Harbour Energy plc

CNSE Survey Permitting Support

EPS Protected Sites and Species Risk Assessment

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ACRONYMS

ACRONYM	DEFINITION
µPa	micropascal
3D	Three dimensional
AA	Appropriate Assessment
CNS	Central North Sea
CNSE	Central North Sea Electrification
CO_2	Carbon Dioxide
dB	Decibels
EPS	European Protected Species
EU	European Union
FCS	Favourable Conservation Status
HF	High Frequency
HRA	Habitat Regulations Appraisal
HWDT	Hebridean Whale and Dolphin Trust
Hz	Hertz
IAMMWG	Inter-Agency Marine Mammal Working Group
IROPI	Imperative Reasons Overriding Public Interest
JNCC	Joint Nature Conservation Committee
kHz	Kilo Hertz
km	Kilometre
km^2	Square kilometres
LF	Low frequency
LSE	Likely Significant Effects
m/s	Metres per Second
m	Metres
m^3	Cubic metre
MBES	Multi Beam Echo Sounder
MF	Mid Frequency
MHWS	Mean High Water Spring
MMO	Marine Mammal Observer
MMMU	Marine Mammals Management Unit
MMPP	Marine Mammal Protection Plan
MS-LOT	Marine Scotland Licensing Operations Team

ACRONYM	DEFINITION
MSL	Mean Sea Level
MU	Management Unit
NCMPA	Nature Conservation Marine Protected Area
N/E	No Effect
nm	Nautical miles
NMFS	National Marine Fisheries Service
NMPi	National Marine Plan interactive
OSPAR	Oslo and Paris Convention
p	Pressure
Pa	Pascal
PAM	Passive Acoustic Monitoring
PMF	Priority Marine Features
pSPA	Potential Special Protection Areas
PTS	Permanent Threshold Shift
PW	Pinnipeds in Water
RMS	Root Mean Square
ROV	Remotely Operated Vehicle
s	seconds
SAC	Special Areas of Conservation
SBES	Single Beam Echosounder
SBP	Sub Bottom Profiler
SCANS-III	Small Cetaceans in Atlantic Waters of the North Sea-III
SCOS	Special Committee on Seals
SEL	Sound Exposure Level
SNCB	Statutory Nature Conservation Bodies
SNH	Scottish Natural Heritage
SPA	Special Protection Areas
SPL	Sound Pressure Level
SSS	Side Scan Sonar
SVP	Sound Velocity Profilers
TTS	Temporary Threshold Shift
UK	United Kingdom
UKCS	United Kingdom Continental Shelf

ACRONYM	DEFINITION
USBL	Ultra Short Baseline
UXO	Unexploded Ordnance
VHF	Very High Frequency
WCA	Wildlife and Countryside Act

1 INTRODUCTION

Chrysaor Petroleum Company Ltd (a subsidiary of Harbour Energy Ltd, and hereafter referred to as Harbour Energy) are proposing to undertake a nearshore cable route survey from a landfall location near Longhaven (south of Peterhead) to an offshore hub location in the Central North Sea (CNS), near the United Kingdom (UK)/Norway boundary line, as illustrated in Figure 1-1 and Figure 1-2.

Harbour Energy plan to undertake a geophysical, environmental baseline (benthic) and habitat assessment survey for a Power from Shore cable route; the Central North Sea Electrification (CNSE) Greenfield Project (hereafter referred to as CNSE Project). The proposed Power from Shore route is to a proposed offshore hub located in the CNS and will also cover subsequent cable routes from the hub to individual platforms. It is proposed that the CNSE Project will enable the electrification of a number of oil and gas assets in the CNS.

The proposed cable route survey will be completed using the following techniques: Multi Beam Echosounder (MBES), Single Beam Echosounder (SBES), Side Scan Sonar (SSS), Sub-Bottom Profiler (SBP), Magnetometer, Ultra-Short Baseline (USBL), Sound Velocity Profilers (SVP). Environmental survey methods will consist of drop-down camera and environmental grab sampling. The survey methods outlined will be used to inform the CNSE Project. Specifically, the proposed survey activities will enable the CNSE Project to:

- Provide engineering level data suitable for cable route selection and to inform cable burial risk assessments.
- Map the seabed topography full detail in order to detect and identify objects of potential significance located on the seabed. This will be used to inform future engineering works; and
- Characterise the seabed environment using images and sampling, in order to map seabed habitats and determine seawater composition, benthic and epibenthic macro and microfauna, anthropogenic environmental changes, and wrecks. The data acquired will also be studied for indications of inundated archaeological sites and potential Unexploded Ordnance (UXO) areas.

1.1 Project Overview

The cable survey is required to complete the remaining environmental baseline and habitat assessments previously conducted in 2022. The survey work can be defined by the following aspect in the nearshore area:

- Remaining nearshore (completing the operations from 2022)camera transects and geophysical acquisition (towed array only) near Longhaven; and
- Additional camera transects and geophysical acquisition (towed array only) near the Longhaven landfall option. Seabed sediment samples will also be acquired near Longhaven (dependent on features of interest).

It is anticipated that the nearshore operations will take place along the export cable route and samples will be taken every 1 – 2 km from the 12 nautical miles (nm) limit to the landfall (Figure 1-1).

The proposed survey operations will be conducted by the Titan Explorer or similar vessel, with geophysical operations (MBES, SSS, SBP, SBES) taking 2-3 days and environmental sampling stations along the cable corridor taking 1-2 day. The proposed operations will take 7 days including vessel standby time. All camera stations will comprise a digital still shallow water camera system. Sediment sampling will be undertaken using a suitable day grab (<1 m^3).

The route survey encompasses Scottish Territorial Waters (<12 nm from Mean High-Water Spring (MHWS)) and UK Offshore Waters (between 12 and 200 nm from MHWS). The proposed cable route survey will cover a water depth of approximately –<100 m below Mean Sea Level (MSL). However, this report only covers the survey within territorial waters. Harbour Energy are consulting separately with NatureScot and Marine Scotland Licensing Operating Teams (MS-LOT) with regards to the offshore route survey and the offshore hub location survey.

The anticipated start date of 1st June 2023 and is expected to take up to 7 days to complete, including vessel standby time. The estimated end date of operations (accounting for technical constraints and weather conditions) is the 31st July 2023. Further details on the survey activity schedule are provided in Section 2.

Figure 1-1 Location of Proposed Cable Route

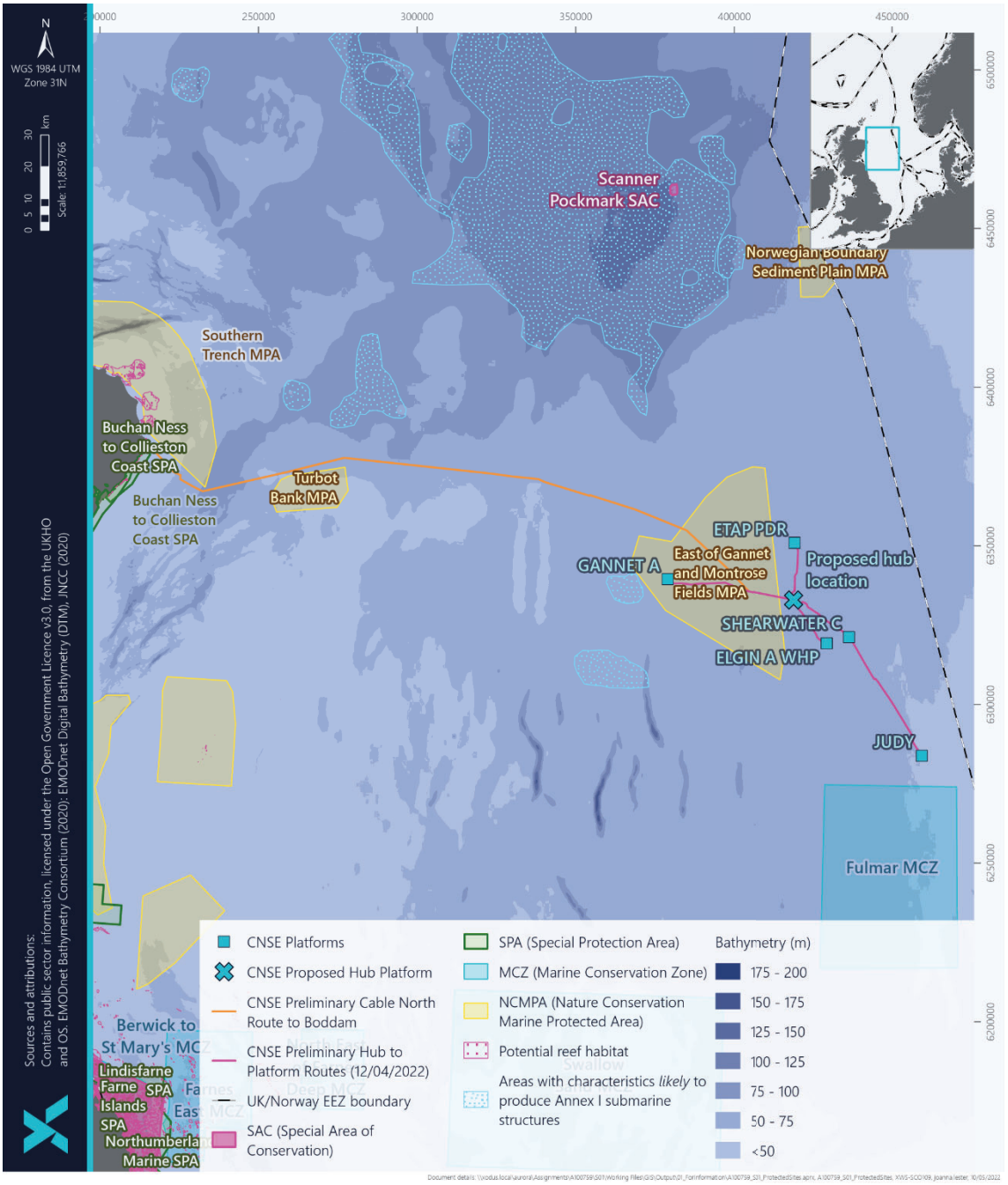
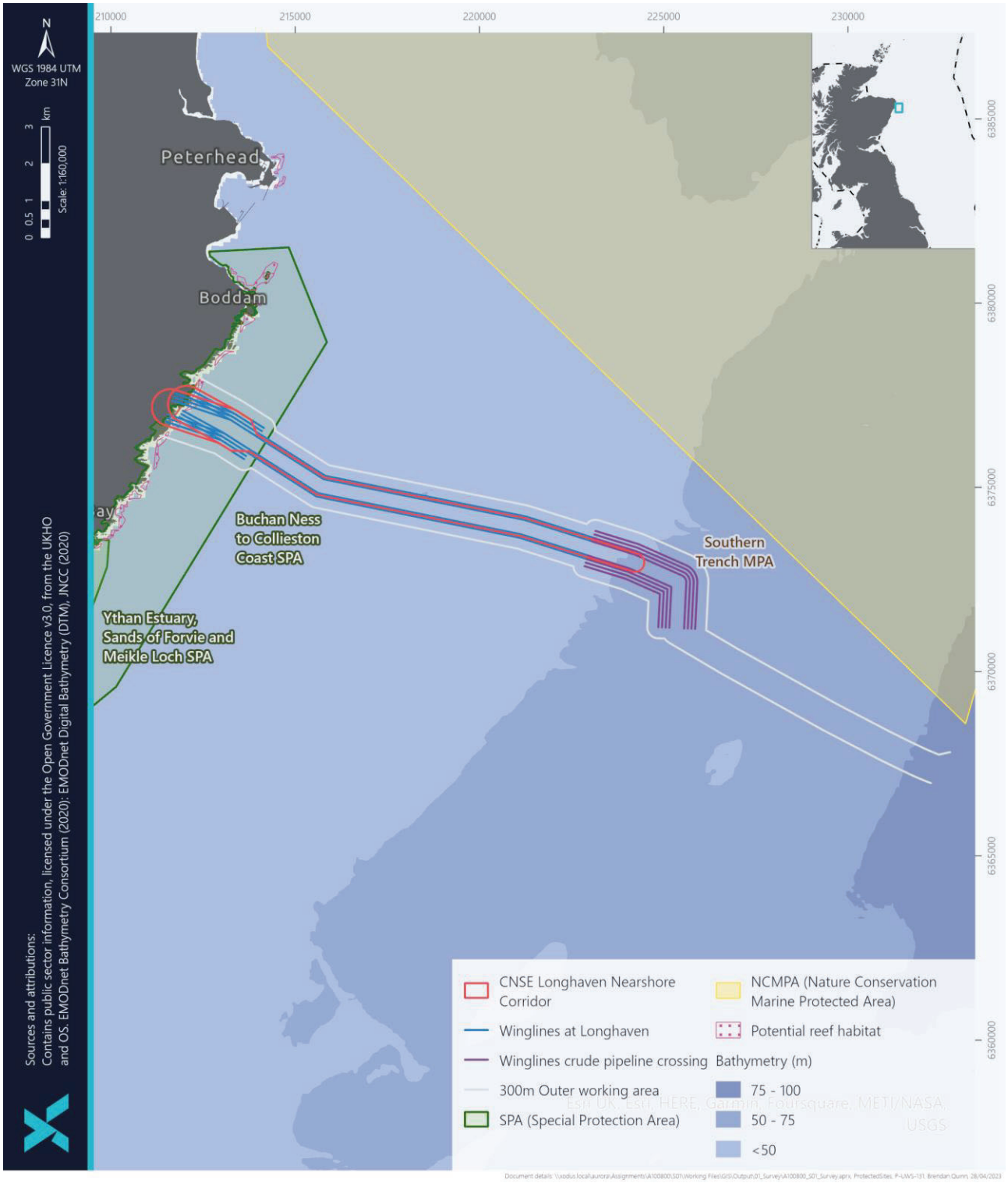


