Leverburgh – Berneray Ferry Route Geophysical Survey Marine Mammal and Basking Shark Risk Assessment

CMAL
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Stòras Mara Cailleannach Eta

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1 Introduction

Caledonian Maritime Assets Limited (CMAL) has contracted SOCOTEC Land & Hydrographic Surveys (previously known as Aspect Land & Hydrographic Surveys) to carry out geophysical surveys on a section of the Leverburgh – Berneray ferry route between the islands of Harris and North Uist in the Outer Hebrides. The results of these surveys will inform dredging operations to achieve safe and operable depths along the ferry route.

The proposed geophysical surveys will involve the use of active acoustic survey methods (Sub-Bottom Profiling (SBP) and Multibeam Echosounders (MBES)) to determine the composition of the seabed and hence appropriate dredging techniques to employ.

This Marine Mammal and Basking Shark Risk Assessment has been produced to support the applications for a European Protected Species (EPS) Licence and Basking Shark Licence to disturb cetaceans and basking sharks (*Cetorhinus maximus*). These licences permit activities that have the potential to disturb or injure cetaceans and basking sharks.

The area that is proposed for geophysical surveying sits within the Sound of Harris, which is an important site for several species of marine mammal (cetaceans and pinnipeds) and is also in the vicinity of basking shark feeding grounds. Both marine mammals and basking sharks are sensitive to anthropogenic underwater noise, thus the proposed geophysical surveys have the potential to disturb or cause harm to these species. The potential for disturbance caused by vessel movements is also considered within this risk assessment.

The Eurasian otter (*Lutra lutra*) is a designated feature of the nearby Loch nam Madadh Special Area of Conservation (SAC), as well as the Loch an Duin Site of Special Scientific Interest (SSSI) and Ramsar sites. These sites have been further considered with the accompanying Designated Sites Considerations Report (Affric, 2026). However, as otter are an EPS that are likely to be encountered in the proposed survey area, they have also been considered within this risk assessment.

The purpose of this Marine Mammal and Basking Shark Risk Assessment is to:

- Understand and assess the likelihood of potential impacts of the proposed geophysical surveys in the Sound of Harris;
- Evaluate the baseline for protected species occurrence in the area, that may be at risk from the identified impacts;
- Assess the magnitude of potential impacts to species and populations; and
- Identify appropriate mitigation to lessen the impact associated with the activities which may cause injury or disturbance to marine mammals and basking sharks.

1.1 Location

The Sound of Harris is located between the islands of North Uist and Harris in the Outer Hebrides, the Sound is approximately 38.5 miles (62km) south-west of Stornoway. The Sound contains many small islands, with a complex environment of shallow sand banks, inlets, and rocky outcrops (Malthus *et al.*, 2006). The proposed geophysical survey boundary is along an approximately 2km long and 300m wide section of the Leverburgh – Berneray ferry route (see Drawing 161_DRG_02_1), where depths range between 2 and 8m (i-Boating, 2026).

2 Legislative Context

The European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (commonly known as 'The Habitats Directive'), led to the establishment of Natura 2000 Sites (now known as 'European Sites' in the United Kingdom (UK)) and designation of EPS. The Habitats Directive continues to apply following the UK's exit from the European Union (EU) and is transposed into Scottish law via the Conservation (Natural Habitats, &c.) Regulations 1994 (commonly known as the 'Habitats Regulations'). As a result of the UK leaving the EU, the Habitats Regulations were amended in Scotland in 2019. The Habitats Regulations remain in force, including the provisions for the protection of European sites.

All cetaceans and otter are listed as Annex IV EPS under the Habitats Directive and therefore included in Schedule 2 of the Habitats Regulations 1994 as EPS. Under regulation 39(1) of the Habitats Regulations 1994 (as amended), it is an offence to deliberately or recklessly kill, injure, harass, or disturb an EPS. If an activity is likely to result in disturbance or injury to an EPS, an EPS licence will be required.

Pinnipeds are not EPS but are listed under Annex II of the Habitats Directive. This designation requires management of the species-specific ecological needs and protects their core habitats through the European site network. For pinnipeds this means that their key haul-out sites are protected and must not be disturbed, though it is important to note that pinnipeds are only protected on land. Furthermore, under the Marine (Scotland) Act 2010, it is a criminal offence to kill, injure, or take a seal, or to deliberately or recklessly harass a seal at a designated haul-out site.

Basking sharks are protected under the Wildlife and Countryside Act 1981; it is an offence to cause disturbance or injury to basking sharks. A basking shark licence is required to undertake an activity legally that may cause this offence.

Additionally, important habitat areas have been designated for the protection of these and other species (including Special Protection Areas (SPA), SACs, SSSI, Ramsar sites, Seal Haul-Outs, and Marine Protected Areas (MPAs)). The relevant legislation for these is considered in detail in the accompanying Designated Sites Considerations Report (Affric, 2026).

3 Methodology

This risk assessment uses the source-pathway-receptor model to understand how the activities (sources) being undertaken can impact the species (receptors) present (Figure 3.1.1).

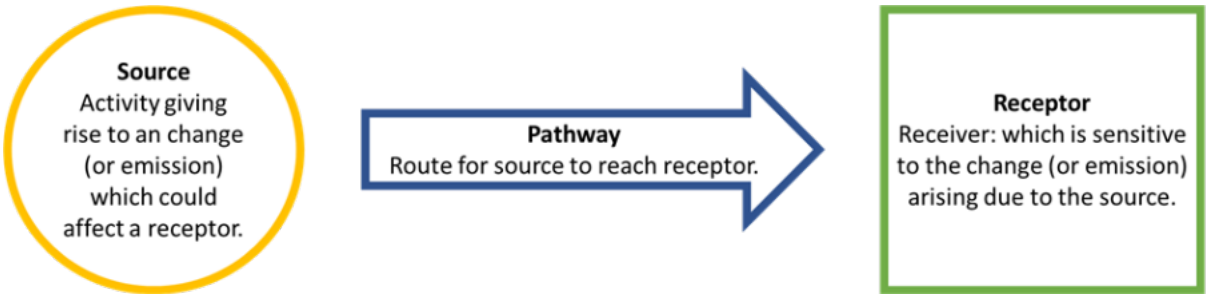

Figure 3.1.1: Source-Pathway-Receptor Model

3.1 Sources

The activities being undertaken in the proposed geophysical surveys that could interact with and impact marine mammals, basking sharks and otter (receptors) are identified in Section 4: Description of the Proposed Geophysical Survey.

3.2 Receptors

Baseline information on the abundance and distribution of marine mammals, basking sharks and otter in the Sound of Harris has been compiled through a desk-based review of the following sources:

- The Small Cetaceans in European Atlantic Waters and the North Sea (SCANS) surveys III & IV;
- The Hebridean Whale and Dolphin Trust (HWDT) sightings map;
- Sea Watch Foundation Map Viewer;
- Inter-Agency Marine Mammal Working Group (IAMMWG) management unit (MU) reports;
- Special Committee on Seals (SCOS) 2024 report; and
- National Biodiversity Network (NBN) Atlas Interactive Map.

The SCANS-IV, IAMMWG and SCOS reports provide estimates of mean group sizes and densities for large survey areas. As species' distributions through these areas are not uniform but patchy, it was more appropriate to gather site-specific estimates of mean group size from the HWDT sightings map. We also checked sightings recorded by the Sea Watch Foundation (Sea Watch Foundation, 2026). However, this platform is less commonly used in this region and the numbers of records available were not useful for the estimates required in this area. Species group size was estimated using sightings reported between July 2017 – February 2026. The HWDT data is not standardised in effort, and correct species identification cannot be confirmed as the database is submitted by members of the public that may not have received formal identification training. Therefore, this was used for indicative purposes only. Furthermore, densities and population estimates of pinnipeds, otter and basking shark could not be calculated within the Sound as this information is not available.

