120 m	8 m	1.5 km

Table 11 Summary of the impact ranges for auditory injury using criteria from NMFS (2018) for vibropiling (non-impulsive) noise over 24 hours

Vibropiling Popper *et al*. (2014) - RMS	Recoverable injury	TTS
Fish: swim bladder involved in hearing	19 m (48 hours)	88 m (12 hours)

Table 12 Summary of the impact ranges for fish using criteria from Popper et al. (2014) for vibropiling (continuous) noise. Fish must remain within this range for the time in parentheses to reach threshold.

Conclusions

Revised underwater noise modelling has been undertaken in respect of recent marine mammal and fish impact thresholds published since issue of the original underwater noise impact assessment. Using these new thresholds, the risk of PTS onset to any species would require a receptor to be within 10 m of the noise source under consideration, assuming that the receptor swims away from the noise. TTS onset could occur within 230 m of the noise source.

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