Figure 1-2 Landfall Site for the Proposed Cable Route



1.2 Report Purpose

Ahead of any planned route survey operations, all relevant consents and licences need to be in place. As the geophysical and environmental survey data collection will occur within Scottish waters, it is recognised that licences will be required under Scotland legislation. This document provides the necessary information to support the following:

- An assessment of potential impacts on cetaceans, and determination of the need for a European Protected Species (EPS) Licence under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) (the Habitats Regulations). Where an EPS licence is required, this document also provides the EPS risk assessment to support the application.
- An assessment of potential impacts on basking sharks, and determination of whether a derogation licence will be required under the Wildlife and Countryside Act 1981 (as amended).
- An assessment of the potential for Likely Significant Effects (LSE) on designated sites as required by the Habitats Regulations, the Marine (Scotland) Act 2010. This will be in line with the Habitats Regulations Appraisal (HRA) process, which is conducted by the Competent Authority (as prescribed by the Habitats Regulations), to assess the potential of likely significant effects on the UK Site Network; and
- An assessment of the potential to harass (intentionally or recklessly) any seals at designated seal haul-outs, as defined by section 117 of the Marine (Scotland) Act 2010, as amended by the Protection of Seals (Designation of Haul-Out Sites) (Scotland) Amendment Order 2017.

As part of the planned survey operations, other Regulatory exemptions/licences will be applied for including:

- Notice of intention to carry out a Marine Licence exempted activity for benthic sampling of < 1 m^3 volume per sample, under the Marine Licensing (Exempted Activities) (Scottish Offshore Region) Order 2011;
- A Marine Works Licence application will be made to Crown Estate Scotland; and
- Harbour Energy has provided evidence to MS-LOT that an EPS was not deemed to be required under the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) for the offshore (i.e. beyond 12 nm) portion of the route survey and for the hub survey.

1.3 Protected Species Overview

1.3.1 European Protected Species (EPS)

Cetaceans

All cetacean species within UK waters are deemed 'species of community interest' under Annex IV of the Habitats Directive and thus require strict protection as EPS. The strict protection to all cetaceans as EPS is enshrined in domestic legislation through the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), while bottlenose dolphin and harbour porpoise have further protection under Annex II of the Habitats Directive, which regulates the designation of SACs for those species.

In Scotland, the Habitats Directive is transposed into law by The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) within Scottish Territorial waters (12 nm limit), and the Conservation of Offshore Marine Habitats and

Species Regulations 2017 (as amended) in UK Offshore Waters. An EPS licence is required where an activity may result in an offence under the Habitats Regulations, which in the context of marine surveys, pertains to cetaceans.

Part III of both these Regulations defines what is considered an offence, in terms of human interactions with EPS. However, the definition of an offence under The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) differs slightly from that prescribed in The Conservation of Habitats and Species Regulations 2017 (as amended), as summarised in Table 1-1 below. The key difference is regulation 39(2) within The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (highlighted in bold in Table 1-1), which makes disturbance of any cetacean an offence in Scottish Territorial Waters. There is no equivalent regulation in the offshore legislation.

The Eurasian Otter

The Eurasian otter is the only native UK otter species and is fully protected as an EPS and under section 9 and 11 of the Wildlife and Countryside Act (WCA) 1981 (as amended). When considering a certain activity, the presence of an otter as an EPS is a material consideration if the proposals are likely to result in the disturbance or harm to the species.

Considering information on their known distribution, and the fact that no protected sites list this species as a qualifying feature (as assessed by the criteria set out in Section 1.5.4), it is considered extremely unlikely that interactions with otters will occur. Therefore, this species is not considered further in this assessment.

An EPS Licence will therefore be required for:

1. Any activity that might result in injury to any cetacean or other EPS;
2. Disturbance to any individual cetacean within Scottish inshore (nearshore) waters; and/or
3. Any population of individuals in Scottish offshore waters, as stated in Table 1-1.

Table 1-1 Definitions of Disturbance Offenses Against EPS in Scottish Territorial Waters

AREA	SCOTTISH TERRITORIAL WATERS
Applicability	Within 12 nm Limit
Relevant Legislation	The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)
Definition of Relevant Offences	Regulation 39: (1) 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.

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

1.3.2 Basking Sharks

Basking sharks (*Cetorhinus maximus*) are protected under Schedule 5 of the WCA (1981) (as amended) which prohibits the killing, injuring or taking by any method of those wild animals listed on Schedule 5 of the Act. The Nature Conservation (Scotland) Act 2004, Part 3 and Schedule 6 make amendments to the WCA, strengthening the legal protection for threatened species to include 'reckless' acts, and specifically makes it an offence to intentionally or recklessly disturb or harass basking sharks. A derogation licence under the WCA will therefore be required for any activity which may result in disturbance or injury to basking sharks.

Basking sharks are only very rarely present within the North Sea area (Paxton *et al.*, 2014). Considering information on their known distribution, it is considered extremely unlikely that interactions with basking sharks will occur, hence the potential for the proposed survey activities to result in intentional or reckless disturbance or harassment of this species is equally limited.

1.3.3 Seals

The Marine (Scotland) Act 2010 protects both harbour seal *Phoca vitulina* and grey seal *Halichoerus grypus* around Scotland's coast. This Act provides the Scottish Ministers with the power to designate Seal Conservation Areas. The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) prohibits certain methods of catching or killing seals. The Protection of Seals (Designated of Haul-Out Sites) (Scotland) Order 2014 (as amended) introduces additional protection for seals at designated haul-out sites, where harbour seal and grey seal come ashore to rest, moult or breed (see Section 3.2.3).

1.3.4 Seabirds

The primary legislation for the protection of birds is the WCA in combination with the Nature Conservation (Scotland) Act 2004. Under these acts, it is an offence to harm wild bird species, their eggs and nests. Additional protection is provided for certain bird species listed on Schedule 1 of the WCA, and it is an offence to disturb those species at their nest while it is in use.

The proposed cable route survey activities are unlikely to result in the intentional or reckless killing of wild birds or the destruction of their nests, but if carried out during the breeding season, such works could result in an offence by disturbing nesting bird species. Licensing for wild birds does not cover pre-development purposes, so any activity that could result in disturbance of a nesting species should not proceed unless outwith the breeding season.

1.4 Determining the Need for an EPS Licence

The purpose of the assessment presented in this report is to determine whether, when considering the implementation of appropriate mitigation, there is potential for the survey activities to injure or disturb cetaceans or otters. Where the potential for injury or disturbance remains, an EPS licence will be required. The requirement for an EPS licence will be determined based on findings from the EPS Risk Assessment.

If an EPS licence is required, NatureScot's consideration of whether an EPS licence can be granted will comprise three tests:

1. To ascertain whether the licence is to be granted for one of the purposes specified in the Regulations;
2. To ascertain whether there are no satisfactory alternatives to the activity proposed (that would avoid the risk of offence); and
3. That the licensing of the activity will not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status (FCS).

1.4.1 What Constitutes Disturbance?

Whether or not a specific activity could cause 'disturbance' (for the purpose of Article 12(1) (b) of the Habitats Directive) depends on the nature of the particular activity and the impact on the particular species. Whilst 'disturbance' is not defined in the Habitats Regulations, Marine Scotland (2014) advise that the following matters should be taken into account when considering what constitutes disturbance:

- 'Disturbance' in Article 12(1) (b) should be interpreted in light of the purpose of the Habitats Directive to which this Article contributes. In particular, Article 2(2) of the Directive provides that measures taken pursuant to the Habitats Directive must be designed to maintain or restore protected species at FCS;
- Article 12(1)(b) affords protection specifically to species and not to habitats;
- The prohibition relates to the protection of 'species' not 'specimens of species';

- Although the word 'significant' is omitted from Article 12(1)(b) in relation to the nature of the disturbance, that cannot preclude an assessment of the nature and extent of the negative impact and ultimately a judgement as to whether there is sufficient evidence to constitute prohibited 'disturbance' of the species;
- It is recognised that activity during the period of breeding, rearing, hibernation and migration is more likely to have a sufficient negative impact on the species and constitute prohibited 'disturbance' than activity at other times of the year;
- Article 12(1)(b) is transposed into domestic legislation by Regulation 39(1) and (2) of the Habitats Regulations 1994. Therefore, when considering what constitutes 'disturbance', thought should be given to Regulation 39(1)(b) which provides a number of specific circumstances where an EPS could be disturbed, and which can potentially have an impact on the status of the species; and
- Disturbance which could be considered an offence may occur in other circumstances and, therefore, be covered under Regulation 39(2) of the Habitats Regulations which state that it is an offence to 'deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)'.

Where there is the possibility for injury or disturbance to occur, an EPS Risk Assessment must be carried out and the need for an EPS Licence determined.

1.4.2 Alternatives

Harbour Energy are planning a Power from Shore cable to power oil and gas installations in the North Sea. In order to gather environmental and seabed conditions along the cable route, Harbour Energy are required to undertake a survey. There are no other alternatives to gather the relevant information.

Harbour Energy have ensured that the equipment selected for the survey will be operated at the appropriate levels in order to obtain the relevant data, while minimising any potential risks to EPS.

1.5 Protected Sites

1.5.1 European Sites

The term 'European site' is being used to refer to what were previously known as 'Natura 2000' sites. This recognises that Special Protection Areas (SPAs) and SACs protect species and habitats shared across Europe and were originally designated under European legislation.

European sites (SACs and SPAs) form a unique network of protected areas that stretches across the European Union (EU). Prior to leaving the EU, Scotland's sites contributed to the Natura 2000 Network. Now they form part of the Emerald Network, spanning Europe and into Africa.

Natura sites were originally designated under The European Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC). European Sites continue to be designated under Scottish domestic law and are now referred to as the UK Site Network:

- In the terrestrial environment and within Scottish Territorial Waters (12 nm limit) by:
  - The Conservation (Natural Habitats, &c.) Regulations 1994 (Current Scottish legislation); and
  - Habitats Directive and Birds Directive (EU legislation).

- Outwith Scottish Territorial Waters (>12 nm) by:
  - The Offshore Habitats Regulations.

SACs were designated under the Habitats Directive for habitats and non-bird species. The Habitats Directive sets out how such European sites should be protected and has a number of wider implications such as those relating to European protected species. The Birds Directive protects all wild birds and their nests, eggs and habitats within the European Union. SPAs are classified under the Birds Directive to protect birds that are rare or vulnerable in Europe as well as all migratory birds that are regular visitors.

The guidance within, and associated with, the Habitats and Birds Directive continues to inform how our European sites are managed. The Habitats Regulations have been amended as a result of leaving the EU so that European sites are both protected, and continue to operate, as they have done since their original designation. The changes to the Regulations also mean that the requirements of the Directives continue to be relevant to the management of European sites.

The aim of protection for European sites is to promote the maintenance of biodiversity, by requiring maintenance or restoration of representative natural habitats and wild species at FCS, through the introduction of robust protection for those habitats and species of European importance.

