



**Flotta Deep Water Quay
Marine Mammal Risk Assessment**

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EXECUTIVE SUMMARY

EnviroCentre Limited was commissioned by Arch Henderson LLP to undertake a Marine Mammal Risk Assessment (MMRA) to inform a Bathymetric and Geophysical Survey in relation to the design of the proposed Flotta Deep Water Quay (FDWQ). The information will be used to inform navigable depths and provide information on the local geology, including sediment profiles to rockhead, to inform on potential designs for a new quayside.

Without mitigation, the noise generated by the geophysical surveys and increased vessel movement to undertake the surveys, produce some risk of death or injury to marine mammals.

The noise generated from the multibeam bathymetry survey and sonar imagery survey is screened out based on the high frequency of noise being outwit the hearing band for cetaceans and the shallow depth of the water allows noise to attenuate more quickly.

Given the mitigation, as outlined in section 4 is employed and considering 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.

Contents

Executive Summary	i
1 Introduction	1
1.1 Terms of Reference	1
1.2 Scope of Report	1
1.3 Proposed Survey Works	1
1.4 Report Usage	2
2 Marine mammal Baseline	4
2.1 Desk Study Sources	4
2.2 Marine Mammal Baseline Summary	5
3 Marine Mammal Risk Assessment	6
3.1 Activities Affecting Marine Mammals	6
3.2 Impacts of Underwater Noise to Marine Mammals	7
3.3 Effects of Increased Vessel Movement	8
3.4 Assessment of Risk to Marine Mammals	8
4 Marine Mammal Mitigation Plan	9
4.1 Marine Mammal Observer	9
4.2 MMO Equipment	9
4.3 MMO Protocol	10
4.4 Vessel Movement Mitigation Protocol	11
4.5 Additional Good Practice Recommendations	11

Figures

Figure 1-1: Location of survey works (red hatch)	2
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1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Limited was commissioned by Arch Henderson LLP to undertake a Marine Mammal Risk Assessment (MMRA) to inform a Bathymetric and Geophysical Survey in relation to the design of the proposed Flotta Deep Water Quay (FDWQ). The information will be used to inform navigable depths and provide information on the local geology, including sediment profiles to rockhead, to inform on potential designs for a new quayside.

1.2 Scope of Report

This study aims to establish which species are likely to present and could be impacted by the proposed seabed survey works to inform the requirements for a European Protected Species (EPS) licence from Marine Scotland. The objectives were as follows:

- Collate existing data in relation to designated sites, species records, distribution, population counts, habitat use and any other relevant information, to establish which species are likely to be present within the development site and the wider zone of influence of the development.
- Identify potential impacts to marine mammals which could occur as a result of the survey works.
- Provide a summary of species which are likely to be present and which may be subject to significant impacts.

1.3 Proposed Survey Works

The survey includes an overwater bathymetric and geophysical surveys of an area of approximately 0.77km² adjacent to the Flotta Oil Terminal, Orkney Isles. The information will be used to inform navigable depths and provide information on the local geology, including sediment profiles to rockhead, to inform on potential designs for a new quayside.

The survey area is noted below in Figure 1-1, and is located within in an area of relatively shallow water, therefore, works will be limited to working over high water, ideally during a spring tide.