3.3 Assessment

3.3.1 Acoustic Risk

Acoustic risk posed by the proposed activities to the marine mammal and basking shark populations identified in the baseline assessment is evaluated in Section 7: Risk Assessment. The risk includes the sensitivity of identified species to noise, the extent of noise exposure from the activity, and the potential impact magnitude to each species. Acoustic sensitivity is evaluated by comparing the species' hearing range with the levels of noise exposure required to cause injury or disturbance.

Exposure to intense noise has potential to cause injury to marine mammals and basking shark. Disturbance, as defined under the Habitats Directive, will occur if animals incur sustained or chronic disruptions to behaviour that are likely to impair an individual's ability to survive, breed, reproduce, or raise young.

3.3.1.1 Marine Mammals

Cetaceans and pinniped species can be broadly grouped by their hearing range sensitivity. Cetacea are divided into mysticetes and odontocetes, which differ in diet and behaviour. Mysticetes (baleen whales) utilise low-frequency sounds and feed by filtering plankton from the water through baleen plates, while odontocetes (toothed whales, dolphins and porpoise) use high-frequency sounds and primarily hunt fish. Different hearing sensitivities across species influences how they are affected by exposure to noise. Marine mammal species are broadly grouped by their hearing sensitivities. These groups and guidance for their hearing ranges have undergone updates as new information became available. Most recent guidance for generalised hearing ranges and the onset of auditory impacts for these groups, developed by the United States' National Marine Fisheries Service (NMFS, 2024a) are summarised in Table 3.3.1. The previously held guidance from Southall *et al.* (2019) is also presented with examples of species which are relevant to the Sound of Harris.

Table 3.3.1: Marine Mammal Hearing Groups

Hearing Group	Marine Mammal Species (Example)	Generalised Hearing Range (NMFS, 2024a)	Generalised Hearing Range (Southall *et al.*, 2019)
Low Frequency (LF) Cetaceans	All Species of Baleen Whale e.g. Minke Whale (*Balaenoptera acutorostrata*)	7Hz to 36kHz	7Hz to 35kHz
High Frequency (HF) Cetaceans	All UK Species of True Dolphin e.g. Common Dolphin (*Delphinus delphis*)	150Hz to 160kHz	150Hz to 160Hz
Very High Frequency (VHF) Cetaceans	All UK Species of True Porpoise e.g. Harbour Porpoise (*Phocoena phocoena*)	200Hz to 165kHz	275Hz to 160kHz
Phocid Pinnipeds (PW)	All Phocid Species e.g. Grey Seal (*Halichoerus grypus*)	40Hz to 90kHz	50Hz to 86kHz

Guidance on marine mammal hearing for the onset of auditory impacts presents single strike, unweighted sound pressure level peak criteria (SPL_{peak}) and cumulative (i.e., more than a single sound impulse) weighted sound exposure level criteria (SEL_{cum}), for sound energy accumulated over a 24-hour period. Southhall *et al.* (2019) laid out criteria for onset of Temporary Threshold Shift (TTS) and Permanent Threshold Shift (PTS). The NMFS guidance (NMFS, 2024a) includes changes to the terminology for auditory impacts, providing criteria for onset of TTS and auditory injury (AUD INJ). AUD INJ encompasses damage to the inner ear that can result in destruction of tissue, which may or may not result in PTS.

This assessment of acoustic risk uses the NMFS 2024 criteria (NMFS, 2024a). As these criteria and terminology have only recently been adopted into risk assessments, we also present the

Southall *et al.* (2019) criteria for reference. These criteria for the onset of PTS / AUD INJ and TTS risk for each of the key marine mammal hearing groups when considering impulsive (e.g. impact piling) from NMFS (2024a) and Southall *et al.* (2019) are presented in Table 3.3.2. The NMFS (2024a) values used for this assessment have been shown in bold text in this table.

Table 3.3.2: Criteria for Onset of Auditory Impacts for Marine Mammal Hearing Groups from Southall *et al.* (2019) and NMFS (2024) guidance

Hearing Group	Parameter	Impulsive			
		TTS (dB re 1µPa)		PTS (dB re 1µPa)	AUD INJ (dB re 1µPa)
		Southall *et al.* 2019	NMFS 2024a	Southall *et al.* 2019	NMFS 2024a
LF cetaceans	SPL_{peak}, unweighted	213	**216**	219	**222**
	SEL_{cum}, LF weighted	168	**168**	183	**183**
HF cetaceans	SPL_{peak}, unweighted	224	**224**	230	**230**
	SEL_{cum}, HF weighted	170	**178**	185	**193**
VHF cetaceans	SPL_{peak}, unweighted	196	**196**	202	**202**
	SEL_{cum}, VHF weighted	140	**144**	155	**159**
PW	SPL_{peak}, unweighted	212	**217**	218	**223**
	SEL_{cum}, PW weighted	170	**168**	185	**183**

3.3.1.2 Otter

Scientific publications indicate that otter have an in-air hearing range of approximately 125 Hz to 32 kHz (Ghoul & Reichmuth, 2014). However, there is insufficient evidence to establish an auditory injury threshold for either impulsive or non-impulsive noise. As a result, potential risks of PTS/AUD INJ or TTS cannot be quantified for otters.

Otters frequently swim with their heads above the water and typically only submerge during foraging. Consequently, they are also susceptible to disturbance from airborne noise. Given the current state of knowledge, behavioural disturbance is considered a more relevant concern than auditory injury.

3.3.1.3 Basking Shark

Basking sharks are less sensitive to underwater noise than bony fishes due to their lack of a swim bladder (Hart & Collin, 2015). Sharks are understood to have an auditory range of 20Hz–1.5kHz, with peak sensitivities between 200–600Hz depending on the species (Chapuis *et al.*, 2019). Though there is little known about basking shark hearing range specifically.

Popper *et al.* (2014) groups fish into functional hearing groups as shown in Table 3.3.3. Popper & Hawkins (2019) further proposes TTS, mortal and recoverable injury criteria from impulsive noise exposure for fishes. The applicable criterion for basking shark is presented in Table 3.3.4. For simplicity, recoverable injury was used in place of AUD INJ, as an AUD INJ threshold is not available for basking shark.

Table 3.3.3: Relevant Functional Hearing Groups & Acoustic Impact Thresholds (Popper *et al.*, 2014; Popper & Hawkins, 2019)

Functional Hearing Group	Potential Mortal Injury	Recoverable Injury	TTS
Fish: No Swim Bladder (P-)	>219dB SEL_{cum}	>216dB SEL_{cum}	>186dB SELcum
	> 213dB peak	> 213dB peak	

Table 3.3.4: The Proposed Interim Criteria for Mortality and Recovery Injury from Impulsive Noise Exposure and TTS for Fish: No Swim Bladder, which Includes Basking Sharks (Popper & Hawkins, 2019)

Functional Hearing Group	Relevant Fish Receptors	Sensitivity to Underwater Noise
Fish: No Swim Bladder (P-)	Basking Shark	Least Sensitive
Fish: Swim Bladder Not Involved in Hearing (P-)	None	↓
Fish: Swim Bladder Involved in Hearing (P+)	None	Most Sensitive

3.3.1.4 Risk Estimation

Effect distances for the onset of TTS and AUD INJ for marine mammals and basking shark (recoverable injury in place of AUD INJ) were calculated with the NMFS User Spreadsheet tool (NMFS, 2024b) using the Impulsive-Mobile functions. These functions assume a stationary receiver (receptor) and a mobile noise source (survey vessel). These calculations assume constant source speed and direction, no avoidance behaviour from a receiver, and simple

propagation using spherical spreading (no interaction of sound with sea surface or floor; NMFS, 2020).