As part of these protection measures, there is a requirement to determine whether a plan or project is likely to have an adverse effect on the integrity of a European site. This is implemented through the HRA process. The HRA process requires that any proposal which has the potential to result in a negative LSE to a UK Site Network or its designated features, is subject to an HRA and an Appropriate Assessment (AA) by the Competent Authority. The HRA and AA processes ensure that no activity can be consented if it may cause adverse effects on the integrity of the UK Site Network, unless there are no alternatives, and there is an Imperative Reason of Overriding Public Interest (IROPI) for the activity to proceed.

1.5.2 Nature Conservation Marine Protected Areas

Nature Conservation Marine Protected Areas (NCMPAs), designated under the Marine (Scotland) Act 2010, provide protection for a wide range of important marine habitats and wildlife, geology and geomorphology in Scottish waters.

Under section 82 of the Marine (Scotland) Act 2010, MS-LOT is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature in a NCMPA, or any ecological or geomorphological process on which the conservation of any protected feature in an NCMPA is dependent. If MS-LOT determine there is, or may be, a significant risk of a project hindering the achievement of the conservation objectives, then they must notify the relevant conservation bodies; NatureScot in this case (previously known as Scottish Natural Heritage (SNH)).

It is an offence to intentionally or recklessly kill, remove, damage, or destroy any protected feature of an NCMPA. MS-LOT must be sure that consenting/licensing decisions do not cause a significant risk to the conservation objectives of any NCMPA.

Sufficient detail is provided below in Section 4 to support MS-LOT to ascertain potential effects on NCMPAs.

1.5.3 Designated Seal Haul-Outs

Seal haul-outs are coastal locations that seals use to breed, moult and rest. Nearly 200 seal haul-out sites have been designated through The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014, which was amended with additional sites in 2017. These haul-out sites are protected under Section 117 of the Marine (Scotland) Act 2010. The Act is designed to strengthen the protection of seals when they are at their most vulnerable and, as such, provides additional protection from intentional or reckless harassment whilst seals occupy these important coastal sites. The area designated for the proposed cable landfall near Longhaven is 18 km north of the closest designate seal haul-out site for seals near Newburgh (NMPi, 2023); therefore, interaction is unlikely to occur. Therefore, designated seal haul-out is not considered further in this assessment.

1.5.4 Selection Criteria for Protected Sites

Over and above potential impacts on protected species, the potential for the proposed survey activities to impact protected sites needs to be considered. The following criteria has been used to select those designated sites where potential impacts need to be assessed:

- SACs and NCMPAs (including proposed and candidate sites) with cetaceans as qualifying features within 50 km of the proposed route survey;
- SACs (including proposed and candidate sites) with harbour seal features within 50 km of the proposed route survey and breeding grey seal within 20 km of the proposed route survey;
- Designated seal haul-outs or seal breeding and/or otter sites that overlap with or located within 500 m of the proposed route survey;
- SPAs and NCMPAs (including proposed and candidate sites) with birds as qualifying features that overlap with or are located within 2 km of the proposed route survey;
- SACs and NCMPAs (including proposed and candidate sites) with otter features that overlap with or located within 500 m of the proposed route survey; and
- SACs and NCMPAs (including proposed and candidate sites) with vegetation or ground features that overlap or located within proposed route survey.

As shown in Figure 1-1, the proposed nearshore cable route survey goes through the Buchan Ness to Collieston Coast SPA. It should be noted that the proposed nearshore cable route survey is not located within the Southern Trench NCMPA.

2 DESCRIPTION OF PROJECT ACTIVITIES

2.1 Overview

The CNSE Project are planning to carry out a cable route survey along the proposed cable route from near Longhaven, south of Peterhead, to an offshore hub and hub to platform routes in the CNS. The results of the proposed cable route survey will be used to ascertain seabed conditions along the cable and at the hub location, in order to inform engineering design to determine cable route selection and to inform the cable burial risk assessments. An environmental survey will include grab samples at 1 – 2 km intervals in the nearshore (12 nm limit to landfall option) area.

2.2 Testing and Calibration of Survey Equipment

Prior to survey activities commencing, the survey equipment and sensors will need to be tested and calibrated. Testing and calibration may be required for all survey equipment that will be utilised during the route survey activity, as detailed in Table 2-1. It is anticipated that the testing and calibration will take approximately one day to complete and will be tested within the overall survey corridor. As far as reasonably practicable, Harbour Energy will endeavour to undertaken testing and calibration in the offshore (beyond 12 nm limit) region.

Since the vessel, equipment, and activities required for testing and calibration will be the same as those used during geophysical survey works, the potential impacts on protected species and sites resulting from testing and calibration will be analogous to those resulting from the main survey phase. As such, testing and calibration is not specifically considered by this assessment.

2.3 Survey Activities

Survey equipment selection and deployment will be informed (both prior to and during the route survey operations), by several factors including environmental considerations, weather and sea state, survey requirements and water depth. The Titan Explorer survey vessel or similar vessel will undertake the proposed activities in the nearshore area. Table 2-1 presents the types of activity that are associated with the planned geophysical survey.

Table 2-1 Summary of the Activities Associated with the Geophysical Survey

ROUTE SURVEY ACTIVITES	
Survey acquisition	Titan Explorer survey vessel or similar vessel
Survey techniques	MBES
	SSS
	SBES
	SBP
	USBL

ROUTE SURVEY ACTIVITES	
	Magnetometer
	SVP

2.4 Survey Equipment

As illustrated in Table 2-1, a range of different equipment may be employed during route survey activities. The use of the planned survey equipment is summarised in Table 2-2. Each type of equipment has been assessed for its potential to introduce sound into the marine environment and/or interact with protected species. The most significant sound related aspects potentially generated by this project are detailed within Table 3-1, along with a determination as to whether each requires further assessment.

Table 2-2 Details of the Equipment to be Employed for the Planned Survey Activities

SURVEY EQUIPMENT	DESCRIPTION
MBES	MBES are used to obtain detailed three-dimensional (3D) maps of the seafloor which show water depths. They measure water depth by recording the two-way travel time of a high frequency pulse emitted by a transducer. The beams produce a fanned arc composed of individual beams (also known as a swathe). MBES can, typically, carry out 200 or more simultaneous measurements. Frequency levels below 200 kHz will not be used during route survey activities and have therefore been scoped out of further assessment on the basis that they are out-with the generalised hearing range for EPS and other protected species likely to be affected by underwater sound. The Kongsberg EM 2040C will be used for the proposed cable route survey and operates at frequency >200 kHz.
SBES	SBESs operate in a similar manner to MBES; rather than measuring multiple points per acoustic echo wave (echo) emitted, SBES can only measure one point at a time. The nature of the sound emitted by SBES is impulsive. The preferred equipment is a Kongsberg EA400 for the proposed cable route survey and operates at frequency 38-200 kHz.
SSS	SSS is used to generate an accurate image of the seabed, which may include 3D imagery. An acoustic beam is used to obtain an accurate image of a narrow area of seabed to either side of the instrument by measuring the amplitude of back-scattered return signals. The instrument can either be towed behind a ship at a specified depth or mounted on to a Remotely Operated Vehicle (ROV). The frequencies used by SSS are generally very high and outside of the main hearing range of all marine species (NMFS, 2018). The higher frequency systems provide higher resolution but shorter-range measurements. The Edgetech 4200-FS SSS will be used for the proposed cable route survey and operates at frequencies between 100 -500 kHZ.

SURVEY EQUIPMENT	DESCRIPTION
SBP	SBP systems are used to identify and characterise layers of sediment under the seafloor. A transducer emits a sound pulse vertically downwards towards the seafloor, and a receiver records the return of the pulse once it has been reflected off the seafloor. There are numerous SBP technologies which may be deployed during route survey operations, including pingers, chirpers, boomers, and sparkers. These devices can operate across a range of frequencies depending on the purpose of the survey. Higher frequencies of operation provide the highest resolution but are limited in amount of penetration below the sea floor. The high frequency profilers are particularly useful for delineating shallow features. Lower frequencies yield more penetration but provide less resolution; lower frequency systems are more general-purpose tools that provide a good compromise between penetration capacity and resolution. The GeoAcoustics GeoPulse Pinger system SBP will be used for the cable route survey, operating at a frequency range of between 2-8 kHz.
USBL	USBL systems are used to determine the position of subsea survey items, including ROVs, towed devices, grab samplers, etc. This involves the emission of sound from a vessel-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. A USBL system consists of a transducer, which is mounted on the vessel and a transponder attached to the ROV. The transducer transmits acoustics through the water and the transponder sends a response which is detected by the transducer. The USBL calculates the bearing and time taken for the transmissions to be completed and thus the position of the subsea unit / sampling equipment is determined. These systems can either be used continuously or intermittently through the operation they are supporting. The Sonardyne Ranger USBL System will be used in the proposed cable route survey, operating at frequencies between 19-34 kHz and will be used at <200 dB.
Magnetometer	Magnetometer surveys are used to detect any ferrous metal objects on the seabed, such as wrecks, UXO, or any other obstructions. Marine magnetometers come in two types: surface towed and near-bottom. Both are towed a sufficient distance (about two ship lengths) away from the ship to allow them to collect data without it being polluted by the ship's magnetic properties. Surface towed magnetometers allow for a wider range of detection at the price of precision accuracy that is afforded by the near-bottom magnetometers. These surveys use equipment to record spatial variation in the Earth's magnetic field. The Geometris G882 Magnetometer System is a passive magnetometer to be used during the proposed cable route survey.
SVP	The SVP continuously emits high frequency pulses as it is lowered towards the seafloor in order to measure the speed of sound within the water column. This technology also makes use of sonar to determine how quickly sound attenuates in the marine environment, which can aid in calibrating geophysical survey equipment. The equipment used will be a MIDAS SVP. The frequency of the equipment used will be 1,000 – 4,000 kHz.

2.5 Activity Schedule

The proposed geophysical and environmental survey activities are scheduled to be undertaken from 1st June 2023. The nearshore route survey (as covered by this document) is due to take approximately 7days (including standby). Prior to the commencement of the surveys, the equipment will be tested at the project site. An additional 54 days have been included in the duration to account for unforeseen operational and/or weather delays.

3 EUROPEAN PROTECTED SPECIES RISK ASSESSMENT

3.1 Overview

The primary purpose of this EPS Risk Assessment is to determine whether an EPS licence is required for the proposed nearshore route survey activities, by identifying the potential for injury and disturbance to EPS. This section of the risk assessment addresses potential impacts to EPS, regardless of their inclusion as qualifying features of protected sites. An assessment of potential impacts to protected sites and their qualifying features is provided in Section 4. Although not classified as EPS, an assessment of underwater sound impacts to pinnipeds, including sound modelling, has been included in this section to support the Protected Sites Impact Assessment undertaken in Section 4.

Furthermore, although not specifically an EPS, an assessment of the potential impacts to basking sharks from the nearshore route survey activities is also provided within Section 3.3.1.

A number of different cable route survey activities will be employed as part of the route survey works, each with varying risk to protected species. They include:

- Vessel activity;
- Survey equipment calibration testing – it should be noted that Harbour Energy will endeavour, as far as practicable, to undertake calibration testing in the offshore part of the route survey;
- Geophysical surveys of the seabed; and
- Grab samples.

Underwater sound emissions from geophysical survey equipment are the primary source of potential injury and disturbance to EPS. An overview of survey activities and their potential sound-related impacts to EPS, basking sharks and pinnipeds is provided in Table 3-1.

While some survey techniques may introduce sound to the marine environment, the majority of survey equipment types do not operate in relevant frequency ranges or generate sufficient levels of sound to be considered as potential sources of sound-related injury or disturbance to EPS, basking sharks and pinnipeds, and have been screened out of the detailed assessment, as indicated in Table 3-1.

It is acknowledged that the physical presence of vessel during the proposed nearshore route survey operations may also generate disturbance to EPS, basking sharks and pinnipeds; these potential impacts are discussed further in the relevant EPS and Other Protected Species in Section 4.2.