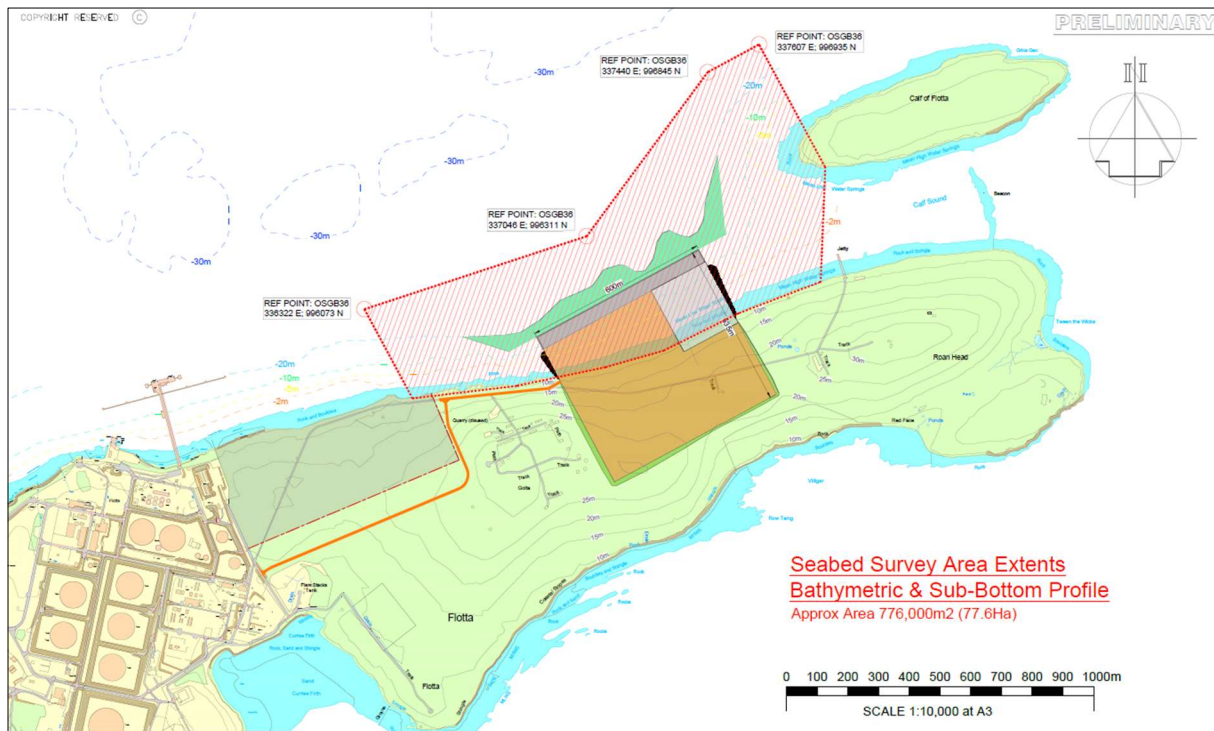


Figure 1-1: Location of survey works (red hatch)

The survey works include:

- A multibeam bathymetry, the use of multiple, simultaneous sound waves, to provide a map of the sea floor profile.
- A geophysical survey of the area adjacent to the dock will be undertaken to determine the depth of sediment overlay and rockhead profile.
- Side-scan sonar imagery is commonly used to detect items of debris and other obstructions on the seabed that may be hazardous to shipping or construction installations and to provide an understanding of the differences in material and geology of the seabed.
- A magnetometer survey to detect metallic objects on the seabed and in the sub-strata, aiding the identification of ferrous objects.

1.4 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 Sources

In order to anticipate the potential marine mammal ecological sensitivities at the site, a desk study was conducted. The following sources were checked:

- The Joint Nature Conservation Committee (JNCC)¹ & ²;
- Sea Watch Foundation (SWF)³ & ⁴;
- NatureScot (NS)⁵;
- Whale and Dolphin Conservation (WDC)⁶;
- The Hebridean Whale and Dolphin Trust (HWDT) Whale Track⁷;
- Orcadian Wildlife (OW)⁸;
- Scottish Marine Animal Stranding Scheme (SMASS)⁹;
- NS Seals Webpage¹⁰;
- Marine Scotland (MS) Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters ¹¹ and appendices¹²;
- IUCN Red List¹³

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 efforts rather than actual distribution.

¹ JNCC Statutory Nature Conservation Agency Guidelines for Minimising the Risk of Injury to Marine Mammals from geophysical surveys (2017) available at: <https://hub.jncc.gov.uk/assets/e2a46de5-43d4-43f0-b296-c62134397ce4> last accessed 29/08/2023

² 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> last accessed 29/08/2023

³ Sea Watch Foundation Cetaceans of Orkney available at: <https://seawatchfoundation.org.uk/wp-content/uploads/2012/07/Orkney2.pdf> last accessed 29/08/2023

⁴ Sea Watch Foundation Recent Sightings Orkney available at: <https://www.seawatchfoundation.org.uk/recent sightings/> last accessed 29/08/2023