The area of exceedance (of AUD INJ and TTS threshold) is calculated using the effect distance as the radius in the affected area (A) equation:

$$A = \pi r^2$$

From this, the number of animals affected were calculated from the area of exceedance and density estimates from SCANS-IV surveys, that are listed in Table 6.1.1, using the following equation:

$$N = D \times A$$

Whereby *N* is the number of animals affected in the specified area, *D* is the density of animals per km^2; and *A* is the affected area (i.e. hearing threshold or disturbance area in km^2). As density estimates used are for large MU scale areas, the numbers derived from the above equation are discussed in the context of site-specific sightings data.

3.3.2 Physical Risk

To determine risk of physical injury or disturbance to marine mammals, activities are considered qualitatively to allow appropriate mitigation to be identified.

3.4 Mitigation

Mitigation is detailed in Section 8: Mitigation with actions to reduce risk of adverse effects from activities.

4 Description of the Proposed Geophysical Survey

SBP uses seismic reflection from an acoustic boomer sub-bottom system. The outputs will seek to determine the depths to all significant seismic reflectors, particularly those that can be correlated to changes in geological strata (i.e. till, gravel, sand, mud, etc.).

The SBP system will be mounted on a catamaran towed behind the survey vessel. This system contains acoustic boomers consisting of an induction coil and a metal plate. A short duration, high power electrical pulse is delivered to the induction coil, and the resultant magnetic field explosively repels the metal plate, generating a broadband acoustic pressure pulse into the water column. The frequency of this pulse is in the range 400Hz to 14kHz, with most of the energy being directed vertically downward at a maximum output of 300J per pulse. A percentage of the acoustic energy is reflected from the sea floor, and the remaining energy penetrates the seabed and is reflected from layers of contrasting acoustic impedance, i.e. different seabed materials. The reflections of the sound pulse are detected by a multi-element hydrophone which is towed parallel to the source catamaran, astern of the vessel. Acoustic boomers for use in SBP typically have a source level of 212dB re 1 µPa @ 1m from the source with a 200J pulse energy, and a SPL_{peak} of 215 dB re 1µPa @ 1m with a 300J pulse energy (Applied Acoustics, 2010). For the assessment the SPL peak-to-peak is assumed to be double the SPL_{Peak} at 1m, hence 218dB. The weighting factor adjustment (WFA) is assumed to be 1kHz as per the assumptions laid out in the NMFS User Spreadsheet tool (NMFS, 2024b). We have

assumed a repetition factor of 3 pulses per second (Applied Acoustics, 2020; Applied Acoustics 2026) and a vessel speed of 3knots (1.5m/s).

The proposed survey will cover the channel area at 20m line spacing over the proposed area, with 50m spaced cross lines.

MBES uses high frequency sonar to create detailed maps of the seafloor. The MBES survey equipment will utilise frequencies over 165kHz. It is anticipated that MBES surveys will be conducted at the same time as the SBP surveys.

5 Consideration of Alternatives

As previously stated, MBES frequencies will be above all hearing ranges detectable by marine mammals and basking sharks and therefore will not result in any risk of injury or disturbance. Therefore, no alternatives for this technique needs to be considered. Alternatives to SBP techniques are identified and considered in this section.

5.1 Do Nothing

There are two alternatives considered under the 'Do Nothing' strategy:

- Do Not Survey or Dredge; and
- Do Not Survey and Dredge.

5.1.1 Do Not Survey or Dredge

The results of the geophysical surveys will inform dredging operations to achieve safe and operable depths for the continued use of the ferry service. If the surveys or dredging operation were not undertaken, it is likely that the ferry would be unable to safely make the crossing and hence the service would be stopped. Thus, this is not a viable option.

5.1.2 Do Not Survey and Dredge

Another alternative, if the geophysical surveys were not undertaken, would be to proceed with the dredge operations. However, without the survey data to inform key aspects of the work, such as the dredge route and equipment selection, there is a heightened risk of the dredge being unsuccessful, delayed, or more costly. For example, in the absence of detailed information on seabed composition or the presence of rock, more destructive dredge equipment may be used to minimise the risk of damaging machinery. This, in turn, could lead to greater impacts on marine habitats and ecosystems. For these reasons, proceeding with dredging without preliminary geophysical surveys is not considered a viable option.

Subsequently, both alternatives under 'Do Nothing' are not viable and are not considered further.

5.2 Undertake Geotechnical Surveys

Geotechnical surveys could be undertaken to sample the seabed to gain an understanding of seabed conditions. To obtain the required resolution of seabed conditions would involve the collection of high numbers of vibrocore samples within the survey boundary, which would result in extended survey durations. In addition, this option would not be financially viable and disrupt ferry movements in the area.

6 Receptors

6.1 Cetaceans

Approximately 32 species of cetacean (whales, dolphins and porpoise) are found in UK waters, some are seasonal visitors, while others inhabit the shelf waters all year-round (Evans *et al.*, 2003). Six cetacean species were identified that are known to frequent the waters around the Sound of Harris and the wider Hebrides area, these are the harbour porpoise, minke whale, short-beaked common dolphin, bottlenose dolphin, Risso's dolphin and orca. These species fall within the three cetacean functional hearing groups (Table 3.3.1). As these species cover all cetacean hearing groups, potential impacts to species that are less frequently recorded in the area (e.g. White-beaked dolphin (*Lagenorhynchus albirostris*), and Atlantic white-sided dolphin (*Leucopleurus acutus*; HWDT, 2026) are also protected by the mitigations laid out in Section 8: Mitigation. This methodology ensures that marine mammals of all hearing frequency groups are considered and protected from injury.

A summary of the cetacean species most likely to be encountered in the Sound of Harris during the survey is provided in Table 6.1.1. This summary also includes the likelihood of occurrence for each species, density estimates from the SCANS-IV survey (Gilles *et al.*, 2023), and the estimated group size extrapolated from the HWDT sightings map.

Table 6.1.1: Cetacean Baseline Summary

Frequency Group (Southall *et al.*, 2019)	Species	Likelihood of Occurrence (HWDT, 2026)	Density Estimate per km² (Gilles *et al.*, 2023)	Group Sizes (mean ± standard deviation; HWDT, 2026)
LF Cetaceans	Minke whale	Possible	0.0353	1.75 ± 1.1
HF Cetaceans	Common dolphin	Likely	0.9266	14.23 ± 20.5
	Bottlenose dolphin (*Tursiops truncatus*)	Possible	0.3421	3.2 ± 3.9
	Risso's dolphin (*Grampus griseus*)	Very Unlikely	0.0244	3.67 ± 1.5
	Orca (*Orcinus orca*)	Very Unlikely	NA	2 ± 0
VHF Cetaceans	Harbour porpoise	Very Likely	0.3911	2.18 ± 1.6

NA =Not Available. It should be noted that NA does not mean an absence of a species, but that there is not enough available data for a reliable estimate.

6.1.1 Harbour Porpoise

Harbour porpoise are distributed throughout temperate and subarctic waters in the Northern Hemisphere (Evans *et al.*, 2003). Harbour porpoise are the most abundant and smallest cetacean found in northwest European shelf waters, with the highest densities identified in the North Sea, Northern Isles, and the Outer Hebrides. They are typically sighted alone or in small groups of up to ten individuals throughout the year (HWDT, 2023; Evans *et al.*, 2003). Harbour porpoise are regularly sighted along the Leverburgh – Berneray ferry route throughout the year and are the most likely cetacean to be encountered during the geophysical survey.