Table 3-1 Overview of Potential Impacts of Marine Survey Equipment on EPS and Other Protected Species within the Vicinity of the Proposed Cable Route Survey

ACTIVITY / EQUIPMENT	EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (KHZ)	INDICATIVE SPL_{RMS} / SPL_{PEAK} (DB RE 1µPA)	FURTHER INFORMATION REQUIRED AS PART OF THE EPS AND PROTECTED SITES ASSESSMENT
Survey Vessel	Titan Explorer or similar vessel	Propellers, engines, and propulsion activities form the primary sound sources of survey vessel. Vessel sound is generally continuous and comes in both narrowband and broadband emissions. Potential impacts on EPS and other protected species depend on the duration of the survey activities, location of the route surveys and species of cetacean potentially present in the area. Increased vessel activity additionally has the potential to cause injury from collisions. The risk of collision with an animal is influenced by the dimensions of the vessel and its speed. It should be noted that travel speed of most typical survey vessels is between 3-4 knots. This is slower than the majority of marine mammals which could be impacted via collisions.	Acoustic energy from vessels is strongest at frequencies <1 kHz	Approximately 160 – 175 (SPLrms)	No – The source levels associated with vessel is likely to be too low to result in injury, and the presence of the survey vessel does not constitute a change from baseline conditions. It is acknowledged that the vessel poses a collision risk to EPS and other protected species. While this does not constitute a change from baseline, the vessel will adhere those mitigation measures, as outlined in Section 5.

ACTIVITY / EQUIPMENT	EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (KHZ)	INDICATIVE SPL_{RMS} / SPL_{PEAK} (DB RE 1µPA)	FURTHER INFORMATION REQUIRED AS PART OF THE EPS AND PROTECTED SITES ASSESSMENT
SBP	GeoPulse 5430A	SBP involves the vertical emission of sound pulses (impulsive sound) to characterise the layers of sediment comprising the seabed. Such activities introduce sound emissions into the marine environment. The potential impact of this sound depends upon the type of profiler technology used, as well as the abundance, distribution and sensitivity of the species, and the duration of the operations. A shallow SBP will be deployed. A pinger system will be used which transmits a sweep of frequencies (e.g. 2-8 kHz) in a single pulse. These systems operate by creating low sound frequencies which produce impulsive underwater sound. The pulses penetrate into the sediment and examine sediment layers and the extent of bedrock, seabed sediment and formations, etc.	2-8 kHz	SPLrms: 221 SPLpeak: 223.5	Yes – The frequency of the sound emissions are within marine mammal hearing ranges and the source pressure level may pose a risk of injury and disturbance to EPS.

ACTIVITY / EQUIPMENT	EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (KHZ)	INDICATIVE SPL_{RMS} / SPL_{PEAK} (DB RE 1µPA)	FURTHER INFORMATION REQUIRED AS PART OF THE EPS AND PROTECTED SITES ASSESSMENT
SBES	Kongsberg EA400	High frequency sound pulses created by SBES equipment generate sound waves which produce impulsive underwater sound. Depending on the frequency of the pulses, location and duration of the operations, and the species present, there could be potential impacts on cetaceans.	38 - 200	SPLpeak: 227	Yes – The SBES used for the proposed survey operations will operate at frequencies between 38 - 200 kHz. This is within the hearing threshold of high and very high frequency marine mammals and protected species which may be present in the area (as detailed in Table 3-2). Hence there may be potential for injury or disturbance exists (NMFS, 2018); however, the SBES equipment is considered to represent the worst-case.
MBES	Kongsberg EM 2040C	High frequency sound pulses created by MBES equipment generate sound waves which produce impulsive underwater sound. Depending on the frequency of the pulses, location and duration of the operations, and the species present, there could be potential impacts on cetaceans.	200 - 400	SPLpeak: 218 SPLrms: 215	No – The MBES used for the proposed survey operations will operate at frequencies above 200 kHz. This is above the hearing threshold of all marine mammals and protected species which may be present in the area (as detailed in Table 3-2). Hence no potential for injury or disturbance exists (NMFS, 2018).

ACTIVITY / EQUIPMENT	EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (KHZ)	INDICATIVE SPL_{RMS} / SPL_{PEAK} (DB RE 1µPA)	FURTHER INFORMATION REQUIRED AS PART OF THE EPS AND PROTECTED SITES ASSESSMENT
SSS	Edgetech 4200-FS	SSS equipment produces impulsive sound emissions through high frequency pulses used to image the seabed habitat. Potential impacts to EPS and other marine mammals depend upon the frequency, location, and duration of the pulses.	100-500	SPLpeak: 210	**No** – If used the SSS will operate at frequencies above 200 kHz. This is above the hearing threshold of all marine mammals and protected species which may be present in the area (as detailed in Table 3-2). Hence no potential for injury or disturbance exists (NMFS, 2018).
SVP	MIDAS SVP	SVPs rely on high frequency pulsed sounds to gather data on the marine environment and are used to measure the speed of sound within the water column to calibrate geophysical survey equipment.	N/A	N/A	**No** - the sound source frequencies fall out-with the hearing range of marine mammals. There is no potential for injury or disturbance to any marine mammal species from sound emitted by this equipment.
Magnetometer	Geometrics G882	Surface towed magnetometers allow for a wider range of detection at the price of precision accuracy that is afforded by the near-bottom magnetometers. These surveys use equipment to record spatial variation in the Earth's magnetic field. As the magnetometer does not generate any underwater sound, there is no considered impact from this survey.	N/A	N/A	**No** – the magnetometer is passive and does not generate underwater sound as part of its normal operations. Therefore, it is not considered to pose any risk of injury or disturbance to EPS.

ACTIVITY / EQUIPMENT	EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (KHZ)	INDICATIVE SPL_{RMS} / SPL_{PEAK} (DB RE 1µPA)	FURTHER INFORMATION REQUIRED AS PART OF THE EPS AND PROTECTED SITES ASSESSMENT
USBL	Sonardyne Ranger USBL	USBL systems involve the emission of impulsive sound from a hull-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. The potential impacts of this sound on cetaceans depends upon the abundance, distribution and sensitivity of the species, and the duration of the operations.	19-34	SPLpeak: 170-200	No – The USBL used for the proposed survey operations will operate at frequencies between 19 - 34 kHz. This is within the hearing threshold of marine mammals and protected species which may be present in the area (as detailed in Table 3-2). However, the USBL will be used <200 dB and is not likely to cause injury or disturbance to marine mammals and other protected species.

3.2 European Protected Species

3.2.1 Cetaceans

All cetacean species within UK waters are deemed 'species of community interest' under Annex IV of the Habitats Directive and thus require strict protection as EPS. Harbour porpoise and bottlenose dolphin are listed as individual EPS, while all other cetaceans are categorically listed as "all other Cetacea". Cetaceans are also fully protected in Scottish waters under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), while bottlenose dolphin and harbour porpoise have further protection under Annex II of the Habitats Directive, which regulates the designation of SAC for those species. Additionally, in 2014, under the power and duties of The Marine (Scotland) Act 2010 and the UK Marine and Coastal Access Act 2009, Scottish Ministers adopted a list of 81 Priority Marine Features (PMFs) – which are features characteristic of the Scottish marine environment. All species of Cetaceans are included as PMFs.

Eight species of cetaceans have been recorded in the waters off the east Scotland (SeaWatch, 2023). According to SeaWatch Foundation, the east region of Scotland (including nearshore [within 60 km of the coast] and offshore waters) from Eyemouth on the Scottish Borders to Cape Wrath in Highland Region is moderately rich in cetacean fauna. From East Lothian to Angus, six species (a little over 21% of the 28 total UK species) are recorded regularly and are expected to be present in the route survey area (SeaWatch, 2023; Hague *et al.*, 2020; Reid *et al.*, 2003; Hammond *et al.*, 2021).

The following eight cetacean species are known to frequent or seasonally visit the waters of the east coast of Scotland: harbour porpoise; bottlenose dolphin; minke whale *Balaenoptera acutorostrata;* white-beaked dolphin *Lagenorhynchus albirostris*; Atlantic white-sided dolphin *Lagenorhynchus acutus;* killer whale *Orcinus orca*; Risso's dolphin *Grampus griseus*; and long-finned pilot whale *Globicephala melas* (Hammond *et al.*, 2021; Hague *et al.*, 2020; SeaWatch 2023). Of these species, it is expected that harbour porpoise, bottlenose dolphin, minke whale, white-beaked dolphin, Atlantic white-sided dolphin and killer whale occur with the most frequency in the proposed cable route survey area and its surrounding waters based on survey data and available published abundance and distribution data (Reid *et al.*, 2003; Hague *et al.*, 2020; Hammond *et al.*, 2021).

The proposed cable route survey will take place over a large area with diverse geographical features off the eastern Scottish coast. The following summarises those species regularly sighted in the vicinity of the proposed route survey area:

- Harbour porpoise - The most abundant cetacean species in UK waters and are generally observed in small groups of one to three individuals (Reid *et al.*, 2003). The density of harbour porpoise within Block R of the Small Cetaceans in Atlantic Waters of the North Sea (SCANS) III survey, within which the project resides, was approximately 0.599 animals/km^2, which is above average in the context of the wider United Kingdom Continental Shelf (UKCS) region (Hammond *et al.*, 2021). According to density modelling data (combining SCANS-III density data with environmental predictive factors), it is predicted that harbour porpoise densities within the route survey area will be moderate, with higher densities occurring in waters to the south of the proposed cable route survey area (Hague *et al.*, 2020; Hammond *et al.*, 2021). Nevertheless, this species has also been sighted within the E1 Draft Plan Option (now the E1 area) (Hague *et al.*, 2020). In addition, the peak calving

period for harbour porpoise in Scottish waters is between April and June, indicating a possible increased sensitivity to any potential disturbance during this time. However, the annual distribution and relative abundance of harbour porpoise is moderate throughout the site (NMPi, 2023).

- Bottlenose dolphin - More common in Scottish nearshore waters than offshore waters. Small resident or semi-resident populations occupy a few scattered coastal localities throughout Scotland (Cheney *et al.*, 2018; Hague *et al.*, 2020). Bottlenose dolphins commonly form groups ranging in size of 2-25 individuals. Groups of several tens or low hundreds of animals have also been observed, although usually in offshore waters (Reid *et al.* 2003). In Scottish waters, bottlenose dolphins occur around the west and east coasts, with densities of bottlenose dolphin along the North coast of Scotland lower than the west and east coast (Thompson *et al.*, 2011). Densities within Block R of the SCANS-III survey were approximately 0.0298 animals/km^2, which is slightly above average for the region (Hammond *et a*l., 2021; Hague *et al.*, 2020). In coastal waters, bottlenose dolphins favour river estuaries, headlands and sandbanks, mainly where there is uneven bottom relief and/or strong tidal currents (Wilson *et al.*, 1997). The annual distribution and relative abundance of bottlenose dolphin is 0.0634 animals per standard hour around the nearshore area at Longhaven (NMPi, 2023).

- Minke whale - The smallest, most prevalent baleen whales to occur in Scottish waters. They feed mainly in shallower waters over the continental shelf and regularly appear around shelf banks and mounds, or near fronts where zooplankton and fish are concentrated at the surface (Reid *et al.*, 2003). They are also commonly seen in the strong currents around headlands and small islands, where they can come close to land, even entering estuaries, bays and inlets. Minke whale density within Block R of the SCANS-III survey is considered to be moderate in comparison to the rest of the UKCS, with an estimate 0.0387 animals/km^2 (Hammond *et al.*, 2021). This species shows a large seasonal variation with much lower densities in the winter months, likely driven by variations in sea surface temperature and chlorophyll concentrations (Hague *et al.*, 2020). Breeding locations of this species are currently unknown. The annual distribution and relative abundance of minke whale is moderate to high throughout the route survey area (0.02 – 0.1 animals) (NMPi, 2023).

- White-beaked dolphin - Common in Northern European continental shelf seas from Iceland and Norway south to Ireland and Southwest England, including the northern and central North Sea. White-beaked dolphin have an estimated density within Block R of the SCANS III survey of 0.243 animals/km^2, which is considered moderate compared to the rest of the UKCS (Hammond *et al.*, 2021). According to SeaWatch (2023) peak numbers and frequency of sightings occur between June and September (particularly August). The north of Scotland is used both for feeding and breeding by white-beaked dolphin, primarily between May and August, when this species may be most sensitive to disturbance. The annual distribution and relative abundance of white-beaked dolphin is low (0.01 – 1.97 animals) (NMPi, 2023).