⁵ SNH About Scotland's Nature: Marine Mammals available at: <https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals> last accessed 29/08/2023

⁶ WDC species guides available at: <https://uk.whales.org/whales-dolphins/species-guide/> last accessed 29/08/2023

⁷ HWDT sightings data available at: <https://whaletrack.hwdt.org/sightings-map/> last accessed 29/08/2023

⁸ Orcadian Wildlife information available at: <http://orcadianwildlife.co.uk/wPress/cetaceans-in-orkney/> last accessed 29/08/2023

⁹ Species reported within a 10km (sea route) from 2001-2020 to Scottish Marine Animal Stranding Scheme (SMASS) available at: <https://strandings.org/map/> last accessed 29/08/2023

¹⁰ NatureScot Seals available at: <https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals/seals> last accessed 29/08/2023

¹¹ Marine Scotland 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: <https://data.marine.gov.scot/sites/default/files/Scottish%20Marine%20and%20Freshwater%20Science%20%28SMFS%29%20Vol%2011%20No%2012%20Regional%20baselines%20for%20marine%20mammal%20knowledge%20across%20the%20North%20Sea%20and%20Atlantic%20areas%20of%20Scottish%20waters.pdf>

¹² Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters: Appendix 3 - SCANS surveys Scottish Marine and Freshwater Science Vol 11 No 12, available at: <https://data.marine.gov.scot/sites/default/files/Scottish%20Marine%20and%20Freshwater%20Science%20%28SMFS%29%20Vol%2011%20No%2012%20Regional%20baselines%20for%20marine%20mammal%20knowledge%20across%20the%20North%20Sea%20and%20Atlantic%20areas%20of%20Scottish%20waters%20-%20Appendix%203%20SCANS%20surveys%20%281%29.pdf>

¹³ IUCN Red List available at: <http://www.iucnredlist.org/> last accessed 29/08/2023

2.2 Marine Mammal Baseline Summary

Seven species of cetacean are thought to be present throughout the year in Orkney waters, or at least recorded annually as seasonal visitors, which include (with closest approximate records);

- Minke whale (*Balaenoptera acutorostrata*), 7km south east;
- Long-finned pilot whale (*Globicephala melas*), 5km south west;
- Killer whale (*Orcinus orca*, Scapa flow, north west of the survey area;
- Risso's dolphin (*Grampus griseus*), 13km south east;
- White-beaked dolphin (*Lagenorhynchus albirostris*), 13km west;
- Atlantic white-sided dolphin (*Lagenorhynchus acutus*) 11km north east; and
- Harbour porpoise (*Phocoena phocoena*), 5km east

Unusual cetacean sightings have included fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), Sperm whale (*Physeter macrocephalus*), Sowerby's beaked whale (*Mesoplodon bidens*), Cuvier's beaked whale (*Ziphius cavirostris*), Northern bottlenose whale (*Hyperoodon ampullatus*), short-beaked common dolphin (*Delphinus delphis*), Bottlenose dolphin (*Tursiops truncatus*), False killer (*Pseudorca crassidens*), and Beluga (*Delphinapterus leucas*).

3 MARINE MAMMAL RISK ASSESSMENT

3.1 Activities Affecting Marine Mammals

Proposed activities which will introduce underwater noise into the marine environment include multibeam bathymetry survey, geophysical survey and side-scan sonar survey and any associated vessel movement.

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;
- 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 exact details (or as close to those as possible) of the equipment to be used have been provided. The three methods below are considered the most significant:

3.1.1 Multibeam Bathymetry Survey

The multibeam bathymetry survey works include the use of multiple, simultaneous sound waves, to provide a map of the sea floor profile. The equipment proposed will operate between 200kHz and 400kHz.

3.1.2 Geophysical Survey

A geophysical survey of the area adjacent to the dock will be undertaken to determine the depth of sediment overlay and rockhead profile. The sub-bottom profiling element of the survey will be conducted utilising seismic reflection techniques, with an acoustic boomer system. A short duration, high power electrical pulse discharges to an electrical coil and the resultant magnetic field explosively repels the metal plate, generating a broad band acoustic pressure pulse in the water column. The frequency of this pulse is in the range of 400Hz to 14kHz, with most of the energy being directed vertically downward at a maximum output of 300 joules per pulse. The system is mounted on a catamaran, towed off a vessel.