The Inner Hebrides and the Minches SAC, designated for harbour porpoise, is located approximately 3.5km to the east of the proposed survey site. The SCANS-IV reported the block

including the Sound of Harris and the SAC as containing the second highest density of harbour porpoise in Scotland, at 0.3911 individuals per km^2. Furthermore, the West Scotland MU, which the proposed survey takes place within, has an estimated 28,936 individuals (IAMMWG, 2022).

An analysis of surveys in the northwest of Scotland conducted between 1993 and 1997 recorded an average of 1.88 harbour porpoises per group (Marubini *et al.* 2009). Sightings data for harbour porpoise within the Sound of Harris also indicate small group sizes. Reports between 2023 and 2026 from the HWDT and the Sea Watch Foundation have median group sizes of 2 (HWDT) and average of 2.17 ±1.6 (mean ±standard deviation; HWDT, 2026).

6.1.2 Minke Whale

The minke whale is the smallest and most frequently sighted baleen species in British shelf waters. They are commonly sighted within 7km of the coastline, feeding at depths of less than 200m. The Hebrides has been identified as a minke whale hotspot, where the shallow sandbanks and coastal geography create upwelling, bringing nutrients and fish to the sea surface. Minke whales are typically sighted alone or in small groups of up to three individuals, although aggregations of up to 20 can be seen in feeding hotspots, and are usually associated with feeding seabirds or other cetaceans (Sea Watch Foundation, 2020).

The Sea of the Hebrides Nature Conservation MPA, which is partly designated for minke whales, is located 15.5km to the south-southwest of the proposed survey site. Minke whales are frequently sighted in the summer months between June and September to the west of the Sound of Harris in the Minches (HWDT, 2026). The SCANS-IV survey reported an average density of 0.0353 minke whales per km^2 within the block that encompasses the Sound of Harris. The Celtic and Greater North Seas (CGNS) MU which includes the proposed survey area, was recently estimated to host 20,118 minke whales, and is considered a single population (IAMMWG, 2022). As minke whales are frequently sighted to the east of the Sound of Harris, it can be anticipated that minke whales may be in proximity to the proposed survey.

Minke whales are most commonly sighted as individuals or in groups of two. Macleod *et al.* (2004) found an average group size of 1.5 individuals from surveys conducted off the Ilse of Mull between 1992 – 1999. Similarly, reports between 2023 and 2026 from the HWDT and the have a median group size of 1.5 (HWDT) and average of 1.75 ±1.1 (mean ±standard deviation). Only 3 sightings, all of groups of 2 individuals were recorded by Sea Watch during this period.

6.1.3 Short-beaked Common Dolphin

Short-beaked common dolphin, hereafter referred to as common dolphin, abundances tend to be high in the summer months (May – October), when prey abundance is highest. Common dolphins are the most abundant offshore cetacean in the northwest European shelf waters, aggregating in numbers exceeding 100 individuals, referred to as super-pods, though are more commonly sighted in groups of 10–30 in the Hebridean waters (HWDT, 2026).

The SCANS-IV survey produced a density estimate of 0.9266 individuals per km^2 in the relevant survey block, with the most recent abundance estimates for common dolphins in the CGNS MU being 102,656 individuals (IAMMWG, 2022). Numbers have been increasing in recent years, with the population almost doubling since the 2015 estimate of 56,556 individuals (IAMMWG, 2015).

Common dolphins are regularly sighted to the east of the proposed survey site in the summer months and are regularly seen in groups of about 10 to 30 individuals, but may form large, very active groups consisting of several hundred animals (HWDT, 2026). Sightings records within the Sound of Harris between 2023 and 2026 from the HWDT have a median group size of 9.5 individuals, and an average of 14.2 ± 20.6 (mean ±standard deviation. If the geophysical surveys took place between May and October, it would be likely that common dolphins would be in proximity to the site.

6.1.4 Bottlenose Dolphin

Bottlenose dolphins are distributed worldwide, except for in the polar regions. The British shelf waters host the largest bottlenose dolphins, which reach up to 4m, compared to the global average length of 2.5m. Bottlenose dolphins are present coastally throughout the year, though there is some evidence of seasonal movement further offshore in the winter months. Bottlenose dolphins are sighted in groups from one up to 25 in Hebridean waters (HWDT, 2026).

The most recent estimate of the Coastal West Scotland and Hebrides (CWSH) MU, which includes the Sound of Harris, is 45 individuals (IAMMWG, 2022). This population appears to exhibit stronger site-fidelity than other offshore populations of bottlenose dolphins (IAMMWG, 2023). In addition, the SCANS-IV survey identified a density estimate of 0.3421 bottlenose dolphins per km^2 in the region including the Sound of Harris. The HWDT identify the Sound as a bottlenose dolphin hotspot, though HWDT reported just five sightings within the Sound of Harris between 2019 – 2025, with all sightings recorded between July and September (HWDT, 2026). These sightings range in group sizes of 1 – 10 with a median group size of 1, and average of 3.2 ± 3.9 (mean ±standard deviation).

6.1.5 Risso's Dolphin

The Risso's dolphin has a widespread distribution between 45°S and 64°N throughout the world's oceans (Jefferson *et al.*, 2014), though publications to quantify their abundance and distribution in Scottish waters are lacking. In recent years, work has been undertaken to develop an understanding of their distribution around the Hebrides. This research has led to the subsequent MPA designation of a key area of habitat off north-east Lewis, 60km north-east of the Sound (NatureScot, 2020a). While the MPA is located at 58°N and is therefore considered close to the most northern extent of the species' range, the abundance of prey species encourages year-round presence (NatureScot, 2020a; Weir *et al.*, 2019). In addition, the occurrence of juveniles and mother-calf pairs suggests the area may also be important for breeding (NatureScot, 2020a).

In the CGNS MU there are an estimated 12,262 individuals (IAMMWG, 2022). There were six Risso's dolphin sightings within the vicinity of the Sound of Harris on the HWDT sightings database. Group sizes for these six sightings ranged in number from 2 – 5, with an average of 3.5 ± 1.5 (mean ± standard deviation; HWDT, 2026).

Density estimate made within the relevant survey block for SCANS-IV was 0.0244 Risso's dolphins per km^2 (Gilles *et al.*, 2023; HWDT, 2026). Evans *et al.* (2003) reported that UK populations of Risso's dolphins prefer habitats between 50 – 100m deep, and Weir *et al.* (2019) cite that pods using the north-east Lewis MPA are typically seen in waters deeper than 20m. While it is possible that animals could travel from the deeper waters off western Lewis or from

the north-east Lewis MPA to the Sound of Harris, this habitat is likely unsuited to their presence due to its overall shallow water depth (<20m). As such, the likelihood of the species being present within the area during geophysical surveys is low.

6.1.6 Orca

Orca are known to travel extensively throughout the Outer Hebrides. Orca that utilise this region are known as the North Atlantic ecotype, and prey on both marine mammals and fish. Within this grouping, individuals may be further differentiated into distinct categories; the West Coast Community and transients that typically can be found around Orkney and Shetland, often having seasonally migrated from Icelandic and Norwegian waters (Samarra & Foote, 2015).