- Other cetacean species - Atlantic white-sided dolphin has been recorded in very low numbers in the proposed cable route survey area, with an estimated density within Block R of the SCANS III survey of 0.1 animals/km^2, which is considered low compared to the rest of the UKCS (Hammond *et al.*, 2021). Other species such as Risso's dolphin, long-finned pilot whale and killer whales are encountered intermittently throughout the year along the north coast of Scotland, with no obvious spatial or temporal patterns in abundance or distribution (Reid *et al.*, 2003; Hague *et al.*, 2020) or not within the proposed route survey area (Hammond *et al.*, 2021). Predicted density surfaces could not be developed for killer whales, Risso's dolphins or long-finned pilot whale as there were not enough sightings (Hague *et al.*, 2020). Due to the relative densities and the chances of observing an individual being extremely low, the above listed species, killer whales, Risso's dolphins or long-finned pilot whales, have not

been included within the EPS Risk Assessment. Although sightings of the Atlantic white-sided dolphin are low, they have been included in the EPS Risk Assessment.

Potential Impacts

Sound emissions from the proposed activities constitute the greatest potential risk of injury or disturbance to cetaceans in the vicinity of the route survey. Injury and disturbance from underwater sound may impact cetaceans in the following ways:

- Injury – physiological damage to auditory or other internal organs; and
- Disturbance (temporary or continuous) – disruptions to behavioural patterns, including, but not limited to migration, breathing, nursing, breeding, foraging, socialising and / or sheltering.

To determine the potential for sound impacts to cetaceans and pinnipeds, predicted emission levels are compared to available empirically estimated thresholds for injury and disturbance. Several threshold criteria and methods for determining how sound levels are perceived by marine mammals are available (e.g., the decibel hearing threshold method and other hearing weighted and linear measures) and each has its own advantages and disadvantages. Scottish Government (2020) guidance recommends using the injury and disturbance criteria proposed by Southall *et al.*, (2007), which is based on a combination of linear (un-weighted) peak Sound Pressure Levels (SPL) and weighted Sound Exposure Levels (SEL). Since the publication of this paper (Southall *et al.*, 2007), there has been mounting evidence of marine mammal auditory abilities in novel species and well-researched species alike (e.g., harbour porpoise) which has led to amendments to the auditory thresholds for injury (NMFS, 2018; Southall *et al.*, 2019). In accordance with recent regulator feedback, these amended hearing groups and thresholds for acoustic injury have been adopted herein; they are detailed in Table 3-2.

If a sound emission is composed of frequencies which lie outwith the estimated auditory bandwidth for a given species, then disturbance or injury is extremely unlikely. To understand the potential for sound-related impacts, the likely hearing sensitivities of different cetacean hearing groups has been summarised in Table 3-2 which is the basis for screening out MBES, SSS, SVP and USBL (note: the magnetometer will be passive) from further assessment as detailed in Table 3-1. During the proposed route survey, it is the SBP and SBES which are within this range and further assessment is provided for the worst-case equipment (SBP) in Section 3.4.

Table 3-2 Auditory Bandwidths Estimated for Cetaceans (Southall et al., 2019; NMFS, 2018)

Hearing Group	Estimated Auditory Bandwidth
Low-frequency cetaceans (LF): (e.g. baleen whales, such as minke whales)	7 Hz to 35 kHz
High-frequency cetaceans (HF): (e.g. dolphins, toothed whales, beaked whales and bottlenose whales)	150 Hz to 160 kHz

Hearing Group	Estimated Auditory Bandwidth
Very high-frequency cetaceans (VHF): (e.g. harbour porpoises and other 'true' porpoises)	275 Hz to 160 kHz

3.2.2 Otters

Otters *Lutra lutra* are small, semi-aquatic mammals which inhabit riverine, brackish and coastal environments throughout the UK. Although land mammals, otters depend on both freshwater and marine environments for food. Their marine habitat comprises low, peat-covered coastlines with shallow, seaweed rich waters and a consistent freshwater supply (DECC, 2016).

Potential Impacts

Otters may be disturbed by the presence of vessels but are not particularly sensitive to sound. The planned survey will be located in the nearshore; however, despite the survey vessel going to <100 m water depth contour, no adverse impacts to otter are expected on otters.

3.2.3 Pinnipeds

Two pinniped (seal) species regularly occur in the Scottish offshore and coastal environment: grey seals *Halichoerus grypus* and harbour seals *Phoca vitulina*. Both grey and harbour seals are listed under Annex II of the EU Habitats Directive and are PMFs. Approximately 36% of the world's grey seals breed in the UK (81% of these breed at colonies in Scotland with the main concentrations in the Outer Hebrides and in Orkney). Approximately 32% of the world's harbour seals are found in the UK, however, this proportion has declined from approximately 40% in 2002. Harbour seals are widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles (SCOS, 2020). Seal haul-outs are terrestrial sites designated for the protection of seals during vulnerable haul-out periods, such as breeding and pupping. The extent of this protection is limited to those seals on shore at the haul-out. According to the National Marine Plan Interactive (NMPi) (2023), the estimated at-sea usage of grey seals within the nearshore survey area is 10 – 50 animals per 25 km^2 at Longhaven, rapidly decreasing to 5 -10 animals and 0-1 animals per 25 km^2. The estimated at-sea usage of harbour seals within the planned survey area is 0 – 1 per 25 km^2.

Potential Impacts

Under the Marine (Scotland) Act 2010 it is an offence to kill or injure a seal. An assessment below focuses on the potential for injury to seals from the proposed cable route survey activities.

Potential impacts from the geophysical survey may arise from underwater sound generated during the proposed activities and physical disturbance at haul-outs (i.e. from vessel or human presence). Seals are particularly susceptible to project-related impacts during their respective pupping and moulting seasons, when the residency of seals at haul-outs and in surrounding waters elevates the relative density of each species.

Underwater sound emissions have the potential to cause physical injury or disturbance to seals, particularly if they fall within their generalised hearing range of 50 Hz to 86 kHz, as detailed within Table 3-3 (NMFS, 2018; Southall *et al.*, 2019). If a sound emission is composed of frequencies which lie out with the estimated auditory bandwidth for a

given species, then disturbance or injury is extremely unlikely. An assessment of underwater sound impacts on seals has been undertaken and is presented within Section 3.4Table 3-3 Auditory Bandwidths Estimated for Pinnipeds (NMFS, 2018; Southall et al., 2019)

HEARING GROUP	ESTIMATED AUDITORY BANDWITH
Phocid carnivores in water (PW) e.g., ear-less or 'true' seals, such as grey and harbour seals	50 Hz to 86 kHz

There are a number of designated seal haul-outs sites which are present along the Scottish coastline (NMPi, 2023). The nearest site designated for seals is located 18 km south of Longhaven, near Newburgh (NMPi, 2023).

The nearshore survey is due to take place over 7 days (including standby). The earliest start date will be 1st June 2023 with an estimated end date of 31st July 2023. As the nearest haul out site is approximately 18 km from the proposed cable route survey, the survey activities are unlikely to impact the breeding and pupping seasons. In addition, data suggests that even with very intense sound emissions, such as those from pile driving activity, harbour seals are likely to return to the region of the sound source once the emissions have ceased (Brasseur *et al.*, 2010). Where this leads to an animal avoiding their main feeding and breeding grounds this can have longer term effects the on health and breeding ability of that animal (Kastelein *et al.*, 2006).

There are no SACs designated for the protection of seal species within 50 km of the proposed route survey. Therefore, it is expected that the potential impacts to seal populations are very low. In addition, mitigation protocols identified as being required for cetaceans will also be implemented for seals.

Project activities will not result in the catching or killing of seals, and thus the protection provided to the two species by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) will not be breached.

3.3 Other Species

3.3.1 Basking Sharks

Basking sharks *Cetorhinus maximus* are one of the only three species of shark which filter feed and are the second largest fish in the world (Sims, 2008). This species can be found throughout the offshore waters in the UK continental shelf (Sims, 2008) and are considered frequent visitors to the north and west coasts of Scotland (HWDT, 2018; Witt, *et al.*, 2012). They are widely distributed in cold and temperate waters and feed predominantly on plankton and zooplankton e.g. barnacles, copepods, fish eggs and deep-water oceanic shrimps by filtering large volumes of water through their wide-open mouth. They typically move very slowly (around 4 miles per hour). In the winter, they dive to great depths to get plankton while in the summer they are mostly near the surface, where the water is warmer.

Basking sharks were hunted in Scotland up to 1994 (Scottish Wildlife Trust, 2023). However, they are now protected in the UK waters principally under Schedule 5 of the Wildlife and Countryside Act 1981 and under the Nature Conservation (Scotland) Act 2004 and are classed as Scottish PMF as well as a species on the Oslo and Paris Convention (OSPAR) list. Due to their size, slow swimming speeds and preference for swimming in coastal waters

during the summer months, basking sharks are considered to be at potential risk of collision with vessels associated with the survey activities. Given that basking sharks are slow to mature and have a long gestation period, the species can be slow to recover if populations are rapidly depleted.

Basking sharks seasonally visit Scottish coastlines in the spring and leave in autumn. In the summer, basking sharks spend the majority of time near the surface, where they appear to be basking whilst feeding on plankton. Summer also functions as a potential breeding season for the species, with aggregations of individuals peaking in July and August. They are mainly found around the western isles of Scotland, but at certain times can be found in the Northern Isles or along the east coast as an occasional visitor (Witt *et al.*, 2012). Basking shark sightings recorded by NatureScot, made available on the NMPi show the observed adjusted densities of basking sharks in the waters surrounding Scotland for all seasons between 2000 – 2012 (NMPi, 2023). The observed basking shark density within the proposed route survey is between 0.0 – 0.1 individuals. However, there have been species sighted on the south-east coast of Scotland, including around Peterhead (NMPi, 2023).

Potential Impacts

The basking shark is an elasmobranch (sharks and rays) which is a group with generally low sensitivity to sound vibrations due to the fact they do not have a swim bladder. The hearing range of basking sharks is not known; however, five other elasmobranchs have been found to have a hearing range between 20 Hz to 1 kHz. However, this may or may not be the same for basking sharks (Macleod *et al.*, 2011). As 20 Hz – 1 kHz only encompass a small proportion of the sound emitted during the proposed geophysical surveys, and the activities are of short duration, sound disturbance is not expected to impact basking sharks. On this basis, the potential for sound emissions to impact upon basking sharks is screened out of further assessment.

Vessel collision also poses a threat to this slow-moving species. Collision risk increases with increasing vessel speed. However, as the survey vessels will be slow-moving and will follow a pre-determined survey transect, the potential for collision risk is generally low.

The potential to impact basking sharks is therefore considered very low as this species is unlikely to be found within the vicinity of the planned survey. Therefore, an application for a Basking Shark licence under the Wildlife and Countryside Act 1981 (as amended) will not be required.