3.1.3 Sonar Imagery Survey

Side-scan sonar imagery is commonly used to detect items of debris and other obstructions on the seabed that may be hazardous to shipping or construction installations and to provide an understanding of the differences in material and geology of the seabed. The side-scan system identified, operates at between 400kHz and 900kHz.

3.2 Impacts of Underwater Noise to Marine Mammals

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 Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing*'¹⁴. 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 fatigue¹⁵.

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 works is assessed by modelling representative scenarios, taking into account environmental variables and the animal's hearing capabilities.

Three noise sources were considered for this assessment, as outlined below.

3.2.1 Multibeam Bathymetry Survey

The multibeam bathymetry survey equipment operates between 200kHz and 400kHz. As the survey is proposed for shallow waters, JNCC guidance¹⁶ states that multi-beam surveys in shallower waters (<200m) are not considered a risk to marine mammals as the higher frequencies used fall outside the frequencies for cetaceans. The sounds produced attenuate more quickly than lower frequencies used in deeper waters. Therefore this sound source is screened out as a potential impact for marine mammals.

3.2.2 Geophysical Survey

The geophysical survey equipment operates between 400 Hz to 14 kHz. This noise level is considered to fall within the hearing range of marine mammals commonly identified in Orkney waters, including the sensitive hearing range for minke whale (200 Hz to 19 kHz), harbour porpoise (12 kHz to 140kHz) and Risso's dolphin (8.8 kHz to 110 kHz)¹⁷. Therefore, it is considered that noise generated from his survey, if unmitigated, could lead to PTS or TTS effects to marine mammals in the vicinity of works.

¹⁴ NOAA guidance available at: <http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm> last accessed 31/08/2023

¹⁵ JNCC UK Marine Noise Registry: Information Document available at: http://jncc.defra.gov.uk/pdf/MNR_Draft_InfoDoc_V1_20160808.pdf last accessed 31/08/2023

¹⁶ JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (Page 17m, accessed 31/08/2023)

¹⁷ Contents (cyfoethnaturiol.cymru) Table 3- Marine mammal hearing groups and estimated hearing ranges, original source Southell et al (2019). Accessed online 01/09/2023

3.2.3 Sonar Imagery Survey

The sonar imagery survey equipment operates at 400 kHz and 900 kHz. These noise parameters are outwith the hearing range for cetaceans, i.e. minke whale (7 Hz to 35 kHz), harbour porpoise (275 Hz to 160 kHz) and Risso's dolphin (150 Hz to 160 kHz). Therefore, this sound source is screened out as a potential impact for marine mammals.

3.3 Effects of Increased Vessel Movement

Larger whales (predominantly Baleen whales) are most often reported in regard to vessel collisions. In general, larger whales are less manoeuvrable than smaller cetaceans and therefore, may be a likely attribute to vessel collision. For example, minke whales have reportedly been killed by ship strikes in UK waters. However, baleen whales are observed much less frequently in the vicinity of FDWQ.

Harbour porpoises often live in the vicinity of vessel traffic and reactions by porpoises to various types of vessels showed only short-term negative effects from speedboats and large ferries in a study by the Sea Watch Foundation¹⁸. HWDC¹⁹ 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.

Risso's dolphins are rarely seen approaching vessels or bow-riding, suggesting that this species may actively avoid vessel traffic.

Killer whales are generally inquisitive and are observed approaching vessels, however, like other smaller cetaceans (white-beaked dolphin and pilot whales) they are fast, agile and manoeuvrable in water.

3.4 Assessment of Risk to Marine Mammals

Without mitigation, the noise generated by the geophysical surveys and increased vessel movement to undertake the surveys, produce some risk of death or injury to marine mammals.

The noise generated from the multibeam bathymetry survey and sonar imagery survey is screened out based on the high frequency of noise being outwith the hearing band for cetaceans and the shallow depth of the water allows noise to attenuate more quickly.