The West Coast Community are the only resident population of orca in the UK. Only two mature bulls of the population have been sighted regularly in recent years, and the remainder of the pod have not been observed since 2016 (Scullion *et al.*, 2021). While present throughout western UK waters year-round, they are most sighted around the Hebrides and appear to range widely across this region (HWDT, 2026). No new calves have been documented since monitoring of the Community began in the 1990's, suggesting the group is at imminent risk of extinction (Beck *et al.*, 2014). Of the orca that are regularly observed in the Northern Isles, sightings are particularly concentrated during the early spring and summer months where they hunt seals and fish (Scullion *et al.*, 2021). Orca in this group typically travel in familial pods containing up to ten individuals, however larger aggregations can occur (Scullion *et al.*, 2021).

Orcas from Orkney or Shetland are less likely to be present around the Hebrides outwith the summer months, and the enormous area range of the West Coast Community across the entire Scottish west coast renders it unlikely they will be within the vicinity during the proposed activity. A single record of a group of 2 orca is recorded by HWDT for the Sound of Harris (HWDT, 2026).

6.2 Pinnipeds

UK waters host two resident species of pinniped: the grey seal, and the harbour seal (*Phoca vitulina*). Occasionally, arctic species including ringed seals (*Pusa hispida*), harp seals (*Pagophilus groenlandicus*), bearded seals (*Erignathus barbatus*), hooded seals (*Cystophora cristata*) and walrus (*Odobenus rosmarus*), visit the UK coastal waters, but these are infrequent, isolated incidences (SCOS, 2024). While these visiting species have not been considered in detail in this assessment, the mitigations laid out in Section 8: Mitigation will also protect them.

6.2.1 Grey Seal

Grey seals are distributed throughout the North Atlantic, Baltic and Barents Seas, with one of the largest populations in the UK, and notably, Scotland (SCOS, 2022). The UK hosts approximately 35% (~ 58,940 individuals) of the total global breeding population (SCOS, 2024). With the largest populations in the Outer Hebrides and Orkney (SCOS, 2022), where pup production is increasing (SCOS, 2024).

The grey seal pupping season is generally shorter in north and west Scottish colonies, with peak season being between October and November (Hammond *et al.*, 2003). Pups will remain hauled-out until they moult their lanugo (non-waterproof fur) at approximately three weeks old (British Divers Marine Life Rescue, 2024). Grey seals spend more time hauled out during

moulting season, which takes place between December and April (Hammond *et al.*, 2003). Grey seals often travel hundreds of kilometres between haul-out sites, and literature suggests that most foraging trips average between 39.8 – 50.0km but varies between individuals (McConnell *et al.*,1999; Cronin *et al.,* 2011; SCOS, 2022).

There are several designated seal haul-out sites around the Outer Hebrides, with two key sites identified within the Sound of Harris. Although designated haul-out sites afford protection to all seal species, each site identifies the species that most commonly uses it. The Sound of Harris Islands designated seal haul-out site, primarily used by grey seals, partly overlaps the survey boundary on the south-eastern side.

6.2.2 Harbour Seal

Harbour seals (also referred to as common seals) are the smaller of the two resident UK species and are distributed throughout the Atlantic, Pacific and sub-Arctic regions in the Northern Hemisphere (SCOS, 2024). Approximately 30% of the European population of harbour seals are found in the UK with 85% concentrated in Scotland. While populations across the UK have been declining overall, the West Scotland population has increased two-fold from the mid-1990's to present day (SCOS, 2024). West Scotland now holds the most significant population of harbour seals in the UK. The Outer Hebrides provides an important habitat for the breeding population of harbour seals, with its shallow sand banks and rocky coastline.

The harbour seal pupping season occurs in the summer (June and July) with the moult taking place in August. Harbour seals haul-out during this time, but they appear to also haul-out in a pattern with the tidal cycle. Harbour seal pups can swim from birth as they moult their lanugo *in utero*. Harbour seals exhibit smaller core and home ranges than grey seals, with fewer long-distance travel between haul-out sites. Foraging ranges vary regionally and between individuals, with some remaining inshore while others travel more than 100km from their haul-out sites (SCOS, 2024). Harbour seals are also protected at the same designated haul-out sites within the Sound as grey seals, though the Loch a' Bhaigh designated haul-out site is predominantly used by harbour seals and is located approximately 5.8 km west-south-west of the survey area.

6.3 Otter

The Eurasian otter was originally described as having '*one of the widest distributions of all Paleoarctic mammals*' (Conroy & Chanin, 2000).

The UK population declined significantly in the 1950s but slowly began to recover from the 1970s (Almeida *et al.*, 2012). Otters are considered generalist amphibious mammals, foraging in marine and freshwater systems, while living terrestrially (Gallardo & Forman, 2024).

Otters are occasionally sighted in the Sound of Harris (NBN Atlas, 2026), and they are a designated feature of the nearby Loch nam Madadh SAC and Loch an Duin Ramsar Site (also an SSSI). As there is habitat connectivity between these designated sites and the area of the proposed survey, otters may be encountered during survey activities.

6.4 Basking Shark

The basking shark is the largest fish in UK waters, and second largest in the world, growing to lengths over 11 meters (Sims, 2008). Basking sharks have a cosmopolitan distribution, inhabiting temperate and boreal waters in the Northern and Southern Hemispheres. They are

highly migratory planktivorous sharks, that generally forage at the surface of coastal and pelagic waters in shelf seas and around steep banks where plankton concentrations are higher, though they have been recorded to feed at depths up to 320m (Skomal *et al.*, 2004).

Basking sharks are seasonal visitors to the Outer Hebrides, when warmer water brings plankton, with the highest observed densities of basking sharks in the Sea of the Hebrides between June and October (Paxton *et al.*, 2014). Several hotspots have been identified where individuals congregate to feed on zooplankton and possibly mate (Speedie *et al.*, 2009). As such, the Sea of the Hebrides MPA was designated in 2020 to protect an extensive area of habitat stretching across the Inner and Outer Hebrides (NatureScot, 2020b). The MPA boundary is 15.5km south-southwest of the proposed survey area. Though no definitive population estimates are available for basking sharks in this area, a basking shark density estimate in the Sea of the Hebrides MPA was obtained from video aerial surveys conducted in 2016 at 0.24 animals/km^2 and estimated a population of 1815 sharks (Webb *et al.* 2018). Basking shark densities are generally lower in the Minches, and they are infrequently sighted within the Sound of Harris, with only ten reports on the Hebridean Whale and Dolphin trust between 2018 – 2023, HWDT, 2026). The bathymetry of the Sound of Harris is not conducive with basking shark preferred habitat, and thus there is a lower probability a basking shark will be encountered during the survey.

7 Risk Assessment

7.1 Acoustic Impacts

7.1.1 Geophysical Survey

The proposed geophysical survey will produce intermittent sound pulses at more intense noise levels than those emitted from other marine anthropogenic activities in the area, such as vessel engine noise. As stated in Section 4, the survey will utilise both MBES and SBP, but the frequencies utilised with MBES will be above the hearing ranges detectable by marine mammals, otter and basking shark and therefore MBES will not be considered further within the risk assessment.

As described in Section 3.3.1.4, the NMFS User Tool (NMFS, 2024b) has been utilised to calculate the distances from the noise source within which TTS and AUD INJ could occur. As detailed in Table 7.1.1 the estimated effect distances for all species were higher for SEL_{cum} than for the SPL_{peak}. Although it should be noted that the modelling assumes that the receptor is stationary and hence the effect distances are likely to be an over estimation. For the purpose of the assessment, the areas of exceedance for SEL_{cum} have been calculated to give a conservative area of exceedance.