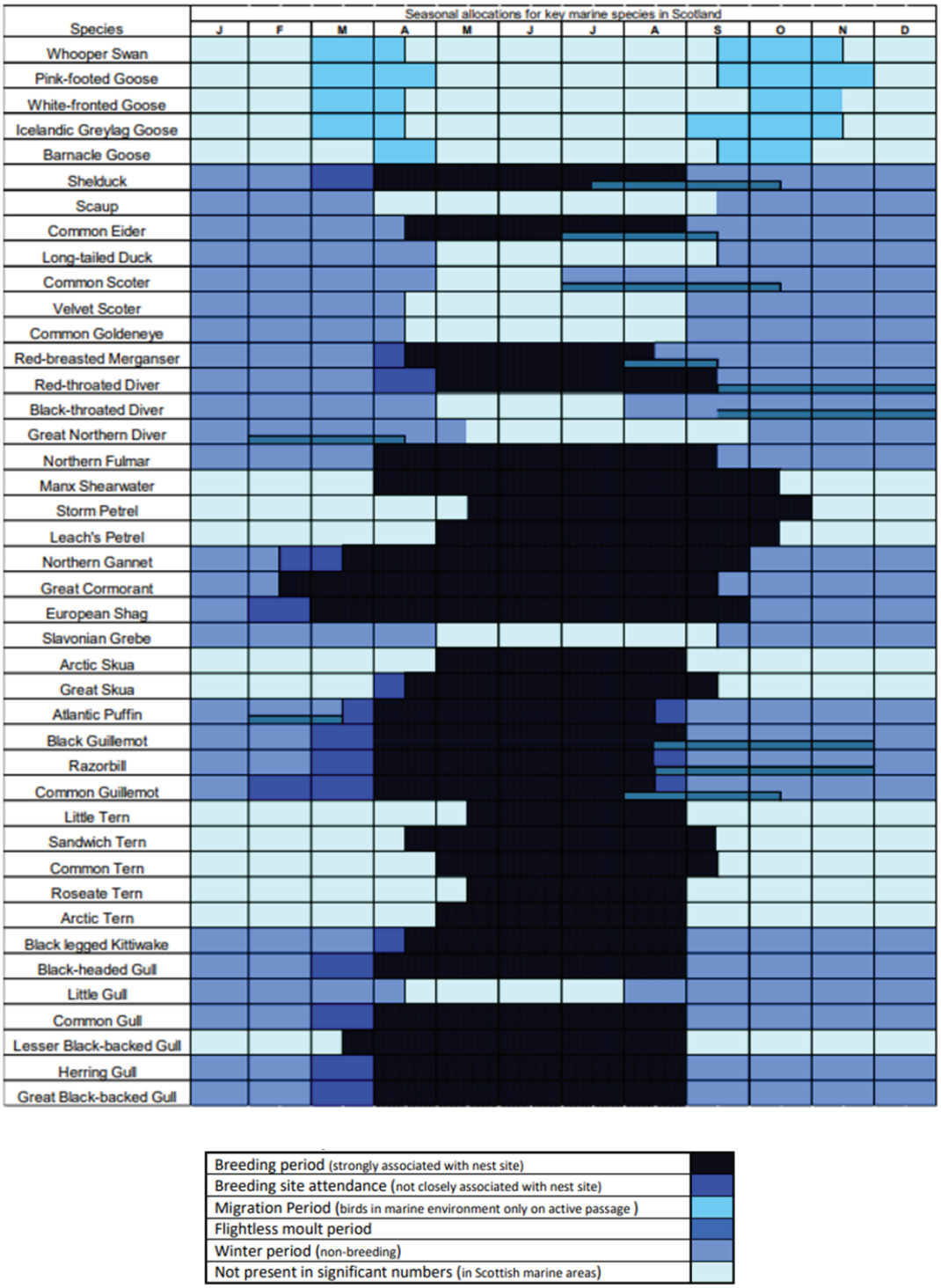
3.3.2 Birds

The primary legislation for the protection of birds is the WCA (1981) (as amended) in combination with the Nature Conservation (Scotland) Act 2004. Under these acts, it is an offence to harm wild bird species, their eggs and nests. Additional protection is provided for certain bird species listed on Schedule 1 of the WCA, and it is an offence to disturb those species at their nest while it is in use.

The Scottish coastal and marine environment offers a number of vital nesting, breeding and foraging habitats for seabird species. The west coast of Scotland hosts some particularly important cliff and island habitats which support seabird populations throughout the year. Seabirds are most vulnerable to human disturbance at sea during the moulting period when many species become flightless and spend a greater portion of time on the sea surface (Pollock et al., 2000). After the breeding season has ended, moulting birds disperse from their coastal colonies and head into

offshore waters. This at-sea period increases the likelihood of human disturbance and interactions with surveys vessels, resulting in an increased potential for collision risk. Important life history periods for seabirds have been summarised in Table 3-4.

Table 3-4 Breeding Season and Nest Occupancy of Seabirds in Scottish Waters (Naturescot, 2020)



In addition, there are several species of seabird, shorebird and waterfowl (e.g. ducks) for which SPAs are designated under the requirements of the EU Birds Directive. These SPAs protect key areas for certain species at specific times of the year, e.g. breeding colonies or important foraging areas.

Potential Impacts

During proposed survey activities, the physical presence of vessels has the potential to result in disturbance to seabirds within the region. The presence of vessel lighting also has the potential to disorientate fledgling birds, leading to increased collision rates with vessels at night, which may be fatal (Rodriguez *et al.*, 2015). The proposed cable route survey have the potential to take place between 1st June and 31st July 2023, and therefore have the potential to coincide with sensitive breeding for seabirds.

Despite the potential overlap between proposed survey activities and sensitive periods for seabird species which utilise the marine environment, the short-term and temporary nature of proposed activities and their limited spatial extent, restrict the potential for significant impacts to birds within the region. Additionally, the survey vessel will be travelling slowly within the marine region and in a predetermined pattern over the course of the surveys. Considering that seabirds are protected under legislation from harm to individuals, eggs or nests, no further assessment is required since these impacts will not occur as a result of the proposed survey operations.

Impacts on designated conservation sites which have a seabird qualifying features (e.g. SPAs) are considered in Section 3.4.2 below. Any mitigation measures that are to be adopted by Harbour Energy in relation to seabird species have been summarised in Section 3.5 below.

3.4 Sound Assessment

3.4.1 Underwater Sound Assessment Metrics

Sound is transmitted through liquids as longitudinal waves, or compression waves. These are waves of alternating pressure deviations from the equilibrium pressure, causing local regions of compression and rarefaction. Sound pressure (p) is therefore the average variation in pressure caused by the sound. By convention, sound levels are expressed in decibels (dB) relative to a fixed reference pressure commonly 1 micropascal (µPa) for underwater measurements, as measurements typically cover a very wide range of pressure values.

Peak Sound Pressure Level (SPL)

The Peak SPL, or zero-to-peak sound pressure, is the maximum sound pressure during a stated time interval. A peak sound pressure may arise from a positive or negative sound pressure, and the unit is the pascal (Pa). This quantity is typically useful as a metric for a pulsed waveform, though it may also be used to describe a periodic waveform

SPL may also be referred to as Zero to Peak (0-Peak) pressure.

Root Mean Square (RMS) sound pressure

The Root Mean Square (RMS) Sound Pressure Level (SPL_{rms}) is the mean square pressure level measured over a given time interval. Therefore, it represents a measure of the average sound pressure level over the time. The RMS sound pressure is expressed in Pa.

When the SPL_{rms} is used to quantify a transient sound source the time period over which the measurements are averaged must be given, as the SPL_{rms} value will vary with the averaging time period.

Sound Exposure Level (SEL)

The Sound Exposure Level (SEL) is the time integral of the square pressure over a time window long enough to include the entire pressure pulse. The SEL is therefore the sum of the acoustic energy over a measurement period, and effectively takes account of both the level of sound, and the duration over which the sound is present in the environment.

Pulse duration

The time during which a specified percentage of sound energy in the signal occurs. In the calculation, sound exposure may be used as a proxy for energy. The pulse duration is expressed in units of seconds(s).

3.4.2 Marine Mammal Impact Criteria

Underwater sound has the potential to affect marine life in different ways depending on its sound level and characteristics. Richardson *et al.* (1995) defined four zones of sound influence which vary with distance from the source and level. These are:

- The zone of audibility: this is the area within which the animal is able to detect the sound. Audibility itself does not implicitly mean that the sound will have an effect on the marine mammal.
- The zone of responsiveness: this is defined as the area within which the animal responds either behaviourally or physiologically. The zone of responsiveness is usually smaller than the zone of audibility because, audibility does not necessarily evoke a reaction.
- The zone of masking: This is defined as the area within which sound can interfere with detection of other sounds such as communication or echolocation clicks. This zone is very hard to estimate due to a paucity of data relating to how marine mammals detect sound in relation to masking levels (for example, humans are able to hear tones well below the numeric value of the overall sound level).
- The zone of hearing loss, discomfort, or injury: this is the area where the sound level is high enough to cause tissue damage to auditory or other systems. This can be classified as either a Temporary Threshold Shift (TTS) or Permanent Threshold Shift (PTS). At even closer ranges, and for very high intensity sound sources (e.g. underwater explosions), physical trauma or even death are possible.

For this assessment, the zones of injury in terms of PTS and disturbance (i.e. responsiveness) are of concern (there is insufficient scientific evidence to properly evaluate masking). To determine the potential spatial range of injury and disturbance, a review has been undertaken of available evidence, including international guidance and scientific literature. The following sections summarise the relevant thresholds for onset of effects and describe the evidence base used to derive them.

Injury (Physiological Damage)

The Joint Nature Conservation Committee (JNCC) (2010) recommends using the injury criteria proposed by Southall *et al.* (2007), which are based on a combination of linear (i.e. un-weighted) peak pressure levels and mammal hearing weighted (M-weighted) SEL.

In 2018, the National Marine Fisheries Service (NMFS) provided details of the acoustic thresholds at which individual marine mammals are predicted to experience changes in their hearing sensitivity for acute, incidental exposure to all underwater anthropogenic sound sources. These new thresholds reflected new/updated scientific formation that has

demonstrated differences between the marine mammal hearing groups first categorised in Southall *et al.* (2007). The hearing weighting functions used in NMFS (2018) are designed to represent the bandwidths of each group within which acoustic exposures may have auditory effects.

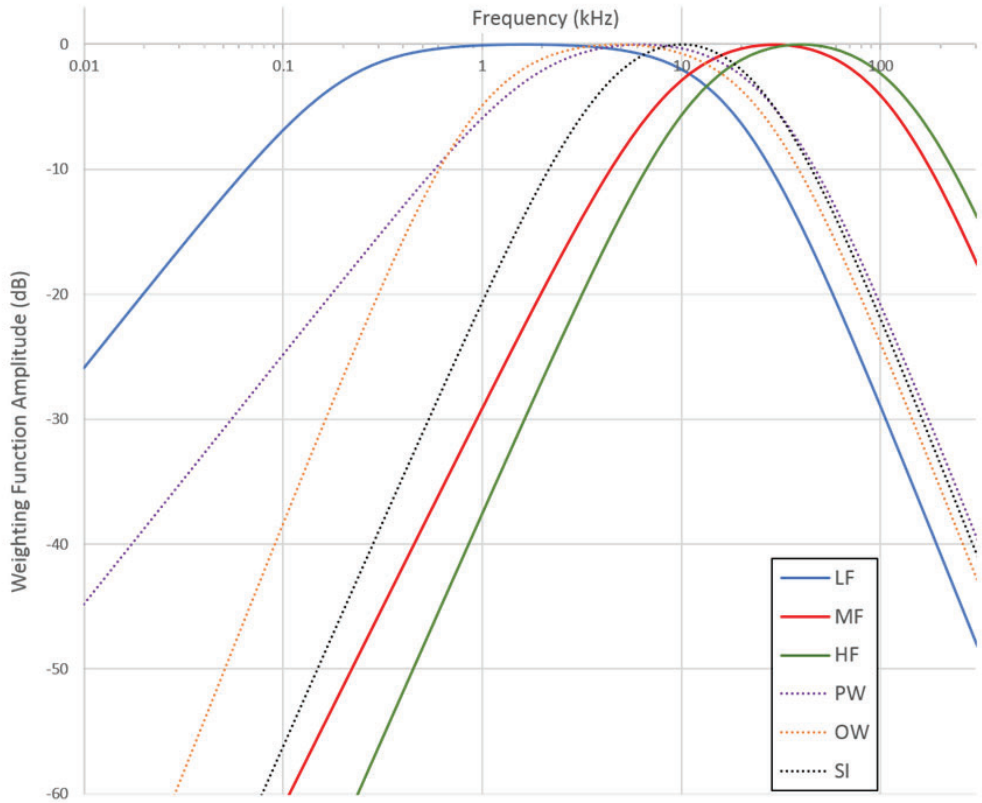
The Southall *et al.* (2007) study was subsequently revaluated in light of these scientific advances and as a result revised the sound exposure criterion previously published (Southall *et al.*, 2019). The only significant difference between Southall *et al.* (2019) and NMFS (2018) is the re-categorisation of mid-frequency and high frequency groups to HF and VHF respectively i.e. very high frequency for greater clarity.

This study uses the NMFS (2018) hearing group frequency categories:

- LF i.e. marine mammal species such as baleen whales with an estimated functional hearing range between 7 Hz and 35 kHz;
- MF i.e. marine mammal species such as dolphins, toothed whales, beaked whales and bottlenose whales with an estimated functional hearing range between 150 Hz and 160 kHz
- HF i.e. marine mammal species such as true porpoises, river dolphins and *Cephalorhynchus* with an estimated functional hearing range between 275 Hz and 160 kHz); and
- PW – i.e. a suborder of carnivorous aquatic mammals that includes seals, walruses and other similar animals having finlike flippers with an estimated functional hearing range between 50 Hz and 86 kHz.

These are illustrated in Figure 3-1.

