XOCEAN: European Protected Species (EPS) and Basking Shark Risk Assessment

Shetland Geophysical Surveys

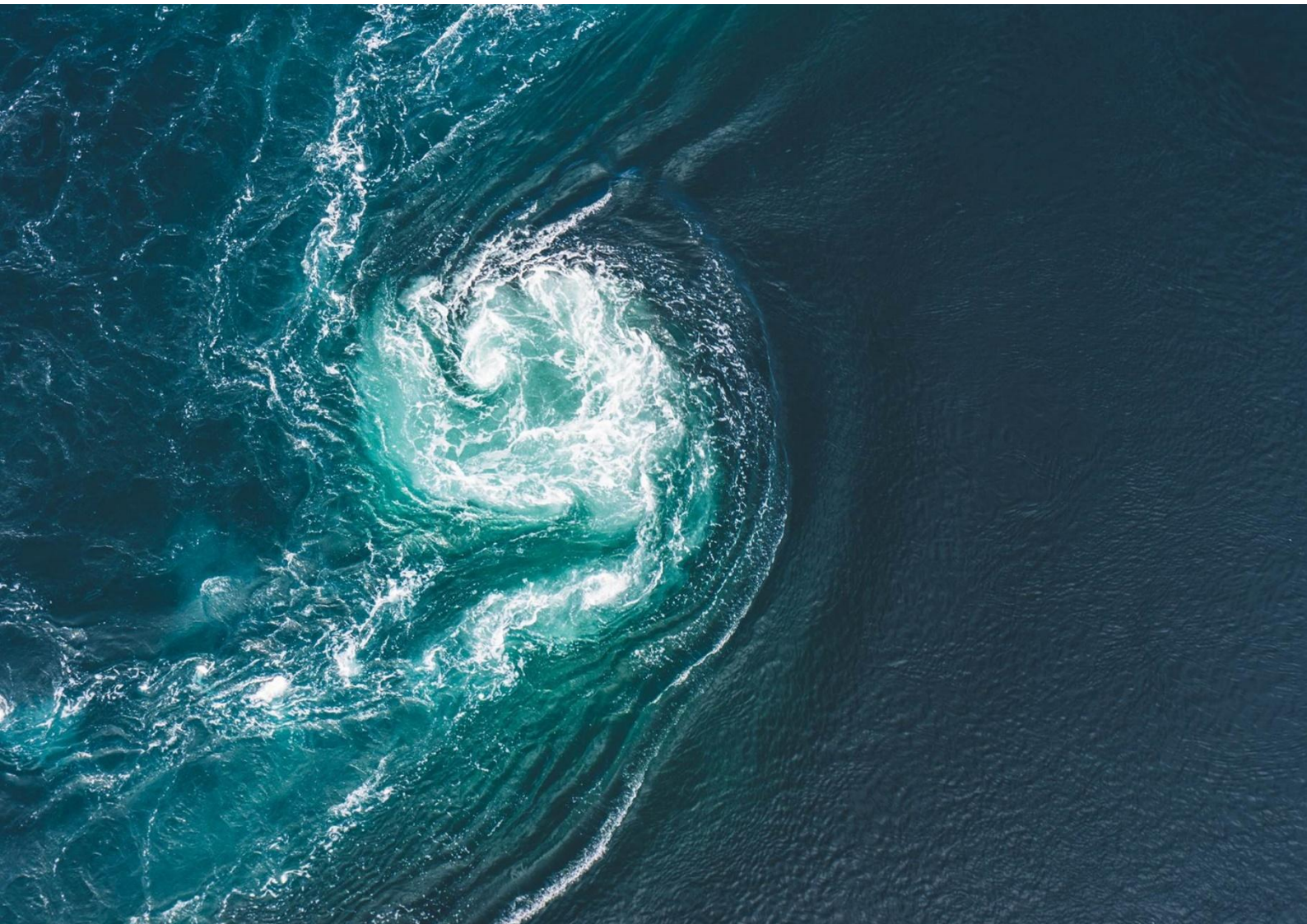
PREPARED FOR

XOCEAN

Ocean data, delivered.

DATE

14 May 2026



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ACRONYMS AND ABBREVIATIONS

Acronyms	Description	Definition
AEP	Auditory Evoked Potential	Reflects auditory ability to perceive a set frequency via brain stimulus
CES	Coastal East Scotland	Cetacean (bottlenose dolphin) management unit
CGNS	Celtic and Greater North Seas	Cetacean (bottlenose dolphin) management unit
ESO	Electricity System Operator	Electricity utility company that owns and operates electricity transmission networks (e.g. National Grid plc in the UK)
EPS	European Protected Species	Species listed on Schedule 2 and Schedule 4 of the Habitats Regulations

Acronyms	Description	Definition
GCR	Geological Conservation Review	Designated sites with geological or geomorphological features of national and international importance
GNS	Greater North Sea	Cetacean (bottlenose dolphin) management unit
HF	High Frequency	Cetacean functional hearing group
HVDC	High Voltage Direct Current	Power transmission system that uses direct current for electric power transmission, with voltages generally between >100kV
IUCN	International Union for Conservation of Nature	International organisation dedicated to the conservation and sustainable use of natural resources, including the protection and designation of endangered species
JNCC	Joint Nature Conservation Committee	A public body that advises the UK Government and devolved administrations on UK and international nature conservation
LF	Low Frequency	Cetacean functional hearing group
MBES	Multibeam Echosounder	A geophysical survey device used to map the seabed using multiple swathes of sonar
MMO	Marine Mammal Observer	A professional trained to identify and record the presence of marine mammals within an area of interest
MPA	Marine Protected Area	Areas of ocean established to protect habitats, species, and processes essential for healthy functioning of marine ecosystems
MU	Management Unit	Spatial zones based on the presence of known populations, with divisions based on ecological classifications and divisions relevant to human activities
NCMPA	Nature Conservation Marine Protected Area	Scottish Marine Protected Areas (MPAs)
NMPi	National Marine Plan Interactive	Online mapping tool provided by Marine Scotland
NS	North Sea	Cetacean (bottlenose dolphin) management unit
OWF	Offshore Wind Farm	An array of turbines located offshore (either floating or on the seabed) that generate electricity through wind energy
PAM	Passive Acoustic Monitoring	Monitoring technique that uses a hydrophone to detect marine mammal presence through vocalisations

Acronyms	Description	Definition
PTS	Permanent Threshold Shift	Permanent change in the frequencies audible to an individual caused by exposure to excessive sound
RMS	Root mean square	Continuous power handling of a speaker or a subwoofer or how much continuous power an amplifier can output.
SAC	Special Area of Conservation	Areas designated to protect Annex I habitats and/or Annex II species
SBES	Single Beam Echo Sounder	A geophysical survey device used to map the seabed using a single sonar beam
SBP	Sub Bottom Profiler	Device used to characterise sub-seabed sedimentation and geology using pressure waves (acoustic or seismic), typically low-frequency
SCANS	Small Cetacean Abundance in the North Sea	A series of large-scale surveys for cetaceans in European Atlantic waters
SEL	Sound Exposure Level	Measurement of the total acoustic energy (energy flux density) of the pressure wave over a measurement period
SPA	Special Protected Area	Protected areas in the UK designated for the protection of birds
SPL	Sound Pressure Level	Unit used to characterise continuous sound and vibration
SSS	Side Scan Sonar	Sonar device that emits high-frequency acoustic pulses between the source and the seabed across a wide angle perpendicular to the direction of travel, to map seabed morphology and texture
SSSI	Site of Special Scientific Interest	Formal conservation designation for an area of interest to science due to rare species or geological or physical features
TTS	Temporary Threshold Shift	Temporary change in the frequencies audible to an individual caused by exposure to excessive sound, recoverable over a period of time
USBL	Ultra-Short Baseline	A method of underwater acoustic positioning consisting of a transponder mounted on a towed/tethered device that transmits a signal to a receiver on the underside of the vessel
USV	Uncrewed Surface Vessel	A small boat or ship that operates on the water surface without a crew
UXO	Unexploded Ordnance	A bomb, projectile, small arms which may have been fired, dropped, launched, or projected and should have exploded but failed to do so.
VHF	Very High Frequency	Cetacean functional hearing group

EXECUTIVE SUMMARY

The UK and Scottish Governments have committed to achieving net zero greenhouse gas emissions, supported in part through the development of offshore infrastructure and the continued expansion of marine renewable energy, electricity transmission and subsea cable networks. To support the planning and development of such infrastructure, it is necessary to undertake geophysical surveys to characterise seabed bathymetry, seabed surface features and sub-surface conditions.

XOCEAN UK Ltd proposes to undertake a geophysical survey in waters around Shetland, including Sullom Voe, Yell Sound and surrounding areas, to inform multiple potential marine infrastructure developments. The proposed survey will utilise uncrewed surface vessels (USVs) equipped with multibeam echosounder (MBES) and sub-bottom profiler (SBP) systems. Survey operations will be of short duration (up to approximately 40 days within a 1-year period) and will be undertaken at the earliest opportunity.

This document presents a European Protected Species (EPS) and Basking Shark Risk Assessment to support an application for an EPS licence in relation to the proposed geophysical surveys. The assessment describes the proposed activities, establishes a biological baseline for the Survey Area, and evaluates the potential for injury or disturbance to EPS and basking shark, with reference to applicable legislation and current best-practice guidance.

The assessment concludes that no significant impacts on EPS are predicted from underwater sound generated by vessels/survey equipment or resulting from collisions with survey vessels. Quantitative assessment of potential behavioural disturbance indicates that only a very small fraction of relevant reference populations could be exposed at any one time, well below thresholds associated with population-level effects. The highly mobile nature of cetaceans, the short-term and non-continuous nature of the surveys, and adherence to established mitigation measures further reduce the likelihood of significant effects. Accordingly, the proposed activities are not predicted to compromise the favourable conservation status of any EPS population.

While the risk of disturbance is assessed to be very low, a precautionary approach has been adopted. As there remains the potential for very low, short-term disturbance associated with SBP operation, an EPS licence will be required to authorise the proposed survey activities.

Basking shark are not commonly recorded in waters around Shetland and the Survey Area is not considered a key area for this species. The assessment concludes that underwater sound from survey equipment and vessel traffic is unlikely to affect basking shark, and the risk of vessel collision is negligible.

Overall, the assessment demonstrates that the proposed geophysical surveys satisfy the three tests required for the granting of an EPS licence: the activity has a licensable purpose, there are no satisfactory alternatives that would avoid disturbance, and the activity will not be detrimental to the maintenance of EPS populations at favourable conservation status in their natural range.

1 INTRODUCTION

This European Protected Species (EPS) and Basking Shark Risk Assessment has been prepared by ERM Ltd (ERM) on behalf of XOCEAN UK Ltd (XOCEAN). The document aims to assess the risk of potential impacts of a planned geophysical survey on EPS and basking shark. XOCEAN plans to undertake a single survey, to meet the interests of multiple clients, involving acquisition of multi-beam echosounder (MBES) and sub-bottom profiler (SBP) data, using uncrewed surface vessels (USVs).

The proposed survey will collect bathymetric, seabed substrate, and marine habitat data within Sullom Voe, Yell Sound and Lunna Holme. XOCEAN aims to complete all data acquisition during one survey campaign to minimise disturbance that may result from multiple survey projects.

This EPS and Basking Shark Risk Assessment considers Joint Nature Conservation Committee (JNCC) guidance on the protection of marine EPS from injury and disturbance (JNCC, 2010), and Marine Directorate guidance on the protection of marine EPS from injury and disturbance for Scottish inshore waters (Marine Scotland, 2020).

The proposed survey equipment has the potential to impact EPS and basking sharks through underwater noise generation and vessel collision. The geophysical survey will be undertaken by USV, in both nearshore and offshore waters, within a total area of approximately 150.48 km².

2 PROPOSED SCOPE OF WORKS

2.1 SURVEY DESIGN

The proposed survey will carry out a data collection to meet the interests of multiple clients. The survey is required to map the seabed, acquire bathymetric data, characterise layers of sediment and rock below the seabed surface and assess seabed habitats. The survey is essential when undertaking any offshore development work that requires assets to be placed on or within the seabed, to ensure the areas are mapped and characterised accordingly. Projects cannot be developed without geophysical work being undertaken, as the data is required to fully document the characteristics of the seabed, inform considerations of effects on the environment and ensure the safety of subsequent installation work.

2.2 SURVEY LOCATION

This EPS and Basking Shark Risk Assessment covers the sections of the Survey Area that fall within Scottish inshore (<12 nm) and offshore (12-200 nm) waters. The Survey Area may be divided between the potential cable landfall location, in Sullom Voe, and the potential offshore cable corridor, comprising Sullom Voe, Dales Voe, and the North Sea to the east of Shetland. As the survey vessel will move along a pre-determined route, and not remain in one area, this Risk Assessment considers the total potential area of disturbance. The total Survey Area covers an area of 150.48 km² (Figure 2-1). A 5 km buffer has been applied as an effective deterrence range (EDR), per request from the regulator (Figure 2-2). The Area of Potential Disturbance (including the 5 km EDR 'buffer') encompasses an area of approximately 730.55 km².