Table 7.1.1: Auditory Effect Distances for Receptor Groups

Hearing Group	AUD INJ SPL_{peak} Estimated Effect Distance (m)	AUD INJ SEL_{cum} Estimated Effect Distance (m)	TTS SPL_{peak} Estimated Effect Distance (m)	TTS SEL_{cum} Estimated Effect Distance (m)	AUD INJ SEL_{cum} Estimated Area of Exceedance (km^2)	TTS SEL_{cum} Estimated Area of Exceedance (km^2)
LF Cetaceans	NA	126	NA	3977	0.049	49.7
HF Cetaceans	NA	2	NA	50	<0.01	<0.01
VHF Cetaceans	4.5	13	8.9	415	<0.01	0.54
PCW Pinnipeds	NA	59	NA	1879	0.011	11.1
Fish: no Swim Bladder (-P)	1.26	0.1	NA	63.5	<0.01	0.01

***NA: Source level is equal to or less than the threshold for the marine mammal hearing group.**

7.1.1.1 Cetaceans

Effect distances from SEL_{cum}, were largest for LF cetaceans; an LF cetacean would need to be within 126m or 3977m to experience AUD INJ or TTS. Effect distances for VHF are 13m (AUD INJ) or 415m (TTS) and for HF cetaceans are 2m (AUD INJ) and 50m (TTS).

The NMFS (2024) guidance provides a $L_{p,RMS,flat}$ threshold of 160 dB re 1 µPa for non-explosive impulsive noise where marine mammals may exhibit behavioural disturbance. However, species and individuals do not respond identically to anthropogenic noise. Species-specific behaviours strongly influence reactions: for example, harbour porpoise typically show avoidance behaviour and often flee from approaching vessels, while common dolphins frequently approach boats to interact with them.

Evidence from seismic surveys in the Moray Firth, which produced SPL_{peak} levels of 242–253 dB re 1 µPa, demonstrated harbour porpoise disturbance at distances up to 5–10 km from the source (Thompson *et al.*, 2013). In contrast, the proposed SBP surveys have a much lower source level of 215 dB re 1 µPa (SPL_{peak}). As a result, the corresponding disturbance distance is expected to be significantly smaller. This reduction is further supported by the fact that the survey will occur in shallower water, where sound attenuates more rapidly due to increased spreading losses and interaction with the seabed. Given that harbour porpoise are the most acoustically sensitive and behaviourally reactive species likely to be present, using them as the representative species provides a precautionary yet realistic assessment of disturbance range.

Overall, any acoustic disturbance caused by the SBP is expected to be short term and restricted to small spatial scales, and therefore the risk of significantly affecting an individual cetacean's ability to survive, reproduce, or raise young is highly unlikely for all receptors. According to NMFS (2024a), infrequent and short-term disturbance events are unlikely to have meaningful energetic consequences for cetaceans, particularly when surveys are conducted in shallow waters, where sound propagation distances are naturally constrained.

Furthermore, because the planned survey will not be repeated frequently or over extended periods, the potential for chronic or cumulative disturbance is low. As a result, the likelihood of long-term behavioural disruption that could impair an individual's ability to thrive is considered very unlikely.

7.1.1.2 Pinnipeds

SPL_{peak} levels from the SBP activities will not exceed AUD INJ or TTS thresholds for pinnipeds in water (Table 7.1.1). However, when considering SEL_{cum}, pinnipeds in water would exceed AUD INJ and TTS thresholds within 59m and 1,879m, respectively.

The Sound of Harris Island Haul-out site, used by a breeding colony of grey seals, overlaps with the survey boundary. Seals are legally protected from disturbance only when at their haul-out, but when they are in the water they could be sensitive to underwater noise disturbance from SBP. However, the survey is anticipated to be conducted in the summer and outwith times when grey seals are more sensitive and anticipated to be using the site in greater numbers. Peak grey seal pupping season falling between October and November (Hammond *et al*., 2003), and moulting times, which takes place between December and April. The Loch a' Bhaigh haul-out site, used by harbour seals primarily in the summer months during their pupping and moulting period, is 5.8km from the survey site. Seals in the water near to this haul-out site are therefore outwith the TTS threshold range. Therefore, the risk of significantly affecting an individual pinniped's ability to survive, reproduce, or raise young is considered to be unlikely.

7.1.1.3 Basking Sharks

Using thresholds given by Popper *et al*. (2014), with recoverable injury thresholds in place of AUD INJ effect distances for basking shark for SPL_{peak} and SEL_{cum} are 1.26m and 0.01m respectively (recoverable injury), and the TTS SEL_{cum} threshold is exceeded within 63.5m.

Popper & Hawkins (2019) suggests that fish without swim bladders (basking shark) will experience '*high*' changes in behaviour '*near*' to pile driving activity, '*moderate*' changes in behaviour at '*intermediate*' distances, and '*low*' changes in behaviour '*far*' from the noise source. While, these distances are subjective, pile driving produces more sound than the proposed survey, so it is likely that behavioural changes in basking sharks will be more limited in extent, although an approximate range of disturbance is not available.

7.1.1.4 Otter

There is little relevant information on impacts of geophysical surveys or underwater noise to otter. However, as they are known to be present in the area of the proposed survey, the mitigation protocol for the proposed survey activities will include otter.

7.1.2 Vessel Traffic

Vessel movements give rise to a continuous source of underwater noise, which can result in detrimental effects to marine mammals through behavioural responses, masking of acoustic signals, as well as increased stress. As the primary noise source while surveys are being conducted will be the SBP boomers the acoustic disturbance from the vessel itself is negligible. However, while the survey vessel is transiting to and from the survey site it will be the sole source of noise. As the survey area is on an active ferry route, there will not be a significant difference in the vessel traffic within the Sound of Harris, and the risk of acoustic disturbance due to vessel noise is low.

7.2 Physical Injury

The movement of vessels can also physically interact with marine mammals, otter and basking shark. Collisions with vessels typically occur when vessels are driving at high speeds and with

erratic movements, and when detection rates are lower due to poor visibility (Winkler *et al*., 2020). Species-specific behaviour also influences collision risk, where a small fast-moving porpoise can react quickly to an approaching vessel, but a slow-moving humpback mother and calf may not be able to react effectively (Winkler *et al*., 2020). The species most likely to be present during the surveys are small cetaceans (see Section 6), present in low densities, lowering the risk of collision. Furthermore, as the Sound of Harrs is not a preferred habitat for basking sharks it is unlikely any individuals will be within the survey boundary. As stated in Section 4, the survey vessel will be travelling at a slow speed, in straight lines on the survey transects, likely during daylight hours. The vessel will transit to the survey site from a nearby harbour (likely Leverburgh) at a higher speed but will not be moving erratically. The vessel movements associated with the surveys are considered as highly unlikely to result in any physical injury to marine mammals, otter or basking shark.

7.3 Consideration of Risks

Table 7.1.2 provides a summary of the potential effect (extent of disturbance and acoustic impact) to marine mammals and basking shark likely to be present in the area of the proposed survey by providing an estimate of impact risk at a population level. The number of animals affected was estimated by multiplying the maximum area where AUD INJ or TTS will occur (area of threshold exceedance) by the species density. This summary uses the predicted marine mammal AUD INJ and TTS impact ranges, and the animal density estimates, as well as Management Unit population estimates (as presented in Section 6). No population density data is available for orca or pinniped species, and therefore effect estimates could not be calculated.