Figure 3-1 Auditory Weighting Functions for Pinnipeds and Cetaceans (NMFS, 2018)[1]



Disturbance

The JNCC (2010) guidance proposes that a disturbance offence may occur when there is a risk of a significant group of animals incurring sustained or chronic disruption of behaviour or when a significant group of animals are displaced from an area, with subsequent redistribution being significantly different from that occurring due to natural variation.

There is much intra-hearing group category as well as intra-species variability in behavioural response. Therefore, this assessment adopts a simplified approach in the absence of further scientific information and uses the US NMFS Level B harassment threshold of 160 dB re 1 µPa (rms) for impulsive sound in combination with the NMFS (2018) TTS threshold criteria.

Level B Harassment is defined as having the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioural patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild. This is similar to the JNCC (2008) description of non-trivial disturbance and has therefore been adopted as the basis for onset of behavioural change in this assessment.

It is important to understand that exposure to sound levels in excess of the behavioural change threshold stated above does not necessarily imply that the sound will result in significant disturbance as defined in the legislation. As

[1] *Sirenians (SI) and Otarids in water (OW) are not relevant to the current study.*

noted previously, it is also necessary to assess the likelihood that the sensitive receptors will be exposed to that sound and whether the numbers exposed are likely to be significant at the population level.

Criteria Summary

The PTS and TTS threshold criteria adopted within this study was those presented in NMFS (2018). This has been reproduced in Table 3-5 and Table 3-6 respectively.

Table 3-5 Marine Mammal Criteria for Onset of PTS (NMFS, 2018)

MARINE MAMMAL GROUP	TYPE OF SOUND	PTS THRESHOLD CRITERIA	
		Peak SPL, dB re 1 µPa (unweighted)	SEL, dB re 1 µPa^{2}s (weighted)
LF cetaceans	Single or multiple pulses – e.g. impulsive	219	183
	Non-impulsive e.g. continuous sound	-	199
MF cetaceans	Single or multiple pulses – e.g. impulsive	230	185
	Non-impulsive e.g. continuous sound	-	198
HF cetaceans	Single or multiple pulses – e.g. impulsive	202	155
	Non-impulsive e.g. continuous sound	-	173
Phocid Pinnipeds (underwater)	Single or multiple pulses – e.g. impulsive	218	185
	Non-impulsive e.g. continuous sound	-	201
Otariid Pinnipeds (underwater)	Single or multiple pulses – e.g. impulsive	232	203
	Non-impulsive e.g. continuous sound	-	219

Table 3-6 Marine Mammal Criteria for Inset of Behavioural Effects and TTS (NMFS, 2018)

MARINE MAMMAL GROUP	TYPE OF SOUND	TTS CRITERIA	
		Peak SPL, dB re 1 µPa (unweighted)	SEL, dB re 1 µPa^{2}s (weighted)
Behavioural change	Impulsive sound: rms sound pressure level more than 160 dBre 1 µPa		
LF cetaceans	Single or multiple pulses – e.g. impulsive	213	168
	Non-impulsive e.g. continuous sound	-	179

MARINE MAMMAL GROUP	TYPE OF SOUND	TTS CRITERIA	
		Peak SPL, dB re 1 µPa (unweighted)	SEL, dB re 1 μPa^2s (weighted)
MF cetaceans	Single or multiple pulses – e.g. impulsive	224	170
	Non-impulsive e.g. continuous sound	-	178
HF cetaceans	Single or multiple pulses – e.g. impulsive	196	140
	Non-impulsive e.g. continuous sound	-	153
Phocid Pinnipeds (underwater)	Single or multiple pulses – e.g. impulsive	212	170
	Non-impulsive e.g. continuous sound	-	181
Otariid Pinnipeds (underwater)	Single or multiple pulses – e.g. impulsive	226	188
	Non-impulsive e.g. continuous sound	-	199

3.4.3 Methodology

Approach

The underwater sound assessment was conducted using Xodus' Xposure model, a set of tools developed for common sound sources (e.g., piling, surveys). This modelling tool is based on an extended version of the semi-empirical model developed by Marsh & Schulkin (1962).

Xposure uses a shallow water correction factor as well as a nearfield anomaly value to account for the effects of varying sea state and bottom type on sound attenuation. The sound attenuation due to these effects are calculated in third octaves intervals between 0.01 KHz and 100kHz based on the approach described by Marsh & Schulkin (1962). The model was extended by Xodus beyond this range by extending the 0.1 kHz and 10 kHz values.; i.e. for frequencies below 0.1 kHz the attenuation values for 0.1 kHz are used and above 10kHz the attenuation values for 10 kHz value are used. The Xposure model also accounts for seawater absorption across the full spectrum range using the method of Ainslie and McColm (1998).

The received sound level at each frequency is calculated as the sound propagates, based on the relative water depth; as such considers the change between spherical and cylindrical spreading. Water absorption makes the greatest contribution to attenuation after spreading, with the nearfield anomaly making a relatively small change to attenuation which (by definition) decreases with distance at all frequencies. The shallow water correction factor has no effect in the nearfield and may become important with distance at higher frequencies.

The sound propagation model uses several concepts including:

- Refractive cycle, or skip distance;

- Geometric divergence;
- Deflection of energy to the seabed at high angles by scattering from the sea surface;
- A simplified Rayleigh two-fluid model of the seabed for sand or mud sediments; and
- Absorption of sound energy by molecules in the water.

The following inputs are required to the model:

- Third-octave band source sound level data;
- Discreet range (distance from source to receiver);
- Water column depth and sediment layer depth;
- Sediment type (sand/mud);
- Sea state; and
- Source directivity characteristics.

The Marsh & Schulkin (1962) model is based on a combination of acoustic theory and empirical data from around 100,000 measurements and has been found to provide good predictions.

As well as calculating the un-weighted RMS and peak sound pressure levels at various distances from the source, it is also necessary to calculate the SEL for a mammal using the relevant auditory weightings described earlier taking into account the number of pulses to which it is exposed. For operation of the survey source, the SEL sound data for a single pulse was utilised, along with the maximum number of pulses expected to be received by marine mammals in order to calculate cumulative exposure. Two conditions were modelled:

- A source vessel passing a static mammal[1]; and
- A mammal moving away from a moving vessel[2].

Both cases were modelled for a range of start distances (initial or closest passing distance between the animal and vessel) to calculate cumulative exposure for the scenarios (moving vessel, static mammal and moving animal, moving vessel). In each case, the pulses to which the mammal is exposed in closest proximity to the vessel dominate the sound exposure. This is due to the logarithmic nature of sound energy summation.

It should be noted that the sound exposure calculations are based on the simplistic assumption that the underwater sound sources are active continuously over a 24-hour period, being activated at the same interval. In the real-world

[1] *This is referred to as the baseline case, as it is considered that marine mammals will not move away from the source without being impacted upon by the received sound level.*
[2] *Further discussion of marine mammal swim speeds is provided in Section 5.1.2*

the situation is more complex with the device not activated during turns for example. However, the SEL calculations do not take any breaks in activity into account and therefore the activation period is assumed to be consecutive and therefore worst case. The potential for recovery is not accounted for in the multiple pulse sound criteria described in NMFS (2018) and so as far as the SEL calculation is concerned breaks in activity are not considered in the assessment.

Survey activities are assumed to be continuous. With the Source Point Interval (SPI) set very low this will mean that cumulative SELs will be comparatively high, albeit the pulses to which the mammal is exposed in closest proximity will dominate the sound exposure.

The SEL calculations have also been conducted to estimate the benefit of soft start operations. In this case, the individual pulse SELs are reduced in magnitude for a period before reverting back to the full source array values. In the absence of any recommended sound reduction levels during soft start procedures, it has been assumed for this assessment that each pulse SEL will be attenuated by 10 dB for a period of 20 minutes during the soft start procedures. The 10 dB reduction has been based on those identified during pile driving operations (Bailey *et.al.*, 2010)

The JNCC (2017) guidelines for minimising the risk of injury and disturbance to marine mammals from sound sources recommends a 20 minutes' soft start procedure. The calculations assume that the mammal does not re-approach the source array in the same day.

Model Inputs

The equipment and environment data were supplied by Harbour Energy, and information provided in the manufacturer's technical specifications. The assessment considered the SBP Geopulse.5430A as it is considered to represent the worst-case.

The details of the sound source modelled is provided in Table 3-7. As the specifications indicated that the equipment could be operated at a range of frequencies, a number of sensitivity models were conducted and only the worst-case results presented in this report.

Table 3-7 GeoAcoustic GeoPulse Sound Model Parameters

GEOACOUSTIC GEOPULSE SOUND MODEL PARAMETERS	
Type	GeoPulse 5430A
Hull mounted or towed	Hull Mounted
'Soft Start' duration	20 mins
Shot interval (seconds)	0.2 second
Ping length (seconds)	0.00029
SPL @ 1 m: dB re 1 µPa (peak)	223.5 dB re 1µPa at 1 m
Duration (continual SBP activity, without turns)	35 hours

GEOACOUSTIC GEOPULSE SOUND MODEL PARAMETERS	
Vessel speed	4 knots
Water depth	<50 m to 110 m (modelled at 110 m)
Sediment type	Sand

3.4.4 Summary of Results

The distances at which sound levels decrease to below threshold values associated with potential injury and behavioural change for the different modelled scenarios are summarised in Table 3-8, based on a comparison of the calculated sound level against the criteria described in Section 3.4.2. Injury zones are presented relative to the leading edge of the survey operations. The emitted sound is assumed to be omni-directional, therefore the distances are presented as the radius of the predicted effected zone.

Table 3-8 Radius of Predicted Effect for PTS and Disturbance from the GeoAcoustic GeoPulse

SITUATION	RADIUS OF EFFECT (M)			
	LOW-FREQUENCY CETACEAN	MID-FREQUENCY CETACEAN	HIGH-FREQUENCY CETACEAN	PINNIPEDS
Peak pressure (SPL) physiological damage	53 m	15 m	424 m	59 m
Peak pressure (SPL) physiological damage + soft start	17 m	5 m	133 m	19 m
SEL of vessel passing static mammal	2 m	No Effect (N/E)	21 m	1 m
SEL of vessel passing static mammal + soft start	N/E	N/E	2 m	N/E
SEL of mammal swimming away from moving vessel	N/E	N/E	2 m	N/E
SEL of mammal swimming away from moving vessel + soft start	N/E	N/E	N/E	N/E
RMS behavioural change	87 m			

The distances presented reflect the start point of the mammal relative to the source when the source first emits sound. The source (hull mounted or vessel towed SBP) would then move away from the mammal receiver position, so the distance between the mammal and the source would increase over time whether the mammal was static or moving away from the source.

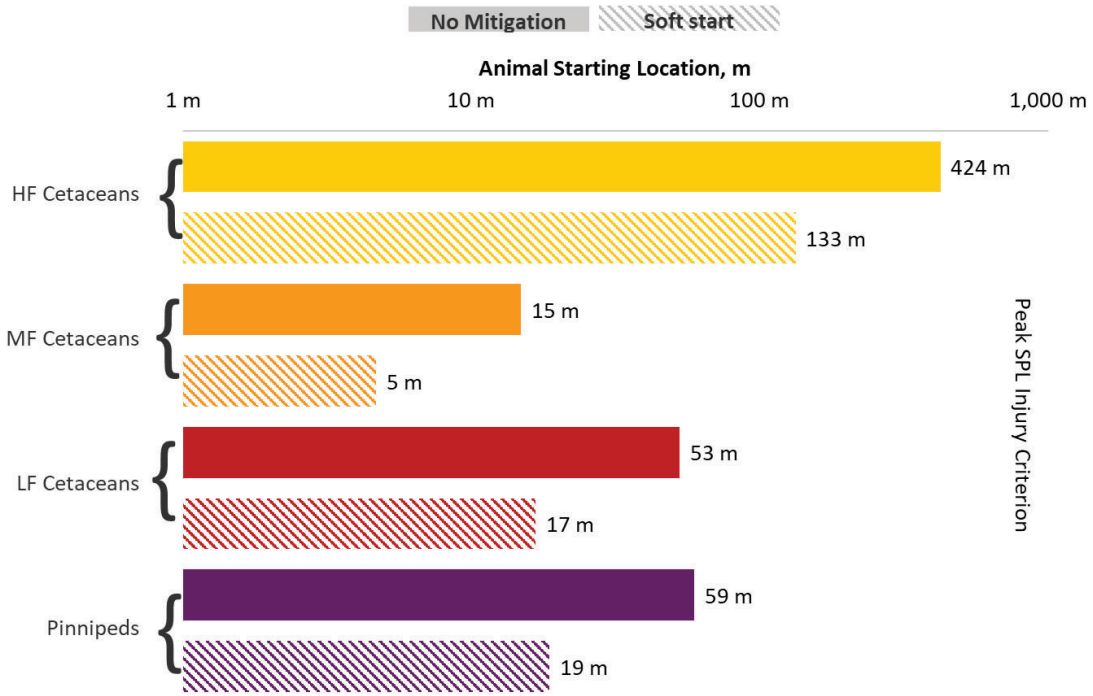
The potential ranges presented for injury and disturbance should not be interpreted as a hard and fast contour 'line' within which an impact will occur. The contour provides a conservative distance estimate at which sound levels will decrease to below SEL threshold values for PTS, which in reality is probabilistic; combination of a range of variables; exposure dependency in PTS onset, individual variations in hearing, uncertainties regarding behavioural response and swim speed / direction.