FIGURE 2-1 PROPOSED SURVEY AREA LOCATION

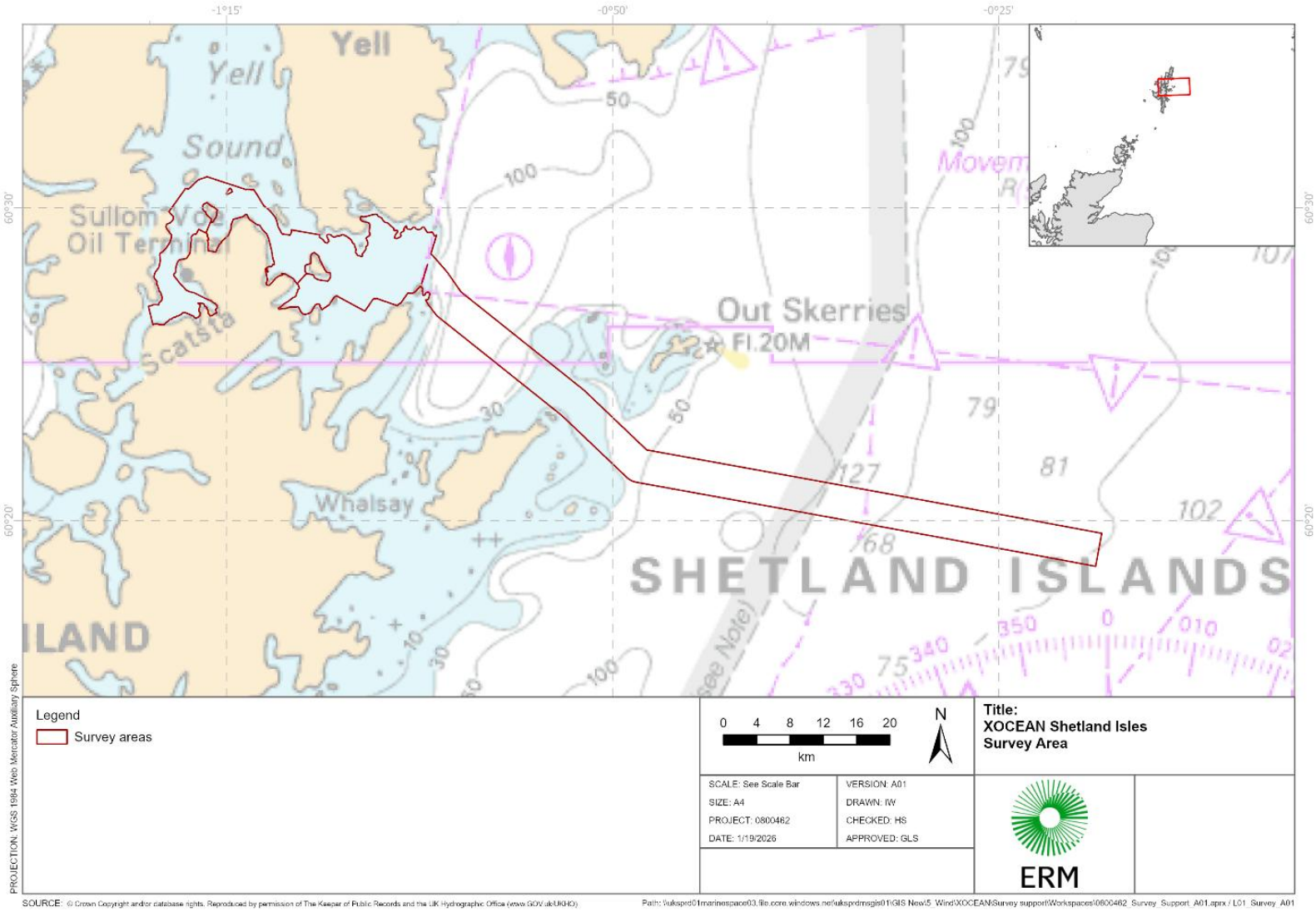
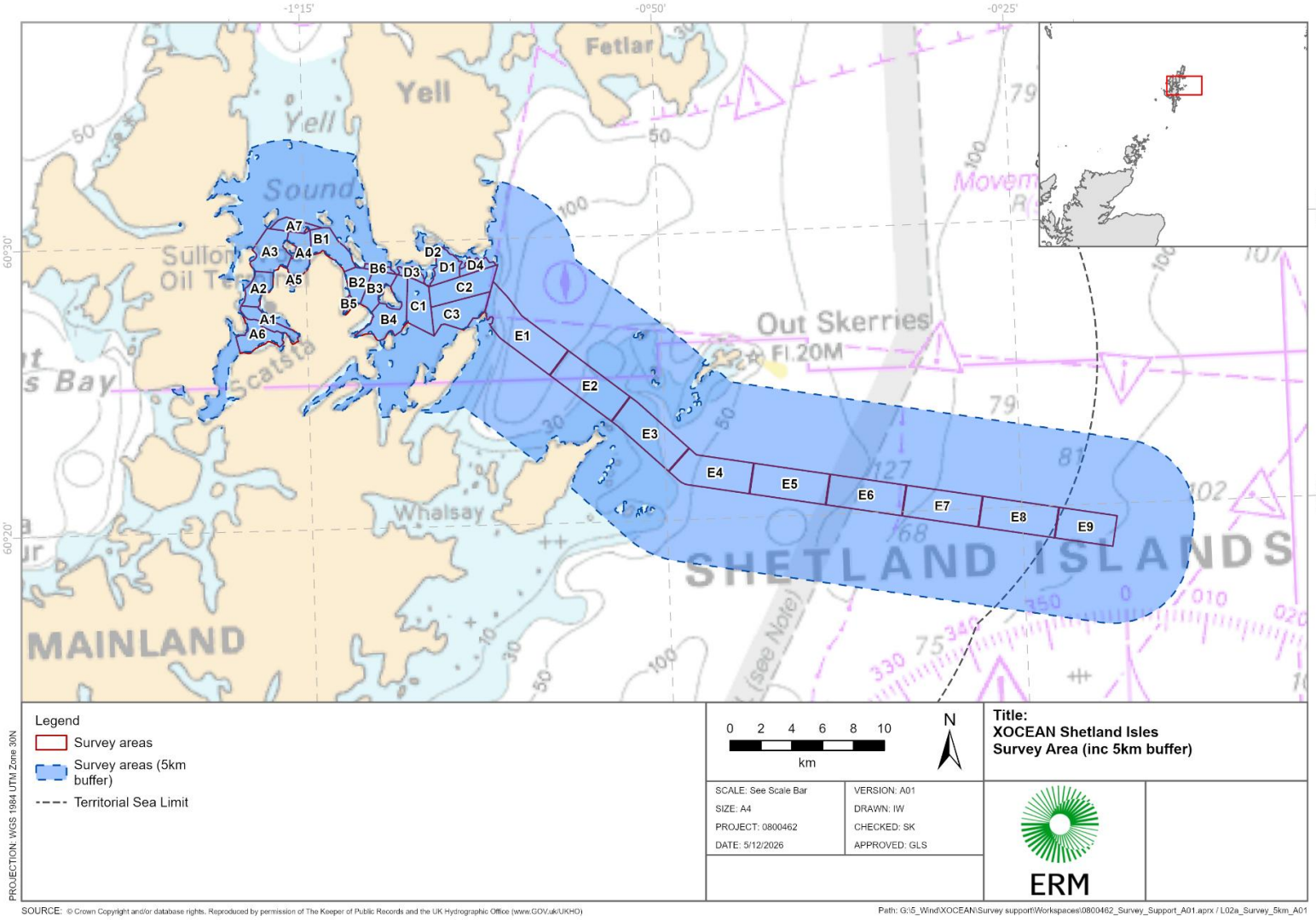


FIGURE 2-2 SURVEY AREA INCLUDING A 5 KM BUFFER AS AN APPROPRIATE EFFECTIVE DETERRENCE RANGE FOR THE RELEVANT GEOPHYSICAL SURVEYS



2.3 SURVEY VESSELS

The survey will utilise an XO-450 model USV, where up to 3 USVs may be required each with MBES and SBP data collection. There will be an escort vessel present outside the harbour limits. The USVs are uncrewed, sending real-time information and images to qualified USV pilots who control the USVs remotely. All vessels may be active throughout the duration of the survey works. The USVs are catamaran-hulled vessels, 4.5 m in length. They are fitted with collision alarms, where, upon activation through proximity to an obstacle, the USV will reverse and await course correction from the pilot.

There will also be a guard vessel present with Marine Mammal Observer (MMO) onboard. The MMO will be present during the start up procedures to determine whether the work is able to commence, based on presence/absence of marine mammals. The guard vessel with the MMO onboard will then leave the area, as operational mitigation will occur using visual and thermal cameras, which will not be a risk to marine mammal species in the area.

2.4 SURVEY DURATION

The surveys will be conducted at the earliest opportunity, following completion and determination of all licensing and permitting requirements, most likely during summer 2026.

A representative duration for geophysical acquisition is less than 30 on water days within the span of 1 year. The MBES and SBP surveys are planned to occur over 14 days, and the estimated completion date is therefore expected to be 28-30 days following commencement, allowing for infill and transit time to / from port. However, to allow for any unforeseen operational and/or weather delays the end date has been specified as 1 year following consent. This end date has been selected to allow for timing flexibility, accounting for survey vessel availability, and does not represent the number of operational days anticipated for the survey. The Port of Operation for all vessels will be the slipway at Sella Ness, with other launch sites potentially utilised following on site audits and owner permission.

2.5 GEOPHYSICAL SURVEY EQUIPMENT SPECIFICATIONS

Geophysical surveys will be conducted within the Survey Area, using a combination of instruments. Sensors to be deployed during the survey are summarised below:

- MBES: Geophysical survey device used to map the seabed by measuring the reflected signal of a high frequency pulse emitted from a transducer. The MBES device produces a swathe of water depth data comprised of individual beams;
- SBP: Geophysical survey device that typically emits low frequency sound pulses that penetrate the seabed. Reflected pulses are recorded to characterise sub-surface geology and sediment layers.

Details on the specifications of the equipment to be employed by XOCEAN during the proposed survey is presented in Table 2.1, which is based on a worst-case scenario as a precautionary measure.

TABLE 2.1 GEOPHYSICAL SURVEY EQUIPMENT PARAMETERS

Parameter	Accuracy and Resolution Requirement based on Project parameters and requirements	Potential for EPS Impact (see detailed justification for impact potential in Section 5.1.2)
Multibeam Echosounder		
Model	Norbit B51s WINGHEAD	No
Frequency Range (kHz)	400	
Indicative SPL (dB re 1µPa)	180-240	
Sub-Bottom Profiler		
Model	Innomar SES-2000 Medium-100	Yes
Frequency Range (kHz)	8-10	
Indicative SPL (dB re 1µPa)	247-250	

3 LEGISLATION

3.1 EUROPEAN PROTECTED SPECIES

In Scottish Territorial waters, the European Habitats Directive (European Union Council Directive 92/43/EEC) is implemented by the Habitats Regulations 1994 (The Conservation (Natural Habitats &c.) Regulations 1994). These are strengthened by the Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007, which contain a revision of the disturbance offence for EPS specifically through Regulation 39, which states:

Under Regulation 39.— (1) of the Habitats Regulations, it is an offence–

(a) Deliberately or recklessly to capture, injure or kill a wild animal of a European protected species;

(b) Deliberately or recklessly–

(i) To harass a wild animal or group of wild animals of a European protected species;

(ii) To disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;

(iii) To disturb such an animal while it is rearing or otherwise caring for its young;

(iv) To obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;

(v) To disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs;

(vi) Disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise.

care for its young; or

(vii) Do disturb such an animal while it is migrating or hibernating;

(c) deliberately or recklessly to take or destroy the eggs of such an animal; or

(d) to damage or destroy a breeding site or resting place of such an animal.

Regulation 39.— (2) of the Habitats Regulations further states:

(2) Subject to the provisions of this Part, it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).

In UK Offshore Waters (beyond 12 nm limit of Scottish inshore waters), the Habitats Directive is transposed into law by the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended). The protection of wild animals listed in Annex IV(a) is addressed under Regulation 45, which states:

45.— (1) Subject to regulations 46 and 55, a person who—

(a) deliberately captures, injures, or kills any wild animal of a European protected species,

(b) deliberately disturbs wild animals of any such species,

(c) deliberately takes or destroys the eggs of such an animal, or

(d) damages or destroys, or does anything to cause the deterioration of, a breeding site or resting place of such an animal, is guilty of an offence.

(2) For the purposes of paragraph (1)(b), disturbance of animals includes in particular any disturbance which is likely—

(a) to impair their ability—

(i) to survive, to breed or reproduce, or to rear or nurture their young; or

(ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate; or

(b) to affect significantly the local distribution or abundance of the species to which they belong.

Any activity that has the potential to disturb these species must therefore obtain an EPS licence prior to the commencement of the activity. There are certain strict criteria that must be met before a licence may be granted exempting the proposed activity:

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

The proposed activity may only proceed if these criteria are fulfilled, and an EPS licence has been granted.

3.2 BASKING SHARK

Basking shark are not listed on either Annex II or Annex IV of the EU Habitats Directive but are given full protection (alongside cetaceans) under Schedule 5 of the Wildlife and Countryside Act 1981. This Act implements the Bern Convention and applies to inshore waters up to 12 nm from land (and terrestrial environment), providing protection for various fish species, including basking shark.

Under Schedule 5, it is an offence to-

- *intentionally or recklessly kill, injure, or take fish;*
- *possess or sell fish; or*
- *intentionally or recklessly disturb or harass fish.*

The protection given by the Wildlife and Countryside Act 1981 is enhanced by the Nature Conservation (Scotland) Act 2004, under which it is an offence for any activity to deliberately or recklessly capture, kill, injure, or disturb any basking shark (or dolphin, whale, or porpoise).

Activities in Scottish inshore waters that have the potential to disturb basking shark must therefore obtain a Basking Shark Licence to undertake the proposed activity.