Given estimated effect areas, population densities and likely presence in the survey area, the risk of marine mammals or basking sharks experiencing AUD INJ and TTS from the proposed survey is very low. However, it is important to note that density values used assume a consistent density across the large management unit area. Therefore, estimates here do not provide accurate representations on the actual number of individuals likely to be affected if animals enter the range of risk. From survey and sightings data within the Sound of Harris (as presented in Table 6.1.1) we can evaluate these estimates in site-specific context and provide an estimated number of animals affected in Table 7.1.2.

Table 7.1.2: Summary of Potential Risks of Acoustic Injury to Considered Species*

Hearing Functional Group	Species	Density (animals) estimate per km²	MU population	TTS SEL_{cum} Range (m)	AUD INJ SEL_{cum} Range (m)	TTS Area of Exceedance (km²)	AUD INJ Area of Exceedance (km²)	TTS Estimated Number of Animals	AUD INJ Estimated Number of Animals	TTS Potential Effect (% of MU)	AUD INJ Potential Effect (% of MU)	Estimated Number Affected
LF Cetaceans	Minke Whale	0.0353	20,118	3977	126	49.7	0.05	1.75	<0.01	<0.01	<0.01	<2
HF Cetaceans	Short-Beaked Common Dolphin	0.9266	102,656	50	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<14
	Bottlenose Dolphin	0.3421	45	50	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<3
	Risso's Dolphin	0.0244	12,262	50	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<4
	Orca	NA	NA	50	2	<0.01	<0.01	NA	NA	NA	NA	<2
VHF Cetaceans	Harbour Porpoise	0.3911	28,936	415	13	0.54	<0.01	0.21	<0.01	<0.01	<0.01	<2
PCW	Pinnipeds	NA	NA	1879	59	11.1	0.01	NA	NA	NA	NA	-
Fish: No Swim Bladder (P-)	Basking Shark	0.24	1,815	63.5	0.1	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<1

***Note: Not all species had density estimates available and thus, the number of individuals could not be calculated. Where the number of individuals could not be calculated, 'Not Available (NA)' has been used.**

The effect distances calculated for the onset of acoustic impacts are an overestimate due to the assumptions included in the calculations.

- The calculations of sound levels do not account for interactions of the sound with the seafloor or seabed. As the sounds produced from the proposed SBP activities will be directed toward the seabed and are within the relatively shallow Sound of Harris, these will interact with the seafloor and sea surface. This results in different rates of sound energy absorption and loss.
- The calculation of cumulative sound exposure level impacts also assumes that receptors remain stationary. However, individuals will move away from the source of noisy events (Kastelein *et al.,* 2018). As individuals move away from the noise source, they experience lower sound levels.

Mitigation protocols, outlined in Section 8, include a 30-minute pre-watch of a 500m mitigation zone before a 20-minute soft start (as per Joint Nature Conservation Committee's (JNCC) protocols). These protocols further reduce the potential risk of auditory impacts as they ensure no marine mammal or basking shark are in the immediate vicinity (500m) of the noise source prior to a soft-start beginning, and the soft-start allows time for the marine mammal or basking shark in the area beyond this zone to flee.

The estimated swim speeds for marine mammal groups are:

- 2.3m/s for low-frequency cetaceans (LF) (Boisseau *et al.,* 2021)
- 1.52m/s for high-frequency cetaceans (HF) (Bailey and Thompson, 2006)
- 1.4m/s for very high-frequency cetaceans (VHF) (Scottish Natural Heritage (SNH) now Nature Scot, 2016), and
- 1.8m/s for phocid carnivores in water (PCW) (SNH, 2016).

From these swim speeds, an LF cetacean would travel 2.76km in the 20-minute soft start period. An LF cetacean could therefore reach 3.26km from the sound source given the 30-minute pre-watch ensuring all animals are 500m from the source prior to the soft start. Given the lower sound levels that an individual would experience as they move away from the source, we can assume that the likelihood of an LF cetacean experiencing TTS is very low. Similarly, given the above swim speeds, HF and VHF cetaceans, and phocids can reach distances well outwith estimated TTS effect ranges within the 20-minute soft start sequence.

An EPS licence requires that activities must not be detrimental to the maintenance of the population of species concerned at a favourable conservation status in their natural range. Numbers of individuals that could potentially be at risk for impact by acoustic injury or disturbance from impact piling activities are estimated to be low and are also small percentages of their management unit populations. Mitigation measures will reduce the risk of individuals being present within impact areas during construction work such that acoustic injury to any individual is highly unlikely. These mitigation measures are detailed in Section 8.

7.4 Cumulative Impacts

There is potential for cumulative impacts on marine mammals, otters and basking sharks during the proposed survey and ongoing activities in the area. A salmon farm owned by Loch Duart Plc operates within the Sound of Harris, located to the south-east of the Leverburgh – Berneray ferry route between the islands of Groay and Lingay. The salmonid farm is planning

to relocate a short distance and to develop the current aquaculture facility within the Sound (planning references 10/00468 and 18/00180). As such, there may be vessels associated with this site and the redevelopment in proximity to the survey area. The current Leverburgh – Berneray ferry route will also be operational during the survey period; the ferry takes the route up to eight times a day. As the survey is very short-term, and will only require one vessel, the cumulative impact of vessel traffic resulting from the proposed survey will be minimal. No other noisy activities are planned in the area that Affric are aware of at the time of writing.

8 Mitigation

To minimise potential impacts to marine mammals, the survey vessel will adhere to the provisions of the Scottish Marine Wildlife Watching Code (Scottish Natural Heritage (SNH; now Nature Scot), 2017), in addition to implementing mitigation measures outlined below based on the JNCC Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017).

8.1 Observation Protocol

Marine mammal observations will be conducted visually by a MMO based on the geophysical survey vessel. As far as practical, geophysical surveys will be undertaken during daylight, good visibility and sea states less than 4. The MMO will be equipped with 7x50 magnification binoculars, an up-to-date copy of the JNCC guidelines, and recording forms. The MMO's vantage point will be located at a suitable position (vantage point) on the vessel which will afford the MMO clear all-round visibility of the mitigation zone. The vantage point will also be in a safe location; away from machinery, ropes, high power transmitters etc., and provide some protection from the prevailing conditions. The MMO will monitor the 500m mitigation zone, estimated from the SBP equipment.

The MMO protocol for SBP surveys is outlined below:

1. The Survey Party Chief will inform the MMO of the intention to commence seismic survey operations, at least 1 hour prior to the beginning of the soft start.
2. The MMO will commence a continuous pre-watch using binoculars, at least 30 minutes before the soft start.
    - If marine mammals, basking sharks or otter (relevant species) are observed during this time the MMO will advise the Survey Party Chief, so that measures can be taken to minimise the impacts of any potential delays on the survey operations.
3. When the 30 minutes pre-watch is complete the Survey Party Chief will ask the MMO whether the soft start can commence:
    - If the 500m mitigation zone around the survey vessel has been clear of any relevant species for at least 20 minutes, the MMO will give permission to commence the soft start.
    - If any relevant species have been observed inside the mitigation zone within the last 20 minutes, the MMO will delay the soft start until at least 20 minutes after the last sighting within the mitigation zone.

5. When the vessel approaches the Start of Line (SoL) and the operational ping-rate has been achieved, the Survey Party Chief will ask the MMO whether survey operations can commence. If:

    - The 500m mitigation zone around the survey vessel has been clear of relevant species for at least 20 minutes, the MMO will give permission to commence the operations to start.

    - Any relevant species have been observed inside the mitigation zone within 20 minutes, the MMO will delay survey operations until at least 20 minutes after the last sighting within the mitigation zone.

6. Once the acoustic survey operations have commenced there will be no requirement to stop if any relevant species enters the mitigation zone, so long as the operation does not stop for a period exceeding 10 minutes.