Given the mitigation, as outlined in section 4 is employed and considering 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 Conservation (Natural Habitats, &c.) Regulations 1994's definition of significant disturbance.

¹⁸ 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

¹⁹ HWDC Harbour Porpoise information available at: <https://hwdt.org/harbour-porpoise> last accessed 12/12/2022

4 MARINE MAMMAL MITIGATION PLAN

The Marine Mammal Observation Protocol (MMOP) will be implemented so that the geophysical survey works do not cause injury or unnecessary disturbance to marine mammals. This section has been designed with reference to current JNCC guidance 'JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys' (2017).

4.1 Marine Mammal Observer

A suitably qualified Marine Mammal Observer (MMO), competent in the identification of marine mammals at sea, will be present during the geophysical survey works. The MMO will undertake observation for marine mammals within the mitigation zone before 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 of an MMO:

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 a vessel 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.

The MMO will be trained. The identity and credentials of the MMO will be agreed with Marine Scotland.

4.2 MMO Equipment

The MMO will be equipped with binoculars (10X42 or similar) and/or a spotting scope (20-60 zoom or equivalent), a copy of the agreed protocol and the Marine Mammal Recording Form (MMRF), 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 the MMO may prefer to use this when observing before transferring the details to the Excel spreadsheets. The ability to determine the range of marine mammals is a key skill for MMOs, therefore a hand-held rangefinder will be used to verify the range.

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

4.2.1 Communication

The contractor will be responsible for the communication channels between those providing the mitigation service and the crews working on the survey vessel. A formal chain of communication from

the MMO to the contractor, who will start/stop the survey works, will be established. In order to confirm the chain of communication and command the MMO will attend any relevant pre-mobilisation meetings.

4.2.2 Mitigation Zone

The MMO/PAM operative will monitor the agreed mitigation zone and advise if any marine mammals are within it. The standard radius of the mitigation zone is 500m, estimated from the centre of the airgun array or noise source location (noting comments in 0). If the size of the mitigation zone is adjusted for any reason, this will be stipulated within the survey consent or licence conditions.

4.3 MMO Protocol

1. The geophysical survey works should also be scheduled on days when the sea is expected to be calm (less than sea state 2).
2. Visual monitoring will not commence during 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 conducive²⁰) 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. An elevated platform for the MMO to monitor from would be beneficial.
3. The MMO(s) will likely be onboard the survey vessel, or a land-based platform, that provides the best viewing platform, that allows 360 degree visual cover, and is likely to be closest to the geophysical survey activities.
4. The mitigation zone will be monitored visually by the MMO for an agreed period prior to the commencement of geophysical survey works. This will be a minimum of 30 minutes.
5. 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, 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.
6. Geophysical survey activities should not be undertaken within 20 minutes of a marine mammal being detected within the mitigation zone.
7. If a marine mammal is observed, or acoustically detected, within the mitigation zone, it should be monitored and tracked until it moves out of range. The MMO should notify the relevant chain of command of the detection and advise that the operation should be delayed. If the marine mammal is not detected again within 20 minutes, it can be assumed that it has left the area and the works may commence.
8. If an MMO is uncertain whether marine mammals are present within the mitigation zone, they should advise that the activity should be delayed as a precaution until they are certain that no animals are present.

²⁰ 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.

9. A soft-start will be employed, with the gradual ramping up of geophysical survey works (where possible). 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.

10. If a marine mammal enters the mitigation zone during the soft-start then, whenever possible, the works will cease until the marine mammal exits the mitigation zone and there is no further detection for 20 minutes.

4.3.1 Reporting

As per the JNCC guidance, reports detailing the geophysical survey activity and marine mammal mitigation (the MMO reports) will be sent to Marine Scotland at the conclusion of the geophysical survey. Reports will include:

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

4.4 Vessel Movement Mitigation Protocol

Survey Vessel operators should be provided with a pre-works toolbox talk about the likely presence of cetaceans and other marine mammals (seals) in the area. The toolbox talks should also information to avoid disturbance to and/or collision with marine mammals which should include, but is not limited to the following:

- 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 marine mammals. 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.

4.5 Additional Good Practice Recommendations

If any dead cetacean is 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.