3.3 SCOTTISH NATIONAL MARINE PLAN

The proposed surveys support Scotland's National Marine Plan and the Scottish Government's commitment to sustainable development. General Policies that have been assessed as being relevant to the project are discussed below:

- GEN 2 Economic Benefit: Surveys will enable construction of various marine infrastructure projects, which will lead to increased employment opportunities in the area;
- GEN 5 Climate Change: Surveys are required for construction of future marine infrastructure projects, which will directly aid the transition to a low carbon economy;
- GEN 9 Natural Heritage: This risk assessment has been compiled in compliance with the legal requirements for any activity (e.g. the proposed surveys) that has the potential to impact protected areas and protected species (e.g. EPS), in order to protect the marine environment;
- GEN 13 Noise: This risk assessment specifically considers and addresses the potential for impacts on EPS as a result of underwater sound generated by the proposed surveys, including potential mitigation measures;
- GEN 19 Sound Evidence: This risk assessment is based on sound scientific evidence and considers the most up-to-date peer-reviewed sources openly available.

4 BIOLOGICAL BASELINE

4.1PROTECTED AREAS

Protected areas in Scotland are divided into Nature Conservation Marine Protected Areas (NCMPAs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs), and Ramsar sites. These various categories of protected areas function in different ways. SACs and SPAs were designated internationally under the EU Habitats Directive. SACs are areas designated for the protection of marine species and habitats determined through the Habitats Directive to contribute to conservation of Europe's

biodiversity. There are currently 16 SACs for marine mammals in Scottish waters; 1 for harbour porpoise, 1 for bottlenose dolphin, 8 for harbour seal, and 6 for grey seal. SPAs are selected for the protection of rare, threatened, or vulnerable bird species listed in Annex I of the Birds Directive and are not required to be considered further in this assessment. NCMPAs add additional protection and serve to fill in any gaps not protected by SACs or SPAs. In total, 230 of these various categories of sites make up the Scottish Marine Protected Area (MPA) Network.

In addition to potential impacts on protected species (assessed in Section 5), this Risk Assessment considers the potential for survey activities to impact protected sites with EPS as designated features. As selection criteria, the Risk Assessment considers SACs and NCMPAs with EPS as qualifying features that fall in part or wholly within 100 km of the proposed survey corridor. There is not considered to be the potential for impact from geophysical survey activities on benthic designated features (JNCC, 2017) therefore these sites have not been included in this assessment.

There is 1 SAC/NCMPA within 100 km of the proposed Survey Area which includes EPS designated features. Protected sites, with EPS designated features within Scottish waters, along with the distance between the proposed Survey Area to the site, are listed in Table 4.1. There are additional MPAs designated for EPS further south, however those are too far away to be of any concern for the geophysical surveys planned in the Survey Area. There are also numerous harbour and grey seal haul out sites in the wider area. As seal are not a EPS, protected sites and haul outs are not considered within this assessment.

TABLE 4.1 PROTECTED SITES WITHIN SCOTTISH WATERS WHICH HAVE EPS AS DESIGNATED FEATURES

Site name	EPS designated feature	Distance to proposed Survey Area (km)
Yell Sound Coast SAC	Eurasian otter, harbour seal[a]	0
Southern Trench NCMPA	Common minke whale	187.26
North-East Lewis NCMPA	Risso's dolphin	218.68
Firth of Tay and Eden Estuary SAC	Eurasian otter	283.66
Small Isles NCMPA	Harbour porpoise	291.79
Moray Firth SAC	Common bottlenose dolphin	302.53
Inner Hebrides and the Minches SAC	Harbour porpoise	346.03
Sea of the Hebrides NCMPA	Harbour porpoise	451.58

[a] Due to concerns over the overlap between the proposed survey works and the Yell Sound Coast SAC, along with the high presence of seal within the area, assessment has been made on harbour seal within the Yell Sound Coast SAC (Section 5.3.1).

4.2 PROTECTED SPECIES

4.2.1 CETACEANS

All cetacean species with recorded sightings in Scottish waters are considered EPS of Community Interest and in need of strict protection under Annex IV of the Habitats Directive. Additionally, harbour porpoise *Phocoena phocoena* and common bottlenose dolphin *Tursiops*

truncatus are protected under Annex II as species of Community Interest whose conservation requires the designation of SACs.

Of the cetacean species known to be present in Scottish waters, 8 species are considered common around Shetland (Table 4.2): harbour porpoise, common minke whale *Balaenoptera acutorostrata*, humpback whale *Megaptera novaeangliae*, orca *Orcinus orca*, Risso's dolphin *Grampus griseus*, white-beaked dolphin *Lagenorhynchus albirostris*, short-beaked common dolphin *Delphinus delphis*, and Atlantic white-sided dolphin *Leucopleurus acutus* (Gilles *et al.*, 2023; IUCN-MMPATF, 2024; OBIS, 2026).

Several other species are known to be present within the area but are not commonly observed: sei whale *Balaenoptera borealis*, fin whale *Balaenoptera physalus*, long-finned pilot whale *Globicephala melas*, beaked whale spp., sperm whale *Physeter macrocephalus*, and common bottlenose dolphin (IUCN-MMPATF, 2024; OBIS, 2026) (Table 4.2).

TABLE 4.2 SPECIES PRESENT AROUND THE SURVEY AREA, INCLUDING IMPORTANT CHARACTERISTICS

Species	Sighting Regularity[a]	Site Use[b]	Seasonality[b]
Harbour porpoise *Phocoena phocoena*	Common	Resident, Reproductive, Feeding, Transient	All year
Common minke whale *Balaenoptera acutorostrata*	Common	Resident, Feeding, Transient	Primarily seasonal (spring-autumn)
Humpback whale *Megaptera novaeangliae*	Occasional	Resident, Feeding, Migration, Transient	Primarily seasonal (spring-autumn)
Orca *Orcinus orca*	Common	Resident, Reproductive, Feeding, Transient	All year
Risso's dolphin *Grampus griseus*	Occasional	Resident, Transient	All year
White-beaked dolphin *Lagenorhynchus albirostris*	Occasional	Resident, Transient	Primarily seasonal (spring-autumn)
Short-beaked common dolphin *Delphinus delphis*	Occasional	Resident, Transient	Seasonal but sporadic
Atlantic white-sided dolphin *Leucopleurus acutus*	Occasional	Resident, Transient	Primarily seasonal (summer)
Sei whale *Balaenoptera borealis*	Rare	Transient	Uncertain – no obvious trend due to lack of data
Fin whale *Balaenoptera physalus*	Rare	Transient	Uncertain – no obvious trend due to lack of data
Long-finned pilot whale *Globicephala melas*	Rare	Transient	Uncertain – no obvious trend due to lack of data
Beaked whale spp.	Rare	Transient	Uncertain – no obvious trend due to lack of data
Sperm whale *Physeter macrocephalus*	Rare	Transient	Uncertain – no obvious trend due to lack of data

Species	Sighting Regularity[a]	Site Use[b]	Seasonality[b]
Common bottlenose dolphin *Tursiops truncatus*	Occasional	Resident, Transient[c]	Seasonal but sporadic

[a] Based on sightings information from Gilles *et al.*, 2023; IUCN-MMPATF, 2024; HWDT, 2026c; OBIS, 2026.
[b] Based on guidance in IUCN-MMPATF, 2024.
[c] Based on recent observations Shetland News, 2025; ORCA, 2026.

Abundance and density estimates for the Survey Area were extracted from the most recent Small Cetaceans in European Atlantic waters and the North Sea (SCANS) surveys (SCANS IV: Gilles *et al*., 2023). Additional surveys were performed in 2005 (SCANS-II; Hammond *et al*., 2013), 2007 (CODA, 2009), and 2016 (SCANS-III; Hammond *et al*., 2021). The most recent relevant survey, SCANS-IV, took place in 2022 (Gilles *et al*., 2023). A more recent SCANS report, winterSCANS, describes work carried out in 2024 (Ramirez-Martinez *et al.*, 2025), however, this survey only looked at the North Sea, >300 km south of the Survey Area. The aim of the SCANS survey programme is to provide abundance estimates of cetacean species in shelf and oceanic waters of the European Atlantic to enable effective and efficient future monitoring, and to enable management of cetacean populations at favourable conservation status (Hammond *et al*., 2002).

The Survey Area falls within SCANS-IV survey Block NS-E. Abundances and densities of EPS species within survey Block NS-E are presented in Table 4.3. Species that have recorded sightings in the area but that were not sighted during SCANS surveys in this block are included in the table but have no displayed density or abundance. Abundances for cetacean Management Units (MUs) that overlap the study area are also included (IAMMWG, 2023). MU abundances provide a reference for population-level impact assessments of proposed plans (and cumulative impacts with other projects).

TABLE 4.3 ABUNDANCE AND DENSITY INFORMATION FOR SPECIES COMMONLY SIGHTED WITHIN THE SURVEY AREA

Species	Abundance in SCANS IV Data Block NS-E	Species Density (animals/km²) SCANS IV Data Block NS-E	Abundance Management Unit (MU)[a] (Hague *et al.*, 2020; IAMMWG, 2023)
Harbour porpoise *Phocoena phocoena*	33,735	0.5156	346,601 (NS)
Common minke whale *Balaenoptera acutorostrata*	795	0.0121	20,188 (CGNS)
Humpback whale *Megaptera novaeangliae*	None recorded	None recorded	At least 35,000 (North Atlantic)[b]
Orca *Orcinus orca*	None recorded	None recorded	15,000 (North Atlantic)[b]
Risso's dolphin *Grampus griseus*	4,589	0.0702	12,262 (CGNS)
White-beaked dolphin *Lagenorhynchus albirostris*	11,611	0.1775	43,951 (CGNS)
Short-beaked common dolphin *Delphinus delphis*	None recorded	None recorded	102,656 (CGNS)

Species	Abundance in SCANS IV Data Block NS-E	Species Density (animals/km²) SCANS IV Data Block NS-E	Abundance Management Unit (MU)[a] (Hague *et al.*, 2020; IAMMWG, 2023)
Atlantic white-sided dolphin *Leucopleurus acutus*	958	0.0146	18,128 (CGNS)
Common bottlenose dolphin *Tursiops truncatus*	None recorded	None recorded	2,022 (GNS)

[a] NS = North Sea; GNS = Greater North Sea; CGNS = Celtic & Greater North Sea
[b] No Management Unit available for these species. Data taken from Hague et al. (2020)

4.2.1.1 HARBOUR PORPOISE *PHOCOENA PHOCOENA*

Harbour porpoise are the most common cetacean species in UK waters and are present in Scottish inshore and offshore waters year-round, with peak sightings of small groups recorded in summer months (Evans *et al.*, 2006; Evans *et al*., 2011; Hague *et al*., 2020; Gilles *et al.*, 2023). The highest densities and encounter rates of harbour porpoise in Scottish waters occur within eastern and southeastern waters, albeit at markedly lower densities than populations within the central and southern North Sea (Baxter *et al*., 2011; Lacey *et al*., 2022). Harbour porpoise are frequently recorded by surveys undertaken within the vicinity of the Survey Area and are considered resident within the area year-round (Hague *et al*., 2020). The area may be utilised for reproductive and feeding purposes, as well as maintaining a general populace (IUCN-MMPTAF, 2024).

The main diet of this species consists of small (<40 cm) fish, such as Gadidae (Atlantic cod *Gadus morhua*, whiting *Merlangius merlangus* and haddock *Melanogrammus aeglefinus*), Ammodytidae (sandeel spp.), and Atlantic herring *Clupea harengus*, amongst other species (Santos and Pierce, 2003). They require energy-rich prey with high fat contents to maintain body condition due to high metabolic requirements (Leopold *et al.*, 2015; Booth, 2019).

Harbour porpoise are particularly sensitive to the effects of elevated underwater sound as they rely heavily upon sound to navigate and forage. They are often considered the benchmark species when considering the worst-case impacts of sound producing activities, such as geophysical surveys (HWDT, 2024; JNCC, 2025).

4.2.1.2 COMMON MINKE WHALE *BALAENOPTERA ACUTOROSTRATA*

Common minke whale are the most common baleen whale species in Scottish waters, and density is greatest within inshore waters off western Scottish coastlines (Hague *et al*., 2020). The distribution of common minke whale is seasonal in nature, with low densities during winter months and higher densities within summer months, particularly during the July-August period (Reeves *et al*., 2002; Waggitt *et al*., 2020). The species is designated as a feature of conservation interest within the Southern Trench NCMPA which is located 187 km south of the Survey Area. Minke whale density peaks in the summer months, concentrated in the north-west section of the Southern Trench NCMPA, toward to outskirts of the Moray Firth (Robinson *et al.,* 2023).

Common minke whale are members of the baleen family (Mysticeti) and are filter feeders. Their main diet consists of various teleost fish species, including Ammodytidae, Clupeidae, Scombridae, and Carangidae (Robinson and Tetley, 2007; Anderwald and Evans, 2012). While minke whale may be seen in loose aggregations of 3-15 individuals in areas of high prey

availability (Evans, 2000; Sea Watch Foundation, 2012), they tend to be solitary (WDC, 2026), though are often associated with mixed-species flocks of seabirds when feeding (Anderwald *et al*., 2007; Robinson and Tetley, 2007).

4.2.1.3 HUMPBACK WHALE *MEGAPTERA NOVAEANGLIAE*

Humpback whale have a worldwide distribution, inhabiting tropical, temperate, and polar regions in both the southern and northern hemisphere. They are occasionally encountered in the British Isles, distributed mainly over continental shelves around Scotland, in the northern Irish Sea, and in the western channel, between breeding grounds off Africa to feeding grounds around Iceland and Norway (Reid *et al*., 2003; Sea Watch Foundation, 2024; HWDT, 2026a). Although no humpback whale were detected in SCANS IV surveys of Block NS-E (Gilles *et al.*, 2023), they are regularly seen around Shetland (IUCN-MMPTAF, 2024; Sea Watch Foundation, 2024), where the species can be sighted between May and September.