7. If there is a break in survey operations predicted to exceed 10 minutes (i.e., SBP is not operating), the Survey Party Chief will inform the MMO who will conduct a continuous watch for the duration of the break in operations.

    - If a break exceeds 10 minutes, and a continuous watch has not been undertaken then the full soft-start procedure must be followed.

    - If the break is less than 20 minutes in duration, and the mitigation zone remains clear of any relevant species, the operations can resume immediately.

    - If the break exceeds 20 minutes, or any relevant species are sighted within the mitigation zone, as full start-up procedure will be required (Steps 1-4 above).

8. When a turn between survey lines is required, the following provisions will be made:

    - If the turn duration will not exceed 20 minutes; the survey equipment shall continue to operate. As such the survey operation will be continuous and no additional watches are required.

    - If the turn duration will exceed 20 minutes (highly unlikely in this instance); the acoustic equipment should be turned off and the procedure for a break in operations exceeding 10 minutes should be followed (starting from Step 1).

9. If the visibility falls to below 500 m around the survey vessel, or the sea state increases to a condition which prevents visual observations from being undertaken, then survey operations shall not commence after a break in operations longer than 10 minutes.

9 Conclusion

This Marine Mammal & Basking Shark Risk Assessment has been produced to supplement the EPS and Basking Shark licence applications for SOCOTEC Land and Hydrographic Surveys to undertake geophysical surveys to inform dredging operations to achieve safe and operable depths along the ferry route. This assessment summarises the risk of disturbance and/or injury to marine mammals and basking sharks from SBP and MBES, as well as the associated vessel movement. The mitigation protocol outlined in this report will mitigate the injury risk and reduce the risk of disturbance in line with best practice for geophysical survey operations.

The Marine Mammal & Basking Shark Risk Assessment identified that both an EPS licence and basking shark licence for disturbance are required to undertake the proposed geophysical surveys. Marine mammals and basking shark may experience some temporary disturbance of avoiding the areas during SBP activities; however, the disturbance is unlikely to be significant to individual animals or to impact population levels.

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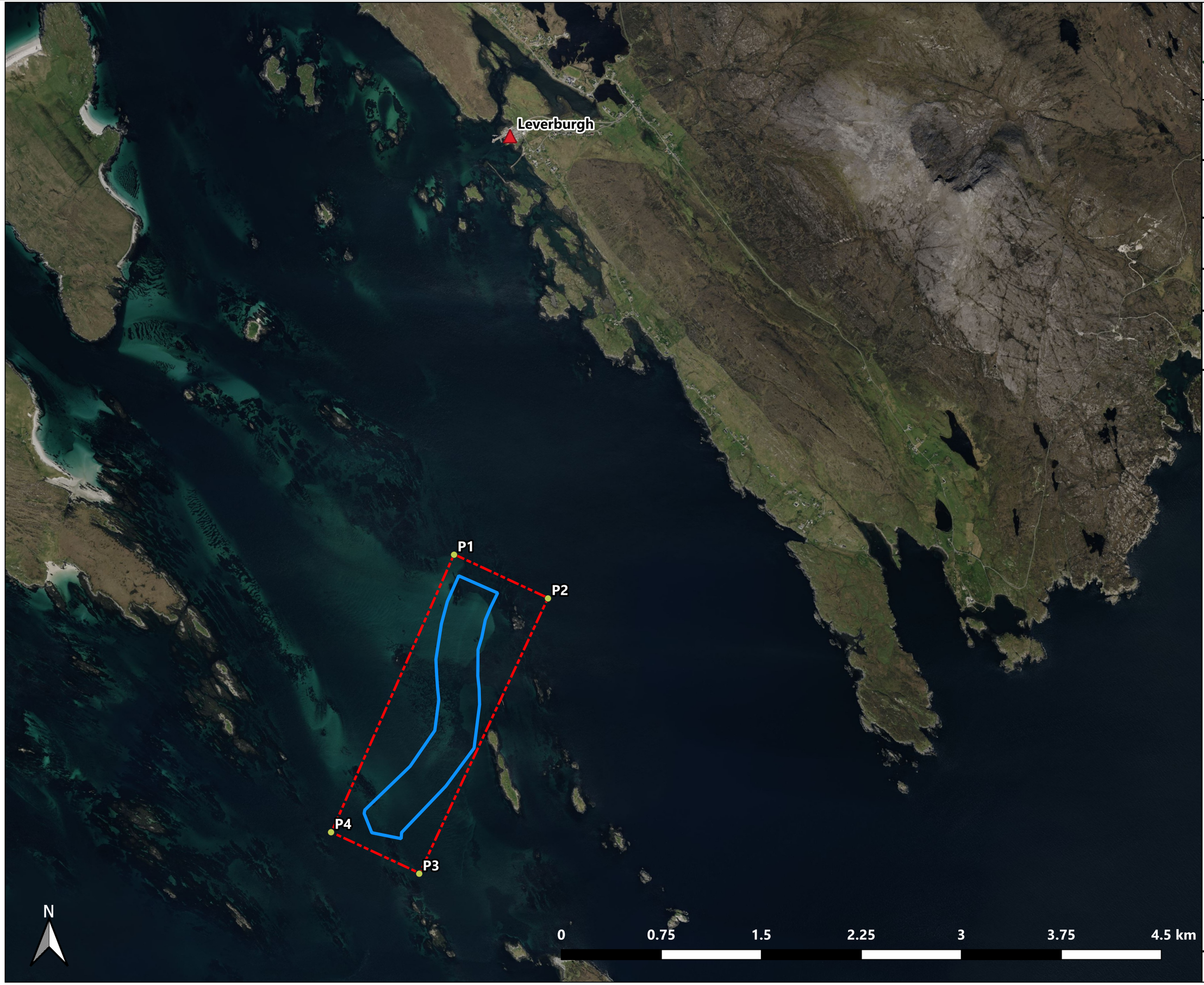
11 Glossary

Acronym	Definition
AUD INJ	Auditory Injury
CGNS	The Celtic and Greater North Seas
CMAL	Caledonian Maritime Assets Limited
CWSH	Coastal West Scotland and Hebrides
EPS	European Protected Species
EU	European Union
HF	High Frequency
HWDT	Hebridean Whale and Dolphin Trust
IAMMWG	Inter-Agency Marine Mammal Working Group
JNCC	Joint Nature Conservation Committee
LF	Low Frequency
MBES	Multi-beam Echo Sounder
MMO	Marine Mammal Observer
MPA	Marine Protected Area
MU	Management Unit
NA	Not Available
NBN	National Biodiversity Network
NMFS	National Marine Fisheries Service
PW	Phocid Pinnipeds
PTS	Permanent Threshold Shift
SAC	Special Area of Conservation
SBP	Sub-bottom Profiling
SCANS	The Small Cetaceans in European Atlantic Waters and the North Sea
SCOS	Special Committee on Seals
SEL_{cum}	Cumulative Sound Exposure Levels
SNH	Scottish Natural Heritage
SoL	Start of Line
SPA	Special Protection Area
SPL_{peak}	Peak Sound Pressure Levels
SSSI	Site of Special Scientific Interest
TTS	Temporary Threshold Shift
UK	United Kingdom
VHF	Very High Frequency

Drawings



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Title: 161_DRG_02_1 Marine Licence Boundary & Survey Area

Projection: OSGB 1936/British National Grid
EPSG: 27700

Example : 'Google Maps'
Map data © 2026 Google, Accessed (19/02/2026)
"Sound of Harris"

Legend

- Leverburgh
- EPS Licence Boundary
- Survey Area
- Survey Boundary Points