Humpback whale are generalist filter feeders. In British waters, humpback whale mainly feed on krill, herring, and cod (HWDT, 2026a). They adopt a range of solo and cooperative foraging techniques including lunge feeding, and bubble netting, which involves herding fish towards the surface by creating walls of bubbles. This plasticity enables humpback whale to adapt their hunting strategies to suit availability of different prey species.

4.2.1.4 ORCA *ORCINUS ORCA*

Orca, or 'killer whale' as they are colloquially referred, generally prefer deep waters but are also sighted in shallow bays or estuaries. The species is usually found within 800 km of continents in colder waters at higher latitudes (Reid *et al.*, 2003) and are globally distributed. Although no orca were detected in SCANS-IV surveys of block NS-E (Gilles *et al.*, 2023), the species has a broad presence across the deep North Atlantic and along the coastlines of northern Europe, including the Faroe Islands. They are known to occur around Shetland (Shetland, 2024), where sightings are increasingly common, particularly between May and August.

Orca are classified into multiple ecotypes according to their geographic distribution and prey preferences, with these differences driving the development of distinct specialisations. The most commonly sighted in Scottish waters are the West Coast community which are now down to 2 remaining members, John Coe and Aquarius, and the Northern Isles community. The Northern Isles community are believed to more opportunistic than the West Coast community, but both groups may be sighted around Shetland.

Orca are at the top of the food chain and feed on a variety of prey, including fish, shark, octopus, and squid, but also birds, seals and other cetaceans (HWDT, 2026b). The West Coast community are known to hunt larger prey (e.g. baleen whales) whereas the Northern Isles community may hunt porpoise, seals, seabirds, and fish.

4.2.1.5 RISSO'S DOLPHIN *GRAMPUS GRISEUS*

Risso's dolphin prefer deep waters along the continental shelf, however, they are resident year-round within western Scottish waters, with a seasonal distribution extending into the Celtic Sea and Irish Sea during winter months (IAMMWG, 2015; Waggitt *et al*., 2020). They are primarily a warm water pelagic species, preferring slope waters 50-100 m depth (Baird and Stacey, 1991; Reid *et al.*, 2003). Population densities within Scottish waters increase during summer months in line with the seasonal distribution of this species (Hague *et al*., 2020). They are

occasionally seen with other cetaceans, such as long-finned pilot whale, white-beaked dolphin, Atlantic white-sided dolphin, and common bottlenose dolphin (Reid *et al.*, 2003).

They are able to switch frequently during the day from being generalist, surface-dwelling predators, to hunting larger squid at depth. Their target foraging depth is 50-600 m, using information on prey layers and foraging performance obtained in previous dives (Clarke, 1996; Arranz *et al.*, 2016; Arranz *et al.*, 2018; Arranz *et al.*, 2019; Benoit-Bird *et al.*, 2019; Jensen *et al.*, 2020).

4.2.1.6 WHITE-BEAKED DOLPHIN *LAGENORHYNCHUS ALBIROSTRIS*

White-beaked dolphin are another commonly sighted cetacean species within Scottish inshore waters, preferring depths of <200 m (Barnes, 2008). The species typically forms large pods, and they have been noted to school with Atlantic white-sided dolphin, as well as other cetacean species (Reid *et al*., 2003). Their distribution is thought to vary by season, with a substantially higher abundance recorded within summer months (Waggitt *et al*., 2020).

The main diet of white-beaked dolphin is similar to common bottlenose dolphin, consisting of fish and shellfish species such as Gadidae, Cephalopoda, and Crustacea (Canning *et al*., 2008; Kinze, 2009).

4.2.1.7 SHORT-BEAKED COMMON DOLPHIN *DELPHINUS DELPHIS*

Short-beaked common dolphin are seasonal visitors to Scottish waters, with sightings primarily concentrated within the Celtic Sea and west of the Hebrides (Hammond *et al*., 2021; Hague *et al*., 2020). Sightings are less common off the southeast Scottish coastlines, but they are still known around Shetland (Hague *et al*., 2020).

They have a universal diet, feed opportunistically and take a range of prey including small fish, shellfish, and cephalopods. In the North-East Atlantic their diet is comprised mostly of teleost fish (95-97%), with cephalopods comprising <5%, and only a few crustaceans recorded (Brophy *et al*., 2009). Short-beaked common dolphin forage mostly by targeting small, schooling fish.

4.2.1.8 ATLANTIC WHITE-SIDED DOLPHIN *LEUCOPLEURUS ACUTUS*

Atlantic white-sided dolphin are primarily distributed in deep offshore waters, however, they are also regularly sighted off northeastern and eastern Scottish coastlines (Evans *et al*., 2011; Hammond *et al*., 2021). Whilst offshore group sizes may approach 1,000 individuals (Reid *et al*., 2003), sightings in Scottish waters are generally low, with greater likelihood of occurrence during late summer and autumn months (Hague *et al*., 2020).

The diet of Atlantic white-sided dolphin is similar to that of white-beaked dolphin and common bottlenose dolphin, consisting of fish and shellfish species such as Gadidae, Scombridae, Carangidae, Cephalopoda, and Crustacea (Evans and Smeenk, 2008; Evans *et al*., 2011).

4.2.1.9 COMMON BOTTLENOSE DOLPHIN *TURSIOPS TRUNCATUS*

Common bottlenose dolphin are a common species within inshore and offshore waters of the north Atlantic Ocean (Reid *et al*., 2003; Hague *et al.*, 2020). Although no common bottlenose dolphin were detected in SCANS IV Block NS-E (Gilles *et al*., 2023), there is a known notable resident population within the Moray Firth (Wilson *et al*., 1997), which is part of the Coastal East Scotland (CES) Management Unit. There is also a semi-resident population of common bottlenose dolphin in Aberdeen Bay that is commonly observed in pods of 5-10 individuals and

appears to have a high overlap with dolphins previously recorded in the Inner Moray Firth (Sini *et al*., 2005). These dolphins are most frequently observed foraging within 300 m of the harbour entrance and appear tolerant of the vessel activity, evidenced by their continued presence over more than a decade, and preferential use of areas of highest boat activity (Sini *et al*., 2005; Weir *et al*., 2008). The annual distribution and relative abundance of bottlenose dolphin is low throughout the entire Survey Area with no individuals sighted within the immediate Survey Area (NMPi, 2022). Common bottlenose dolphin are not considered "common" but are beginning to become more prominent around Shetland with 4 confirmed sightings of aggregations since 2002 (Shetland News, 2025; ORCA, 2026).

Most sightings are related to individuals within inshore waters during summer months from May-September, but it is known that individuals move into offshore waters during winter months (Evans *et al*., 2011). As sightings are regularly recorded within the Greater North Sea (GNS) Management Unit and the CES Management Unit, these species are considered to be present within the vicinity of the Survey Area (HWDT, 2026c).

The main diet of this species is similar to harbour porpoise, consisting of fish (e.g. Gadidae, Ammodytidae, and mixed small fish species) and shellfish (e.g. Cephalopoda and Crustacea), although noting prey size is likely to be larger than that of harbour porpoise, due to the greater body size of bottlenose dolphin (Wilson, 2008).

4.2.1.10 OTHER CETACEAN SPECIES

Several other cetacean species have been recorded in relatively low numbers by surveys undertaken in the vicinity of the Survey Area, including sei whale *Balaenoptera borealis*, fin whale *Balaenoptera physalus*, long-finned pilot whale *Globicephala melas*, beaked whale spp., and sperm whale *Physeter macrocephalus* (Hague *et al.*, 2020; Evans *et al.*, 2011; Waggitt *et al.*, 2020; HWDT, 2026c). Due to the rarity of sightings of these species, it can be inferred that their presence around the Study Area is less common. Therefore, further consideration of these species will not be included due to negligible exposure pathway of effect.

4.2.2 OTHER SPECIES

4.2.2.1 BASKING SHARK *CETORHINUS MAXIMUS*

Basking shark *Cetorhinus maximus* are the largest fish species found in UK waters and are assessed as Endangered on the IUCN Red List of Threatened Species (Rigby *et al.*, 2021). They follow a seasonal distribution, with increased sightings in the summer months as sharks feed on plankton in coastal surface waters near tidal fronts (Sims and Quayle, 1998; Doherty *et al.*, 2017). In the summer, they are most common around the southwest coast of England, throughout the Irish Sea, and off the west coast of Scotland (Shark Trust, 2022). In winter, basking shark in the northeast Atlantic inhabit the waters of continental shelf and shelf edge, but do not hibernate or exhibit prolonged movements into open-ocean regions (Sims *et al.*, 2008).

The Sea of the Hebrides MPA is currently the only NCMPA in Scottish waters designated for the protection of basking shark, with hotspots recorded particularly around Coll, Tiree, Skerryvore, and Hyskier (Witt *et al.*, 2016). Basking shark have also recently been recorded off the northeast coast of Scotland (Pentland Firth, Orkney, Shetland, and the northern North Sea), but in lower concentrations compared to the west coast (Fowler, 2000; Sims, 2008).

Basking shark are not commonly sighted around Shetland, particularly outside of the peak season of April-September. They are more commonly observed from the West coast of Scotland per the presence of their copepod food source (Bloomfield and Solandt, 2008).

4.2.2.2 EURASIAN OTTER *LUTRA LUTRA*

The only native UK species of otter are Eurasian otter, which are protected as an EPS under the Habitats Directive. Otter distribution in Scotland occurs primarily in the north and west; the closest SAC to the Survey Area with otters as a qualifying feature is the River Dee SAC (Findlay *et al*., 2015). Otters have been documented using coastal areas within Scotland and the wider UK (Kruuk *et al*., 1998; McMahon and McCafferty, 2006; Liles, 2009). Marine areas can provide increased prey availability, however access to inland habitats must be maintained as freshwater is used for consumption and washing (Kruuk, 2006; Parry *et al*., 2011). Marine foraging activities have been observed in shallow waters within 100 m of shore (Kruuk and Moorhouse, 1991). However, as the Shetland population are diurnal and surveying nearshore will occur predominantly overnight to avoid the Toft to Ulsta Ferry activity, it is unlikely that otter will be impacted (Russo *et al.*, 2022).

4.2.2.3 MARINE TURTLES

Of the species of marine turtle found globally, 5 species have been recorded in European Atlantic waters (Brongersma, 1972; Penhallurick; 1990; Langton *et al*., 1996). In UK waters, marine turtles are migratory and infrequently recorded, with only 1 species, leatherback turtle *Dermochelys coriacea*, seen with regularity (MCS, 2025). However, no marine turtle species are considered resident in the area, as their range is limited by temperature (Botterell *et al.*, 2020). Due to the absence of sightings around Shetland (NBN Atlas, 2026), marine turtles are not considered further within this assessment.

5 RISK ASSESSMENT

An assessment of the possible risks from the proposed geophysical surveys by the identification of injury or disturbance pathways for EPS and basking shark will help to ensure safe operations with a favourable conservation outcome. The primary potential impact pathways that have been identified in relation to the proposed survey are:

- Collision with vessels;
- Underwater sound impacts from geophysical survey equipment;
- Underwater sound impacts from increased vessel traffic.

Collisions with survey or support vessels (‘ship strikes’) have the potential to injure or kill affected individual animals.

Underwater sound from vessels is continuous and non-impulsive at levels between 165-180 dB re 1µPa (RMS) and frequencies below 1 kHz, for vessels between 50-100 m (OSPAR, 2009). Sound emissions from vessels are unlikely to cause physical injury in terms of hearing impairment (e.g. Permanent Threshold Shift (PTS)) or mortality, but may result in behavioural changes, such as displacement of some cetaceans from the affected area (Benhemma-Le Gall *et al*., 2021), or reduction in foraging activity (Wisniewska *et al*., 2018).

Underwater sound emissions from geophysical survey equipment is likely to have the greatest potential impact of the three identified pathways, particularly for cetaceans, as there is the potential to cause Temporary Threshold Shift (TTS) or PTS. TTS is a temporary change in the

frequency threshold audible to an individual, caused by changes to the ear tissues, which recover over time. PTS, in contrast, is a permanent full or partial loss of hearing acuity, also caused by damage to the ear. For the purposes of this assessment, the PTS onset threshold defines the point at which an individual is considered to experience auditory injury. With adherence to Best Practice guidance produced by the JNCC (JNCC, 2010; 2017), the risk of PTS in cetaceans may be reduced to negligible levels.

5.1 LIKELIHOOD OF IMPACT

Likelihood of impact is based upon the sensitivity and exposure of receptors to the potential impact, scored from Negligible to High informed by available published studies:

- Negligible: Impact would be immeasurable against background levels, having no effect on the receptor during the project;
- Low: Impact may be slightly measurable against baseline levels or in the context of natural variation, however, will not be substantial enough to require additional mitigation and receptors will recover within a reasonable period following the end of the project;
- Moderate: Impact will be measurable against the baseline conditions in such a way that regional or population-level effects may be recorded, such impacts are expected to require consideration by the project, but could be managed by design changes or implementation of appropriate mitigation measures;
- High: Impact will be measurable against background levels, and regional or population-level effects are expected to occur; impact will require serious consideration and alteration to the project design or implementation of strong mitigation, or compensatory measures to reduce the impact to an acceptable level.

5.1.1 VESSEL COLLISION

5.1.1.1 CETACEAN IMPACTS

There is a risk to local cetacean species of collision with vessels transiting through the marine environment, which may result in injury or mortality. Large, slow-moving cetaceans (e.g. baleen whales) have a greater sensitivity compared to smaller species (e.g. harbour porpoise) that are more agile and have faster swim speeds (Schoeman *et al*., 2020). This risk also varies with vessel size, speed and time needed to alter course should a marine mammal be identified. Vessels which are >80 m in length or travelling >14 kn are the most likely to cause severe or lethal injuries (Laist *et al*., 2001; Schoeman *et al.*, 2020). Where speeds are reduced to <10 kn, the probability of lethal injury may be lowered to below 50% (Vanderlaan and Taggart, 2007). The waters surrounding Shetland are exposed to high vessel traffic, and it is likely that cetaceans present will be accustomed to the presence and movements of vessels in the area.

Cetaceans are able to detect and avoid vessels, however collisions may still occur while animals are engaged in activities such as resting, foraging, breathing, interacting, or as a result of their inquisitive nature (Wilson *et al*., 2007). Harbour porpoise are the most abundant species within the Survey Area and have been shown to exhibit an avoidance response to vessel sound (Benhemma-Le Gall *et al*., 2023).

The proposed surveys would result in an increase in vessel movements (USVs), as well as the temporary presence of a vessel for MMO mitigation prior to start-up of works. However, the increase will be limited and will not extend beyond the short temporal scale described. Whilst the licence would cover a 1-year period, operational surveying will be limited to approximately

30 survey days maximum, thus the total duration of activities will be significantly less than this timeframe. As such, any increases in the number of transiting vessels will be temporary in nature. Vessels will travel along predefined transit routes between port and the survey location and will follow a survey route that minimises unnecessary vessel movements. Furthermore, geophysical surveys are likely to be conducted from USVs.

The USVs which will be utilised are significantly smaller (4 m) than traditional survey vessels. They are constructed of fibreglass and are therefore also lightweight (<1 tonne); producing less noise than traditional survey vessels. In addition, transit speed will be slow (<4 knots), meaning the likelihood of causing injury or disturbance through collision is much lower than would typically be considered for a survey vessel. The vessel which will be escorting the USV for mitigation purposes will be moving at likewise slow speeds, wherein mitigation purpose is considered to nullify any effects contributed. Through this survey, the requirement for surveying in the future will be reduced as XOCEAN will complete full data collection within the described period of activity on behalf of multiple interested parties. This reduces the future risk caused by geophysical surveying and presence of vessels.

Following Marine Directorate guidance for inshore waters (Marine Scotland, 2020), the potential for injury or disturbance to EPS, as defined in Regulations 39 (1) (a) and (b) and 39 (2) of the Habitats Regulations, from collision with vessels associated with the proposed work is negligible. The likelihood of an injury or disturbance offence (considering alternatives) for collisions with EPS has been assessed as a negligible risk of offence; therefore, it is determined that an EPS licence will not be required for the potential impact of collision with vessels.

5.1.1.2 BASKING SHARK IMPACTS

Basking shark are determined to have a medium sensitivity to collision (NatureScot, 2020); however, the impacts of anthropogenic activities are still poorly documented and understood (Kelly *et al*., 2004; Hayes *et al.*, 2018). Basking shark do not appear to be aware of surface vessels and demonstrate little or no reaction to approaching research vessels (Speedie *et al*., 2009). The risk of collisions between basking shark and surface vessels is therefore increased as basking shark do not exhibit avoidance behaviour (Pirotta *et al*., 2019). There have only been 3 published reports of a collision with a basking shark, all off the west coast of Scotland (Schoeman *et al*., 2020).

This risk is ascertained to be significantly lower around Shetland, where basking shark sightings are rare. Additionally, as for cetaceans, vessels will follow routes that minimise unnecessary movements, are smaller than traditional survey vessels, and will travel at low speeds when surveying and transiting. Finally, all proposed surveys will be short-term in duration. Therefore, the likelihood of an injury or disturbance offence (considering alternatives) for collisions with basking shark has been assessed as a negligible risk of offence.

5.1.2 UNDERWATER SOUND FROM SURVEY EQUIPMENT

The use of geophysical survey equipment as part of the proposed surveys will result in an increase in anthropogenic underwater sound in the marine environment, particularly impulsive sound (from geophysical surveys). However, SBPs are highly directional and pointed at the seabed; therefore, the true disturbance distances from the proposed SBP survey are unlikely to exceed the distance between the source and the seabed beyond a 3° beam width (Innomar, 2026). Cetacean Impacts

Cetacean species are vulnerable to impacts from anthropogenic underwater sound, due to their reliance on vocalisations and hearing to communicate, navigate, and forage for prey. The auditory range and peak frequency sensitivity varies with species and has resulted in the categorisation of cetacean species into one of three functional hearing groups, summarised in Table 5.1.

TABLE 5.1 FUNCTIONAL MARINE MAMMAL HEARING GROUPS POTENTIALLY PRESENT IN THE SURVEY AREA AND ASSOCIATED AUDITORY RANGES (FROM: NMFS, 2018; SOUTHALL *ET AL*., 2019)

Functional hearing group	Species	Auditory range
Very high frequency (VHF)	Harbour porpoise	275 Hz-160 kHz
High frequency (HF)	Orca	150 Hz-160 kHz
	Risso's dolphin	
	White-beaked dolphin	
	Short-beaked common dolphin	
	Atlantic white-sided dolphin	
	Common bottlenose dolphin	
Low frequency (LF)	Common minke whale	7 Hz-35 kHz
	Humpback whale	

Increases in underwater sound have the potential to cause auditory injury in marine animals, which is characterised as the onset of PTS. The sound levels at which these impacts may occur differs across species and across different cetacean hearing groups. In cetaceans, the onset thresholds for PTS and TTS have been summarised by Southall *et al*. (2007; 2019). These thresholds are summarised in Table 5.2, wherein sound level thresholds are dependent on whether sound is impulsive or non-impulsive (Southall *et al*., 2019).

TABLE 5.2 PTS AND TTS ONSET THRESHOLDS FOR CETACEAN FUNCTIONAL HEARING GROUPS (FROM: SOUTHALL *ET AL*., 2019)

Functional hearing group	Sound Exposure Level (SEL) (weighted; dB re 1**µ**Pa2s)		Sound Pressure Level$_{peak}$ (SPL_{peak}) (unweighted; dB re 1**µ**Pa)	
	TTS onset	PTS onset	TTS onset	PTS onset
Very high frequency cetaceans (VHF)	140	155	196	202
High frequency cetaceans (HF)	170	185	224	230
Low frequency cetaceans (LF)	168	183	213	219

Note: peak sound pressure level (SPL_{peak}) measured at distance R (SPL_R) and the cumulative sound exposure level (SEL_{cum}) for a recommended accumulation period of 24 hrs.

5.1.2.1.1 Sub-bottom Profiler (SBP)

The indicative SPL of the Innomar SES-2000 Medium-100 SBP may reach 250 dB re 1 µPa @1m at frequencies (8-10 kHz) that overlap the hearing range of cetaceans in the area. This source level exceeds the injury threshold for all cetacean functional hearing groups. However, the greatest sensitivity of various species to specific frequencies is limited. VHF and HF

cetaceans are most sensitive to sounds 16-140 kHz and 10-120 kHz, respectively (Southall *et al.*, 2019). Therefore, impacts to these groups are likely to be lower due to the lack of overlap with the SBP frequency of 8-10 kHz. LF cetacean sensitivity overlaps with the SBP frequency, at 20 Hz-10 kHz (Southall *et al.*, 2019). There is a higher potential for EPS injury (PTS) in LF cetaceans than in HF and VHF cetaceans.

Sound modelling was conducted for BEIS as part of a Review of Consents Habitats Regulations Appraisal (HRA), exploring worst-case scenarios based on the maximum source levels and bandwidths from various sub-bottom profilers. The findings suggest potential onset of Permanent Threshold Shift (PTS) for harbour porpoise could occur at distances ranging from 17-23 m from the source, with potential behavioural impacts extending between 2.4-2.5 km (BEIS, 2018). Studies have indicated that harbour porpoise exhibit avoidance behaviours in response to underwater sound levels lower than those leading to TTS or PTS (Lucke *et al.*, 2009; Palmer *et al.*, 2021). The average swim speed of 1.5 m/s is considered typical for porpoise.

Another example of sound modelling based on a hull mounted pinger (Neptune T335 pinger sub-bottom profiler) with a sound source of 220 dB re 1 µPa-m suggested that the onset of PTS in minke whale could occur within 5 m of the sound source and in harbour porpoise within 32 m. The thresholds at which the onset of PTS in dolphins could occur were not exceeded. Potential behavioural impacts to marine mammals were predicted to occur out to 1.5 km (Shell, 2017). These sound modelling results are based on equipment emitting a higher level of noise than the proposed survey equipment of this Risk Assessment; therefore, estimated distances at which the onset of PTS is predicted to occur will be smaller than the maximum of 32 m estimated in this example.

In addition, guidance for protection of EPS during geophysical surveys (JNCC, 2010) concludes that SBPs could, in a few cases “cause localised short-term impacts on behaviour such as avoidance”, but that this would not be sufficient to constitute disturbance under the terms of the Regulations.

The likelihood of any an individual animal to be within this limited proximity is considered low. Additionally, as the sound source is directed downward, towards the seabed, the area impacted by the emitted underwater sound is reduced (Innomar, 2026). Sound exposure calculations for underwater sound modelling are also based on the assumption that the source is continuously active over a 24-hour period. Guidance for protection of EPS during geophysical surveys (JNCC, 2010) concludes that SBPs could, in a few cases “cause localised short-term impacts on behaviour such as avoidance”, but that this would not be sufficient to constitute disturbance under the terms of the Regulations.

Sound modelling for behavioural effects was based on the Level B harassment threshold of 160 dB re 1µPa @ 1 m proposed by the United States National Marine Fisheries Service (NMFS, 2018). Based on a single pulse of the Innomar source, a disturbance radius of 169 m was generated for all EPS, which was in turn used to calculate a 0.090 km² Behavioural Change Impact Zone (referred to in this document as the Area of Potential Disturbance) (Majewska *et al.*, 2025). This value is based on a single pulse of the source, as it was stated that the sound emitted from the source will dissipate quickly and there will be no accumulation of sound levels.

From the sound generated during SBP operation, there is potential to cause localised short-term impacts on behaviour (e.g. avoidance), or in rare circumstances injury, for all cetacean

species present in the area, therefore the likelihood of disturbance or injury as a result of SBP is therefore considered to be low.

5.1.2.1.2 Multi-beam Echosounder (MBES)

The MBES equipment that will be used during surveys (Norbit B51s) has an indicative SPL of 180-240 dB re 1µPa @1 m, however the frequency range during operations will occur at 400 kHz, therefore there is no overlap with the auditory range of any EPS, thus these receptors are unlikely to be impacted. As such, the likelihood of injury or disturbance as a result of MBES operation is considered to be negligible.

5.1.2.2 BASKING SHARK IMPACTS

Little information on the hearing range of basking shark is available. However, it is thought that elasmobranch species may have a relatively narrow auditory range and poor sensitivity compared to teleost species (Hart and Collin, 2015). Sharks are thought to have an auditory range of approximately 20 Hz-1.5 kHz, with peak sensitivity between 200-600 Hz (Chapuis *et al*., 2019). Basking shark do not rely on hearing for communication or foraging (Booth *et al*., 2013).

There is no direct evidence that basking shark experience mortality or stress from sound within the ranges produced by the proposed geophysical surveys (Wilding *et al*., 2020), and the peak sensitivity range falls below the frequencies generated by the proposed survey equipment. Therefore, the likelihood of an injury or disturbance offence for impacts of geophysical survey equipment on basking shark has been assessed as a negligible risk of offence.

5.1.3 UNDERWATER SOUND FROM VESSEL TRAFFIC

5.1.3.1 CETACEAN IMPACTS

Underwater sound generated by ship traffic is primarily low frequency in nature (10-100 Hz), leading to a rise in ambient sound in many areas of the global ocean (Erbe *et al*., 2019; Sinclair *et al*., 2021). Marine species whose hearing ranges overlap with frequencies of sound produced by vessel traffic have the potential to experience an impact, potentially resulting in negative behavioural responses, stress, masking of species vocalisations, and temporary or permanent shifts in hearing threshold (TTS and PTS) (Erbe *et al*., 2019; Duarte *et al*., 2021). However, recovery following displacement from a site due to anthropogenic activities may be as short as several hours and does not always equate to utilisation of lower-quality habitats (Thompson *et al*., 2013). In some cases, vessel displacement may even reduce impacts of other, more damaging, anthropogenic underwater sound (Benhemma-Le Gall *et al*., 2023). As both vessel presence and vessel sound will cease following survey operations, survey operations will be limited in duration (~5-6 weeks within the span of 1 year), and as displacement or foraging disruption are predicted to be short-term and temporary (Thompson *et al*., 2013; Pirotta *et al*., 2015), this impact is considered negligible.

The planned surveys are located in an area of high anthropogenic activity, in Sullom Voe and Yell Sound. Commercial and recreational vessel activity in these waters is expected to occur regularly and the presence of vessels within the Survey Area is not considered to be a novel impact pathway for EPS. The regular exposure of EPS to vessel activity in the Survey Area makes it additionally likely that species may be partially habituated to anthropogenic sound, as has been documented elsewhere (Duarte *et al*., 2021).

Underwater sound generation from vessels is dependent on multiple factors including bathymetry, source frequency, vessel and propellor design, speed, and size, among others. Smaller vessels (e.g., jet skis and rigid inflatable boats) are likely to produce source levels of 130-160 dB re 1µPa (Erbe, 2013; Erbe *et al*., 2016). Large vessels (e.g., container ships, ferries) may produce source levels of >200 dB re 1µPa (Simard *et al*., 2016; Gassmann *et al*., 2017). USVs are small, electrically driven, low speed vessels, therefore a receptor is unlikely to experience auditory injury from these vessels due to continuous underwater sound. JNCC guidance on the protection of marine EPS from injury and disturbance states that it is unlikely that a passing vessel would cause more than trivial disturbance (JNCC, 2010). The presence of survey vessels will represent a proportionally small increase in total vessel numbers and therefore will not result in a significant increase in vessel traffic in the area.

5.1.3.1.1 Harbour Porpoise

Harbour porpoise have a high frequency hearing range (275 Hz-160 kHz) and have been shown to have a quick recovery time to disturbance from increased vessel traffic (Wisnieska, 2013). As a result, the likelihood of disturbance to harbour porpoise from underwater sound emitted by vessels associated with the proposed surveys is considered to be low.

5.1.3.1.2 Dolphin Species

Since all dolphin species are grouped within the same auditory range (HF), common bottlenose dolphin are used as the representative species for this group. Offshore wind associated vessel traffic has previously been shown to have no negative impact on common bottlenose dolphins in the Moray Firth (Lusseau *et al*., 2011). Further evidence suggests that habituation to vessel traffic may occur when vessel movements are predictable and do not disrupt foraging behaviours (Sini *et al*., 2005). However, one study indicated that the presence of vessels transiting in the Moray Firth and associated vessel sound resulted in reduced recordings of common bottlenose dolphin prey capture buzzes (Pirotta *et al*., 2015). Reduced foraging success and masking of biological sound may have chronic or long-term impacts on cetacean health, although these are more difficult to quantify compared with short-term behavioural responses (Bejder *et al*., 2006; Weilgart, 2007).

The proposed survey activities will be spatially and temporally limited, therefore exposure to vessel sound output will be short-term. Furthermore, although there is some overlap, the majority of the auditory range of dolphin species falls above the likely vessel sound frequencies (Southall *et al*., 2019). As such, sound emissions from transiting vessels are unlikely to significantly overlap with the peak hearing sensitivities of these species. Therefore, the likelihood of injury or non-trivial disturbance to dolphin species as a result of underwater sound from vessels associated with the proposed surveys is considered to be low.

5.1.3.1.3 Baleen Whales

Since all baleen whales are grouped under the low auditory range (LF), minke whale are used as the representative species for this group. Baleen whales are considered low-frequency cetaceans, with an auditory range of 7 Hz-35 kHz (NMFS, 2018; Southall *et al*., 2019). Underwater sound generated by vessel traffic is therefore likely to overlap with their hearing range and has the potential to temporarily displace these species. Anderwald *et al*., (2013) reported a slight negative correlation between minke whale presence and vessel presence, however the correlation strength was less than the effect of sea state or swell height, and the correlation was not detected at other locations. In Cape Cod (USA), 25 years of observations

show a habituation of minke whale to ship traffic (Watkins, 1986). Minke whale and humpback whale are primarily present within the waters surrounding the Survey Area during the summer months (Orcadian Wildlife, 2024; Sea Watch Foundation, 2024; Waggitt *et al*., 2020).

The survey duration will be short-term, vessels will be relatively slow-moving and small (<30 m) and will not be directly seeking interaction with the animals (as would a whale-watching or recreational vessel). Therefore, the likelihood of injury or non-trivial disturbance to baleen whales as a result of underwater sound from vessels associated with the proposed surveys is considered to be low.

Considering the baseline sound levels from existing traffic, and expected habituation, the potential for underwater sound from vessel traffic to cause disturbance or injury to EPS is considered very low. Therefore, it is considered that there is a negligible risk of offence being committed as defined in Regulations 39 (1) (a), (b) and 39 (2) of the Habitats Regulations.

5.1.3.2 BASKING SHARK IMPACTS

Vessel presence and engine sound appear to have limited or no effect on basking shark (Wilson, 2000; Bloomfield and Solandt, 2006; Speedie *et al*., 2009). There is no direct evidence of sound causing injury, mortality, or stress to basking shark, therefore basking shark have been assessed as having a 'high' resistance and 'high' resilience to underwater sound and are classified as 'not sensitive' in the Marine Life Information Network (MarLIN) sensitivity review (Wilding *et al*., 2020).

Standard mitigation measures and best practice guidance (JNCC, 2017) will be followed for the proposed surveys to ensure any risk of injury to basking shark is minimised. Therefore, the likelihood of an injury or disturbance offence for impacts of underwater sound from vessel traffic on basking shark has been assessed as a negligible risk of offence.

5.1.4 SUMMARY

The likelihood of impact on EPS as a result of the proposed geophysical surveys is presented in Table 5.3.

TABLE 5.3 LIKELIHOOD OF DISTURBANCE OR INJURY ON EPS AND BASKING SHARK AS A RESULT OF PROPOSED GEOPHYSICAL SURVEYS

Impact Pathway	Receptor	Likelihood of Impact
Vessel Collision	EPS	Negligible
	Basking Shark	Negligible
MBES	EPS	Negligible
	Basking Shark	Negligible
SBP	EPS	Low
	Basking Shark	Negligible
Underwater Sound from Vessel Traffic	EPS	Low
	Basking Shark	Negligible

5.2 POPULATION SCALE MAGNITUDE OF IMPACT

5.2.1 CETACEAN IMPACTS

Magnitude is defined in terms of the level of the impact above background conditions and natural variability by whatever parameters are measurable. The assessment of magnitude of impact for underwater sound and vessel collision is based on available scientific literature (e.g. SCANS III and SCANS IV surveys, sightings data, academic journals), as well as on detailed sound modelling performed for similar surveys with comparable equipment (BEIS, 2018; Shell, 2017). The assessment follows a precautionary approach using worst-case assumptions (based on JNCC 2020 guidance) and is focused on impacts on EPS species most likely to be present within the Survey Area.

Consistent with JNCC guidance on EPS disturbance and geophysical surveys (JNCC, 2010; JNCC, 2017), the evaluation also considers:

- source–receptor pathway plausibility;
- conceptual zones of effect (injury vs behavioural disturbance vs no-effect) derived from accepted exposure criteria;
- duration, repetition and spatial scale relative to species mobility and available habitat.

For MBES, the operational frequency band (≥200 kHz) lies above EPS functional hearing ranges and therefore no credible pathway to non-trivial disturbance or injury is identified; for SBP, a plausible pathway to short-term behavioural response exists due to frequency overlap with EPS hearing groups.

For this assessment, all survey activities are evaluated together, and magnitude is ranked from low to high based on the percentage of the reference population potentially disturbed:

- Negligible is 0% of the population potentially disturbed;
- Low is 0-1% of the population potentially disturbed;
- Moderate is 1-5% of the population potentially disturbed;
- High is >5% of the population potentially disturbed.

Calculations of the realistic worst-case total number of individuals of each species present and likely to be impacted within the proposed Survey Area has been based on density estimates from the latest SCANS report on estimates of cetacean abundance (Gilles *et al.*, 2023). To provide transparent context consistent with this framework, Table 5.4 presents the maximum number of individuals potentially present within a single-pulse SBP behavioural disturbance zone using a 169 m radius (area = 0.090 km²). The determination of whether a disturbance offence is likely is then made, considering duration, repetition and spatial scale, rather than on cumulative exposure. Consideration is also provided to the total survey area, which comprises the survey pathway and a 5 km buffer, equating to 730.55 km^2.

The maximum instantaneous number of individuals potentially affected within a single-pulse disturbance zone is calculated as follows:

$$Species\ Abundance\ \div Species\ Density\ = N$$

$$Abundance\ \times\ (Area\ of\ Impact\ (0.090)\ \div N)$$

Following this calculation, the percentage of the reference population potentially affected can be determined by:

$$(Number\ of\ individuals\ potentially\ disturbed\ \div Species\ Abundance) \times 100$$

It should also be recognised that background vessel traffic is highly variable in the area, and the area around Shetland is frequented by a moderate number of vessels (MarineTraffic, 2024). It is not expected that the limited number of additional vessels associated with the proposed survey works will have measurable impact above this background variability, further suggesting that any increases in collision risk or injury and disturbance from underwater sound to EPS because of increased vessel traffic, will be low.

The percentage of the reference population likely to be impacted by underwater noise from geophysical survey activities is calculated using the updated abundance estimates for cetacean MUs (IAMMWG, 2023). These have been used for all species except humpback whale and orca, which do not have a defined UK MU due to their widely distributed populations, and for which no SCANS-IV observations were recorded in the block encompassing the Survey Area. Short-beaked common dolphin and common bottlenose dolphin were not detected in SCANS-IV surveys for Block NS-E and so are listed as “none recorded”. Common bottlenose dolphin were not detected in SCANS-IV surveys, however their presence around Shetland is increasing, and pods are known to be present in the Moray Firth (e.g. the Moray Firth SAC designated for common bottlenose dolphin) and off Aberdeen harbour is well documented with a suggested connection to common bottlenose dolphin sightings around Orkney (Orcadian Wildlife, 2024). Therefore, values from SCANS-III surveys have been used in this case as they are considered representative.

TABLE 5.4 SUMMARY OF POTENTIAL IMPACTS FROM SURVEY OPERATIONS

Species	Species Density (Block NS-E) (individuals/km²)	Species Abundance (Species MU)[a] (Hague *et al.*, 2020; IAMMWG, 2023)	Maximum number of individuals potentially affected within the Total Area of Potential Disturbance (730.55km²)	Maximum instantaneous number of individuals potentially affected within a single-pulse disturbance zone (0.090 km²)[b]	Percentage of the reference population potentially affected (total)	Percentage of the reference population potentially affected (direct)
Harbour porpoise	0.5156	346,601 (NS)	377	0.046	0.11%	0.000013%
Common minke whale	0.0121	20,188 (CGNS)	9	0.001	0.04%	0.000005%
Humpback whale	None recorded	At least 35,000 (North Atlantic)[c]	0[d]	0[d]	0[d]	0[d]
Orca	None recorded	15,000 (North Atlantic)[c]	0[d]	0[d]	0[d]	0[d]
Risso's dolphin	0.0702	12,262 (CGNS)	51	0.006	0.42%	0.00005%
White-beaked dolphin	0.1775	43,951 (CGNS)	130	0.016	0.30%	0.00004%
Short-beaked common dolphin	None recorded	102,656 (CGNS)	0[d]	0[d]	0[d]	0[d]
Atlantic white-sided dolphin	0.0146	18,128 (CGNS)	11	0.0013	0.06%	0.000007%
Common bottlenose dolphin	None recorded	2,022 (GNS)	0[d]	0[d]	0[d]	0[d]

[a] NS = North Sea; GNS = Greater North Sea; CGNS = Celtic & Greater North Sea.

[b] Values represent instantaneous exposure at a single point in time and do not represent cumulative exposure over the survey duration based on evidence that marine mammals typically exhibit avoidance behaviour or move away from active sound sources, resulting in short-term and localised exposure only.

[c] No Management Unit available for these species. Data taken from Hague *et al.* (2020)

[d] No recorded sightings within SCANS-IV Block NS-E or surrounding Blocks means density data is lacking, but there is sufficient evidence that species are present around the Study Area

The species mentioned in the baseline with no recorded presence in the SCANS-IV surveys are assessed as no individuals likely to be affected due to a lack of current population data. However, inferring from a combination of the transience of these species (Table 4.2), the lower sightings numbers compared to other species, and the larger presence in the wider region, it is determined that any potential effects on the population will not be more significant on these aforementioned species.

From the calculations in Table 5.4, it is noted that the proposed surveys do not have the potential to affect more than a fraction of a percent of the reference population for any of the species likely to be present in the direct area. As set out in the table footnote, these values represent instantaneous exposure within a single-pulse behavioural disturbance zone and are not cumulative over the survey duration.

From the calculations in Table 5.4, it is noted that there is the potential for the proposed activities to impact <1% of the reference population of any EPS that may be present in the direct survey area based on a single instantaneous pulse. Within the total area (including a 5 km survey buffer), there is still <1% of the reference population of any EPS likely to be affected. The potential for impact for all species is determined to be negligible.

Harbour porpoise have the potential for the greatest number of individuals to be impacted in the direct area at 0.046, equating to 0.000013% of the reference population. Within the total area, including the 5 km buffer, there may be 377 individuals impacted, equating to 0.11% of the reference population. The species with the highest percentage of the reference population to be potentially impacted is predicted to be Risso's dolphin, however this is still below 1% (0.00005% and 0.006 individuals within the direct area, and 0.42% and 51 individuals within the total area). It should be noted that the total area over which these calculations were carried out represents a precautionary approach to ensure protection and conservation of marine resources. Multiple vessels surveying simultaneously will also not cause a detrimental impact to populations.

JNCC guidance (2010) for the UK offshore marine area on the protection of marine EPS from injury and disturbance states:

"For most cetacean populations in UK waters, disturbance, in terms of the HR or OMR, is unlikely to result from single, short-term operations, e.g. a seismic vessel operating in an area for 4-6 weeks, or the driving of a dozen small diameter piles. Such activities would most likely result in temporary sporadic disturbance, which on its own would not be likely to impair the ability of an animal to survive, reproduce, etc, nor result in significant effects on the local abundance or distribution. Non-trivial disturbance, which would constitute an offence under the Regulations, would most likely result from more prevalent activities in an area, chronically exposing the same animals to disturbance or displacing animals from large areas for long periods of time."

Accordingly, as the surveys are planned to be completed within a period of ~40 days (inclusive of weather), and will not be chronic within a single area, they are not likely to result in more significant effects than temporary disturbance. Furthermore, the sound generated by geophysical surveys is not predicted to accumulate and will quickly attenuate with distance from the source. Thus, any potential impacts are likely to be of low magnitude. In addition, the mobile nature of the source along progressing survey lines means the same animals are unlikely to be repeatedly exposed in a single location.

5.2.2 BASKING SHARK IMPACTS

In the absence of noise modelling data, the assessment of magnitude of impact on basking shark is based on available scientific literature and follows a precautionary approach.

Whilst there is no reference population available for basking shark within the waters of the Survey, observed adjusted densities of basking shark across all seasons from 2000-2012 give a density of 0.0-0.10 individuals/5 km^2 cell based on the available data (Paxton, 2014). Within the potential total area of disturbance of 730.55 km^2, the estimated worst-case number of individuals that may be disturbed as a result of the proposed surveys is calculated as follows:

$$\left(\frac{Potential\ total\ area\ of\ disturbance\ (730.55\ km^2)}{5\ km^2}\right) \times Worst\ case\ density\ (0.10)$$

This determines the worst-case number of individuals with potential to be impacted of 15.

However, this value is highly precautionary given only a limited proportion of the total survey area will be affected on a daily basis during the survey and given the extremely low sightings in the area (HWDT, 2026c), the number of individuals disturbed is likely to be much lower. Whilst this cannot be compared to a wider reference population, it is recognised the waters around Shetland are not key areas for basking shark as shown by low presence records (HWDT, 2026c), and that basking shark show strong fidelity and high densities in other areas such as the Sea of the Hebrides MPA.

As the number of impacted individuals is highly precautionary, and the Survey Area is not a known key area for basking shark, the likelihood of any individuals being present around the proposed survey area is low, and therefore magnitude is determined to be negligible.

5.3 IMPACTS ON PROTECTED AREAS

The protected areas bordering and surrounding the survey site do not have any cetacean species or basking sharks as a designated feature. The closest NCMPA with a designated feature of common minke whale is the Southern Trench which is 187.26 km south of the furthest boundary of the Survey Area. Due to the significant distance to the closest protected site, and the spatial and temporal restrictions of the survey works, no likely significant effect can be concluded for the Conservation Objectives of protected areas within the vicinity of the Survey Area.

5.3.1 YELL SOUND COAST SPECIAL AREA OF CONSERVATION

The Yell Sound Coast SAC (UK0012687) is designated for Eurasian otter and harbour seal.

Eurasian otter are members of the weasel family with a widespread distribution in Scotland. They are largely solitary, semi-aquatic, and obtain most of their food from rivers or the sea. Eurasian otter are considered coastal in this region. They forage in inshore waters, out to approximately 100 m, but also require access to unpolluted freshwater and vegetation for shelter. Safe movement between all sites is important to ensure utilisation of optimal habitats (NatureScot, 2024). Eurasian otter require suitable habitat for foraging, breeding, and resting. They mainly forage for fish and crustaceans, though they are known to select other species such as amphibians, small mammals, and birds when preferential prey is scarce (SNH, 2017).

Harbour seal are widely distributed in the polar and temperate waters; mainly found along the coast and in estuaries, with highest densities present in inshore waters (Carter *et al*., 2022). They haul-out in sheltered areas, such as sandbanks, estuaries, and to a lesser extent, rocky

areas (SCOS, 2020). Harbour seal tend to forage in inshore waters, within 50 km of haul out sites (SCOS, 2022). They are generalist feeders that take a wide variety of prey depending on what is spatially and temporally available. Key species include plaice and sandeel as well as other gadoid and clupeoid fish species, cephalopods, gastropods, and crustaceans (Evans, 2006; Wilson and Hammond, 2019). There are 11 designated seal haul-out sites located within the 5 km survey buffer area for the proposed survey works (Figure 2-2). These are listed below:

- Skea Skerries;
- Little Holm;
- Lamba;
- Little Roe;
- Tinga Skerry;
- Sligga Skerry and North End of Bigga;
- Skerries of Neapaback;
- Muckle Skerry (Out Skerries)
- The Guens, Filla and The Benelips;
- West Linga and Lunning Sound Holms;
- Rumble, East Linga, Grif Skerry.

Key pressures of relevance to this assessment include:

- Pollution;
- Artificial light;
- Vessel collision;
- Vessel disturbance;
- Noise (above water and below).

To understand the potential effects of the proposed survey works, it is necessary to evaluate the Conservation Objectives for Eurasian otter and Harbour seal in the Yell Sound Coast SAC. These are evaluated in the following sections.

5.3.1.1 CONSERVATION OBJECTIVE 1: FAVOURABLE CONSERVATION STATUS

To ensure that the qualifying features of Yell Sound Coast SAC are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

Maintaining favourable conservation status (FCS) requires consideration of all potential pressures. The proposed survey works introduce only temporary pressures, which will be localised spatiotemporally.

Vessel collision risk is low as all vessels used will be small in size and travelling at low speeds. This will reduce the risk of injury or killing from collisions.

Harbour seal have a higher potential risk of collision with vessels than Eurasian otter due to their larger foraging range (50 km). However, harbour seal are regularly exposed to vessels with the high traffic volume in the area and are likely to be habituated to the presence of vessels. As a result of this, they are considered to have a high tolerance to vessel presence, as well as a high adaptability due to their ability to avoid vessels by moving away (ERM Ltd, 2010). Both Eurasian otter and harbour seal are mobile semi-aquatic mammals that are able to detect and subsequently avoid vessels.

There is little research on the impacts of underwater noise and vessels on Eurasian otter in the marine environment. Research conducted on sea otter suggests they are less sensitive to underwater noise than sea lions and other pinniped species (Ghoul and Reichmuth, 2014). Noise produced by vessels is predominantly low frequency, low intensity, and generally considered to be below the onset thresholds for Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) for pinnipeds and cetaceans (OSPAR Commission, 2009). Consequently, there is minimal risk of auditory damage (OSPAR Commission, 2009; Erbe, 2018). Furthermore, sea otter are not thought to vocalise underwater (Zellmer *et al*., 2021), so there is minimal risk of underwater noise masking or interfering with vocal communications.

Harbour seal are sensitive to underwater sounds, though they do not rely on hearing to survive, unlike cetaceans (Asselin *et al*., 1993). The hearing range of harbour seal is ~0.1-79 kHz, with vocalisations typically within a peak frequency of 0.02-24 kHz (Southall *et al*., 2019). As the proposed survey works will be minor and temporary, it is unlikely that FCS will be negatively impacted.

Pollution of watercourses from vessels is one of the most substantial threats to Eurasian otter. While it is still a potential pressure for harbour seal, it is considered to be a lower concern due to their more mobile nature. Although USVs will not present this risk, given the use of an escort vessel there remains a risk of pollution events, such as fuel leakage, that would adversely impact Eurasian otter should they occur. To minimise this risk and ensure site integrity is maintained, best practice procedures would be followed throughout all stages of the Project and a series of control measures would be in place. These include, for example, maintaining a full SOPEP kit on site and full adherence to policies and procedures for environmental protection as part of the Project start-up. Any alterations to habitats are small-scale and represent a minor proportion of habitat available for Eurasian otter and harbour seal.

The proposed survey works are determined to have negligible effect on the FCS of the qualifying features in the Yell Sound Coast SAC.

5.3.1.2 CONSERVATION OBJECTIVE 2A: POPULATION VIABILITY

Harbour seal and otter are viable components of the Yell Sound Coast SAC.

Viability relates to the longevity of a population. As the works are temporary, with minor effects as detailed in Section 5.3.1.1, it is not expected that reproduction and survival rates will be impacted. Vessel activity in the area is high, and it is likely that populations within the proposed survey area are habituated to their presence. There will be no damage to either holts or haul out zones, or sustained disturbance from the proposed survey works.

Populations of Eurasian otter and harbour seal will remain a viable component of the SAC, and detrimental effects are determined to be negligible.

5.3.1.3 CONSERVATION OBJECTIVE 2B: MAINTAINING DISTRIBUTION

The distribution of harbour seal and otter throughout the site is maintained by avoiding significant disturbance.

Eurasian otter within the region use coastal waters for foraging, requiring access to freshwater and vegetated areas. Harbour seal utilise the area for hauling out, involving resting, breeding, and rearing pups. Disturbance from proposed survey works are expected to be localised and temporary and will not occur on shore. Eurasian otter and harbour seal are highly mobile

animals, capable of avoiding disturbance and returning once a noise or disturbance source has ceased.

Artificial light has the potential to disturb or deter the qualifying features from areas of their habitat, however, there is little evidence to suggest that lighting will have a significant impact, with Leblanc (2003) stating that when used in isolation, security lighting did not deter Eurasian otter from approaching fish farms. The likelihood for displacement or disturbance is dependent on location of works in relation to holts and foraging grounds, with no adverse impacts expected beyond 200-250 m. Alterations to habitats would not present a barrier to movement; European otter are highly mobile both on land and in water and will be able to move freely between all areas of their habitat.

For harbour seal, increased vessel traffic during construction and decommissioning can disrupt foraging, resting, and pup-rearing, particularly where seal haul-out sites are present near active work areas. This may cause stress responses, and displace animals from key foraging and resting areas, increasing energy costs. However, the small-scale, temporary works are unlikely to create sustained barrier effects, or cause permanent disturbance of the population.

Distribution of Eurasian otter and harbour seal are expected to be maintained, and disturbance is determined to be negligible.

5.3.1.4 CONSERVATION OBJECTIVE 2C: MAINTAINING SUPPORTING HABITATS

The supporting habitats and processes relevant to harbour seal and otter are maintained, including prey resources for otter.

The proposed survey will not adversely affect prey availability, water quality, or habitat functionality. Eurasian otter mainly prey upon fish and crustaceans, and harbour seal are known to forage a wide array of prey species. Pollution prevention measures, as described in Section 5.3.1.1, will reduce the likelihood of causing detrimental effects on water quality. There will not be any physical structures involved in the proposed survey works which may create barriers to Eurasian otter or harbour seal, and vessels will be small in size and avoidable.

Supporting habitats and processes will be maintained, and effects on prey resources and connectivity will be negligible.

5.3.1.5 SITE DETERMINATION

The proposed survey works are not predicted to have a significant effect on Eurasian otter or Harbour seal in the SAC or surrounding waters, therefore no significant effect is predicted for the Yell Sound Coast SAC.

5.4 IN-COMBINATION IMPACTS

During periods where other activities take place concurrently with the proposed surveys there is the potential for in-combination impacts to occur.

There are various marine developments within 50 km of the Survey Area, including existing subsea cables and a number of proposed offshore renewable energy developments, such as the Arven Offshore Wind Farm and Arven South Offshore Wind Farm. These offshore wind projects are currently at the planning and pre-construction stages, and none are operational at present. The Survey Area is spatially separated from other marine activities in wider Scottish waters that may impact the receptors considered in this assessment. The Survey Area overlaps with the Toft to Ulsta Ferry, and there are high levels of fishery activity within the area. However, the assessed impact pathways are predicted to have a negligible to low likelihood of

effect. The proposed survey work will be of relatively short duration, with approximately 40 days of activity within a one-year period.

On this basis, in-combination impacts arising from the proposed survey work with other marine infrastructure projects are not considered likely to occur.

5.5 MITIGATION MEASURES

In accordance with best practice, the proposed surveys will follow JNCC guidelines for minimising risk to marine mammals from geophysical surveys (JNCC, 2017). These guidelines are designed to reduce the risk of impacts associated with geophysical surveys on the UK continental shelf and are based on conservative assumptions. The surveys will also follow the best practices within the Scottish Marine Wildlife Watching Code.

The proposed surveys will aim to minimise risk through the planning, active mitigation (described below), and reporting phases. In addition to obtaining an EPS licence, the surveys will consider the minimum technical specifications required to complete the work, bearing in mind the marine mammal species present in the Survey Area and any key seasonal considerations.

Prior to any surveys, an MMO will perform a search of the mitigation zone. The mitigation zone encompasses a 500 m radius from the centre of the source location. The duration of the search will be 30 minutes as the maximum depth of the area to be surveyed is <200 m. If marine mammals are detected in the mitigation zone during this period, the soft start of the SBP will be delayed until 20 minutes have passed from the time of the last marine mammal detection within the mitigation zone. Once the SBP is operational, it will remain on until surveys are completed, therefore, the MMO will only be present for visual monitoring during the pre-watch/soft-start (where applicable). During operations, the presence of marine mammals will be monitored using visual and thermal cameras. Survey equipment will remain in operation, with no pauses, for the duration of the survey. If the SBP sensors are shut down at any point during the survey for longer than 40 minutes (in line with the JNCC guidelines online changes), the guard vessel with a MMO onboard will return at the next available opportunity to conduct the pre-watch/soft-start procedures will be followed prior to re-start. In the event it may not be possible to get the guard vessel with a MMO to return until the next morning, XOCEAN proposes to carry out the soft-start of the stopped USV within the vicinity of another USV which is currently carrying out SBP operations.

MBES in shallow waters are thought to fall outside of the hearing frequencies of EPS species and are likely to attenuate quickly, therefore mitigation is not required for the water depths within the Survey Area (<200 m).

These mitigation measures are supplemented by the Marine Mammal Mitigation Operations Protocol (JNCC, 2024).

5.6 CONCLUSION

The outcomes of the step-wise risk assessment demonstrates that no significant impacts on EPS are predicted to occur associated with the proposed activities. The species most likely to be exposed to negative impacts from underwater sound from SBP survey equipment is the harbour porpoise, as the auditory range of this species falls within the range of frequencies emitted by survey activities. However, it is predicted that only 0.000013% of the harbour porpoise reference population could potentially be impacted by the proposed activities. A

greater proportion of the reference population of Risso's dolphin for the Celtic and Greater North Sea MU could potentially be impacted by underwater sound associated with the proposed activities, however as for harbour porpoise, these impacts will be minimised through the short-term nature and low intensity of the proposed surveys, the spatial separation between the proposed surveys and high-usage areas for cetaceans, the highly mobile nature of marine EPS present in the area, and adherence to the JNCC best practice guidance. In line with the above considerations, overall predicted impacts to EPS from exposure to increased underwater sound is low.

The risk assessment also has shown that while the risk of a disturbance occurring due to underwater sound caused by geophysical equipment is likely to be low, it cannot be completely ruled out. Therefore, an EPS licence (for disturbance) for the survey operations will be required.

The outcomes of this risk assessment suggest that it is highly unlikely that basking shark will be present in the area. Furthermore, sound generated by surveys and associated vessel traffic will not impact basking shark, and while there is a minimal risk of collision, this will be reduced through adherence with best practice guidance.

6 EPS LICENCE ASSESSMENT

Any EPS licence application (under regulation 44(2)) must undergo a detailed assessment of whether a licence may be granted. This assessment is comprised of three tests, which have been designed to ascertain: 1) whether the purpose of the licence relates to those specified in the Habitat Regulations; 2) whether there are any/no satisfactory alternatives to the proposed activity (that would not result in an offence); and 3) that the undertaking of the proposed activity will not negatively impact the maintenance of the population of the EPS concerned, at a favourable conservation status. An EPS licence application must pass all three of these tests before it may be granted.

6.1 TEST 1: PURPOSE

The licence application must relate to one of the purposes referred to in Regulation 44(2).

Regulation 44 (2) of the Conservation (Natural Habitats, &c.) Regulations 1994 lists the purposes where an EPS licence is appropriate. Regulation 44 states:

(1) Regulations 39, 41 and 43 do not apply to anything done for any of the following purposes under and in accordance with the terms of a licence granted by the appropriate authority.

(2) The purposes referred to in paragraph (1) are-

a) scientific, research or educational purposes;

b) ringing or marking, or examining any ring or mark on, wild animals;

c) conserving wild animals, including wild birds, or wild plants or introducing them to particular areas;

d) conserving natural habitats;

e) protecting any zoological or botanical collection;

f) preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment;

g) preventing the spread of disease; or

h) preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber, or any other form of property or to fisheries.

The proposed surveys meet the requirements of Test 1 as the activity provides environmental benefit on both national and international scales and helps to deliver environmental policies in relation to climate change, renewable energy targets, and the reduction of greenhouse gas emissions. The development of the new OWF infrastructure is a critical requirement to achieve targets of 50GW and 11GW (UK and Scotland) of renewable energy generated through offshore wind by 2030, and the 2050 UK net zero target (BEIS, 2021).

6.2 TEST 2: ALTERNATIVES

There must be no satisfactory alternative (Regulation 44(3)(a))

An EPS licence may only be granted where Marine Directorate is satisfied that there is no satisfactory alternative to the proposed activity.

6.2.1 OPTION 1: NO ACTIVTY

XOCEAN believes that “No Activity” is not a viable option. In relation to the survey area described within this application multiple clients have approached XOCEAN regarding their data requirements. Typically XOCEAN’s client describe that the current publicly available data does not provide information to the accuracy level required to meet their engineering requirements. Our clients also describe this information as being valuable in their feasibility assessments for development of a particular subsea routing and if this were not to be available they would have to engage a much longer, more costly and higher impact survey option.

In the event that XOCEAN are not successful in this application it is likely that there would be at least 2 further survey permit applications. These would likely be for a higher impact data collection approach so that they have options for the project execution phase. This would then see 2 survey campaigns conducted with a much greater impact to the local environment than the solution put forward by XOCEAN.

6.2.2 OPTION 2: DIFFERENT EQUIPMENT

The most likely risk to EPS from the survey works is the potential impacts from anthropogenic noise produced by the proposed survey equipment. The proposed equipment either will not operate within the hearing frequency of marine mammals (MBES operating at 400 kHz) or has a focussed zone of data collection and therefore reduces potential marine mammal disturbance (SBP <10 m horizontal disturbance). XOCEAN believes therefore that the survey equipment chosen for the works represent the lowest possible potential impact to marine life. The use of the SBP is vital to gather accurate data of the seabed, sediment and any likely obstructions.

In submitting this proposal XOCEAN intends to use its acoustically quiet, electrically driven, low transit speed and lightweight USVs for the works. In comparison with a more traditional survey vessel approach, this provides lower impacts in terms of acoustic signature which in turn will provide lower disturbance levels to the marine environment during transit and operations compared to traditional vessels.

XOCEAN’s USVs are of a fibreglass construction and with enclosed propellers, propelled by an electric drive system. This combined with lower transit speeds of typically less than 4 knots means that, in the unlikely event of a vessel strike, any potential impact to the marine mammal will be significantly reduced in comparison with a traditional survey vessel of steel construction with unguarded propellers.

XOCEAN operations will be supported by a local support vessel for transit in and out of port and MMO operations. Whilst this does raise the potential impact profile of this project, it is necessary in order to conduct operations in line with the current regulatory requirements. It is anticipated that the use of such a support vessel will be minimised as far as possible, meaning that the overall project risk / impact profile is much lower than a traditional survey vessel.

Finally in collecting this data once for multiple clients, the use of the XOCEAN methodology reduces the need for multiple survey campaigns involving multiple traditional survey vessels, which XOCEAN believes heavily reduces the overall impact of the required data collection.

6.2.3 OPTION 3: LOCATION SHIFT

Requested seabed data gathering operations are within a constrained geographical location pertinent to the future needs of our clients. Due to connecting infrastructure, a location shift is not possible in this instance.

6.2.4 OPTION 4: DIFFERENT TIMING

XOCEAN have included for an extended operational window here to allow for any feedback or guidance to influence the timings of planned operations. Whilst XOCEAN remains flexible to any stakeholder feedback it is our preference to do this work in Q2 / Q3 2026 to minimise the time spent on site. Weather has the biggest impact on data quality and the need for more time to collect infill data. As such, and for reasons of the operational health and safety of our onsite team, our preference is to conduct this work during the time of optimal weather conditions.

6.2.5 OPTION 5: CURRENT SCENARIO

XOCEAN believes that the proposed operational model balances the client requirement for data in support of activities pertinent to national policy, whilst ensuring the minimal impact to the marine environment.

6.3TEST 3: CONSERVATION OBJECTIVES

The action authorised must not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range (Regulation 44(3)(b))

An EPS licence will not be granted if the proposed activity is detrimental to the maintenance of the population of the EPS affected at a favourable conservation status in their natural range. When assessing FCS for cetaceans, the application should refer to the relevant cetacean Management Units. 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;*
- *there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.*

There is the potential for 0.00005-0.000005% of the reference population for harbour porpoise, common minke whale, Risso's dolphin, white-beaked dolphin, and Atlantic white-sided dolphin to be temporarily disturbed due to the survey operations. Overall, these effects are considered to represent a low impact on these species and are not predicted to affect their conservation status in their natural range.

Due to lack of information on populations, it was not possible to calculate the potential population disturbance for humpback whale, orca, short-beaked common dolphin, and common

bottlenose dolphin. Due to the transience of these species, the lower sightings numbers compared to other species, and the larger presence in the wider region, it is determined that potential effects on these species will not be more significant than those determined for the aforementioned species; harbour porpoise, common minke whale, Risso's dolphin, white-beaked dolphin, and Atlantic white-sided dolphin.

Should any disturbance occur, it is likely to be short-term in duration and limited spatially. Any impacted individuals are predicted to recover within a short timeframe (several days) following the cessation of disturbance due to their high mobility and ability to use surrounding habitat beyond the impacts of the proposed surveys if displaced. It is therefore not predicted that any significant population-level impacts, such as a reduction in the ability to reproduce or forage, will occur as a result of the activities outlined in this document.

Following the definitions outlined for FCS for cetaceans, the proposed surveys are assessed as having no significant detrimental impact on any of the populations of the species concerned.

6.4 SUMMARY

It is concluded that the proposed survey activities satisfy all 3 EPS licence assessment tests. The activities have a licensable purpose, have considered all alternatives, and will not significantly impact the favourable conservation status of any potentially impacted EPS. However, as there is the potential for low risk of disturbance to some species due to underwater sound produced by geophysical survey equipment, an EPS licence will be required to undertake the proposed surveys.

Underwater sound generation is not predicted to negatively impact basking shark, and the project will employ mitigation measures to counteract the risk of collision in the form of MMOs.

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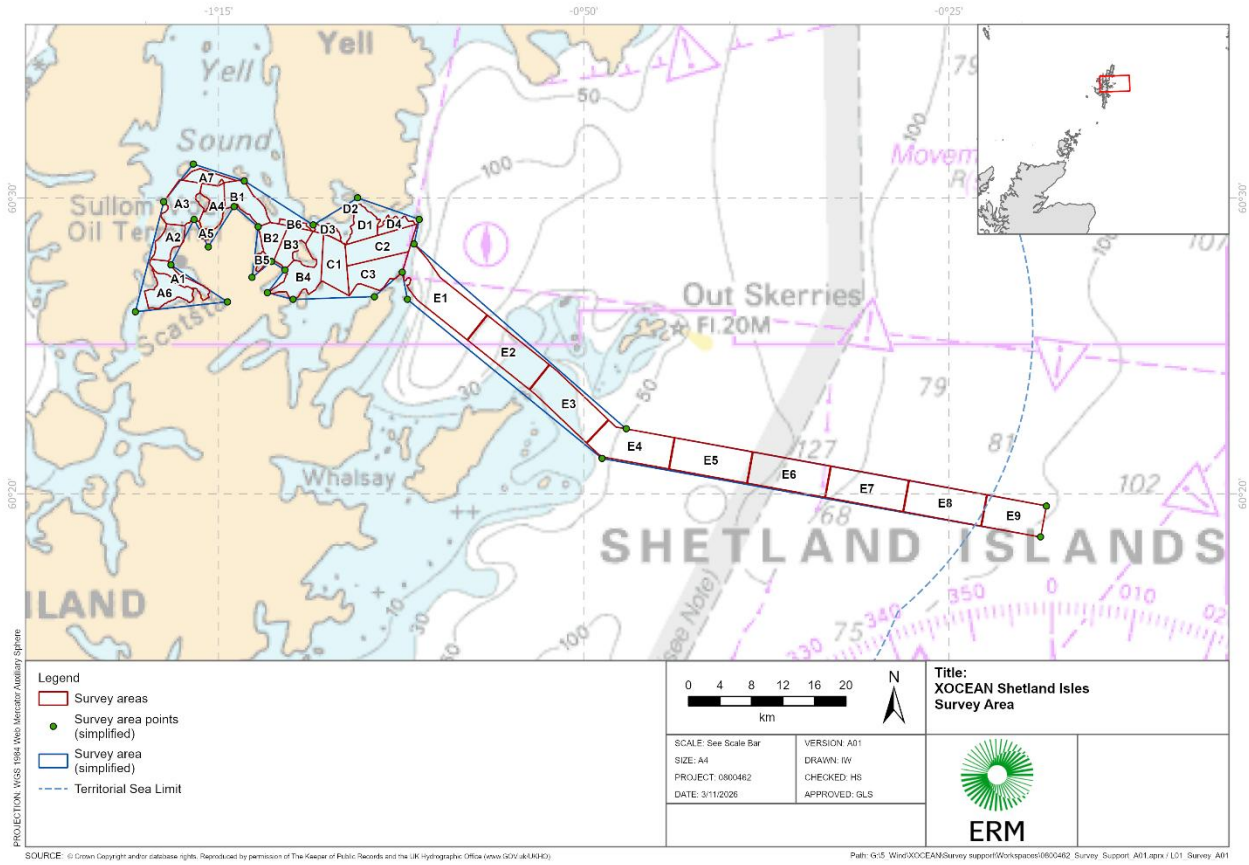
APPENDIX A

A summary of coordinates of the Survey Area are shown in the table below in WGS64 DDM and are also highlighted in the below figure.



ID	Latitude	Longitude
1	60° 19.587' N	000° 18.322' W
2	60° 18.532' N	000° 18.718' W
3	60° 21.194' N	000° 48.747' W
4	60° 26.574' N	001° 02.069' W
5	60° 27.490' N	001° 02.428' W
6	60° 26.670' N	001° 04.341' W
7	60° 26.574' N	001° 09.897' W
8	60° 26.801' N	001° 11.652' W
9	60° 27.570' N	001° 10.449' W
10	60° 27.850' N	001° 11.383' W
11	60° 27.316' N	001° 12.703' W
12	60° 29.026' N	001° 12.290' W

ID	Latitude	Longitude
13	60° 29.714' N	001° 13.943' W
14	60° 28.352' N	001° 15.705' W
15	60° 29.280' N	001° 16.677' W
16	60° 27.739' N	001° 18.270' W
17	60° 26.494' N	001° 14.399' W
18	60° 26.158' N	001° 20.694' W
19	60° 29.870' N	001° 18.751' W
20	60° 31.146' N	001° 16.735' W
21	60° 30.576' N	001° 13.237' W
22	60° 29.087' N	001° 08.523' W
23	60° 30.002' N	001° 05.475' W
24	60° 29.277' N	001° 01.258' W
25	60° 28.447' N	001° 01.609' W
26	60° 22.197' N	000° 47.093' W
27	60° 19.587' N	000° 18.322' W