Peak Pressure

The results that for HF cetaceans sound levels are predicted to decrease to below the SPL threshold value for PTS beyond 424 m from the source. This distance is reduced to 133 m when a soft start procedure is implemented. The sound levels are predicted to decrease to below the SPL threshold value for PTS in all other marine mammal groups beyond 59 m.

The peak pressure levels for each proposed SBP sound source are represented graphically in Figure 3-2.

Figure 3-2 Start Distances Resulting in Exceedance of Guideline Peak Criteria for Onset of PTS in Marine Mammals



Cumulative Weighted SEL

The SEL for:

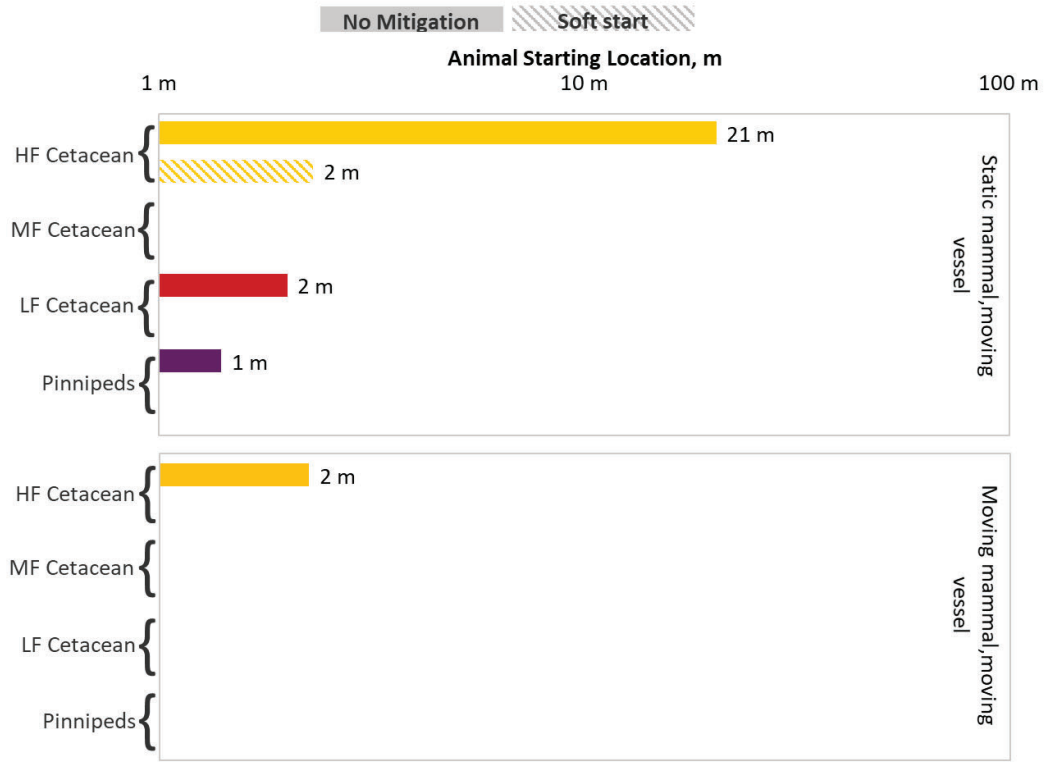
i) A marine mammal staying stationary relative to the passing source array; and

ii) A marine mammal moving away from a moving source array at a constant speed of 1.5 m/s are shown in Figure 3-3. Missing distance bars within the figure indicates that the predicted distances were less than 1 m,

The assumption that the mammal would stay stationary during a period of survey activity is considered to be unrealistic. A more realistic assumption is that, upon hearing the onset of survey activity, the mammal would move away from the sound source, hence the first pulse would provide the highest 'dose' of sound, with each subsequent pulse contributing less to their exposure as they move away from the source. Swim speeds of the species most likely to be observed in the area have been shown to be up to 5 m/s e.g. a cruising minke whale swims at a speed of 3.25 m/s (Cooper *et al.*, 2008) and harbour porpoise up to 4.3 m/s (Otani *et al.*, 2000). Further, SNH (now NatureScot) (2016) has provided standard parameter values for various mammals which include mean swimming speeds. For example, for harbour porpoises the mean speed is 1.4 m/s (Westgate *et al.*, 1995); harbour seal / grey seals 1.8 m/s (Thompson, 2015); minke whale 2.1 m/s (Williams, 2009). Therefore, to take a representative approach, the predicted exposures of marine mammals moving away from the sound source have been calculated using a mean swim speed of 1.5 m/s. This section will therefore consider a marine mammal moving away at a 180-degree angle from a moving vessel source array at a constant speed of 1.5 m/s. The maximum predicted distance at which the sound level

decreases below the SEL cetacean's threshold criteria for the GeoAcoustic GeoPulse is 21 m (HF Cetaceans) from the source.

Figure 3-3 Start Distances Resulting in Exceedance of Guideline SEL Criteria for Onset of PTS in Marine Mammals



The benefit of the soft start operations will be greater at shorter ranges from the source than if the mammal starts further away from the source. This is because at short distances the sound level is higher and falls away at a faster rate, so an animal swimming at a constant speed will see a larger relative reduction in sound if it starts closer to the source. Care should also be taken in interpreting the results close to the source due to near-field effects for the larger source arrays. However, this is considered to be less of a problem for single source SBP devices, such as those being considered in this assessment.

The mitigation measures outlined in the JNCC guidelines (JNCC, 2017) aim to protect marine mammals from the injury due to survey activities by encouraging vessels to be aware of animals that might be in the area and by increasing sound emissions gradually to give animals the opportunity to move away. With a soft start procedure implemented, the overall radius of potential injury in terms of PTS has been reduced significantly as illustrated in the figures above. For example, it indicates that the predicted impact distance during the use of the GeoAcoustic GeoPulse 5430 for HF cetaceans (e.g. harbour porpoise the most sensitive hearing category) is reduced from 2 m to less than 1 m under soft start conditions for a mammal swimming away from the moving source. For a static MF cetacean, the distances would be 21 m without the use of a soft start although the condition that the animal would be stationary is considered unrealistic.

Behavioural Effects

The behavioural impact assessment was also conducted using the Level B harassment threshold of 160 dB re 1 µPa (rms) proposed by NMFS (2005). As a worst-case the results presented corresponds to a static marine mammal. This resulted in a predicted radial distance of approximately 87 m for all marine mammal hearing groups (Table 3-8), which equates to an area of approximately 0.024 km^2.

Behavioural changes such as moving away from an area for short periods, reduced surfacing time or echolocation clicks, vocalisation changes and separation of mothers from offspring for short periods, do not necessarily imply that detrimental effects will result for the animals involved. Similarly, the masking of communication signals may also occur without any detrimental effects for the animals involved. In addition, the pulses will be intermittent rather than a continuous sound, which will reduce the period over which sound is experienced and allow animals to echolocate and communicate between pulses. Some whales are known to continue calling in the presence of pulses since the vocalisations can be heard between pulses (e.g. Greene & McLennan, 2000, Madsen *et al.*, 2002). It is therefore considered that the zone of behavioural change will not be a zone from which animals are necessarily excluded, but rather one in which normal behaviour might be affected across a range of potential responses, from a simple noticing of the sound to a startle response and return to normal behaviour, through to exclusion from an area. The fact that an animal is within this area does not necessarily mean that disturbance will occur. Mitigation of the potential impacts of anthropogenic sound on cetaceans focuses on reducing near field injuries, and risk assessments are based on the assumption that the animals move away from loud sources of sound. While this is supported by various studies, observations also show a decline in response to airgun sound during a seismic survey. The findings of Thompson *et al.* (2013) suggest that broader-scale exclusion from preferred habitats is unlikely. Instead, individual's fitness and demographic consequences are likely to be subtle and indirect, highlighting the need to develop frameworks to assess the population consequences of sub-lethal changes in foraging energetics of animals occurring within affected sites.

To determine the likelihood of impact in terms of actual number of animals, it is possible to calculate the number of animals likely to experience some sort of behavioural impact using local density and population estimates. Density estimates from the area covering the North Sea are not well understood for many cetacean species but estimates from SCANS-III (detailed in Hammond *et al.*, 2021) provide regional density estimates for some of the species most regularly found in vicinity of the proposed cable route survey.

To assess how the number of animals that might be affected might constitute a non-trivial disturbance offence, it is important to understand what proportion of the population this number represents and what the duration of an effect may be. Temporarily affecting a small proportion of a population would be highly unlikely to result in population level effects, thus not considered as being qualifying as non-trivial disturbance. In contrast, affecting a large proportion of a population may be considered non-trivial disturbance. Determining this proportion is not a simple task since it is not clear how northeast Atlantic marine mammal populations act at a local level. For example, minke whales are likely to make use of the entire northeast Atlantic, so the population can be viewed as one, whilst other species, such as bottlenose dolphins, may display more local fidelity and be viewed as a series of sub-populations.

The Statutory Nature Conservation Bodies (SNCBs) (Hammond *et al.*, 2021; IAMMWG, 2022) note that marine mammals of almost all species found in UK waters are part of larger biological populations whose range extends into the waters of other States and/or the High Seas. To obtain the best conservation outcomes for many species, it is

necessary to consider the division of populations into smaller management units. This requires an understanding of the geographical range of populations and sub-populations, to provide advice on impacts at the most appropriate spatial scale. The output of the SNCB exercise investigating how marine mammal populations may act is the determination of Marine Mammal Management Units (MMMU) for species including harbour porpoise, bottlenose dolphin, Atlantic white-sided dolphin, minke whale and white-beaked dolphin. These MMMUs and associated population estimates can be interpreted in the context of the potential disturbance zones to consider the potential for a significant impact to occur.

Bottlenose dolphin, harbour porpoise, minke whale, Atlantic white-sided dolphin and white-beaked dolphin have been recorded within the route survey area. The number of individual cetaceans potentially affected by the proposed operations are detailed in Table 3-9.

The percentage of populations that may be affected are very small/low. Therefore, the proposed operations would be largely undetectable against natural variation and would have no significant effect at the population level.

Two species of seals inhabit UK waters: grey seal and harbour seal, as detailed in Section 3.2.3. According to the seal density maps provided in NMPi (2023), grey seal densities in the nearshore route survey peak to 10 - 50 individuals per 25 km^2, decreasing rapidly to 5 – 10 and 0 – 1 individuals per 25 km^2. Harbour seals densities are 0 -1 animals per 25 km^2. As with cetaceans, the number of individuals likely to be impacted is very small and, therefore, would be largely undetectable against natural variation and would have no significant effect at the population level. Seals are not EPS and due to the relatively low densities, an assessment was not undertaken for seals within the route survey. The information provided indicates that there is a very low likelihood of injury or non-trivial disturbance as a result of the proposed survey.

The information provided indicates that there is a very low likelihood of injury or non-trivial disturbance as a result of the proposed survey (Table 3-9). These values are based on a single pulse of the GeoAcoustic GeoPulse 5430A and not for the entire proposed cable route survey. Whilst the latter will provide larger predicted numbers of animals impacted, the sound emitted from the source will dissipate relatively very quickly and there will be no accumulation of the sound levels. Therefore, whilst animals may move away from the sound source, they are likely to be able to return to the area following the passing of the survey vessel. Hence, it was considered that the single pulse approach represented a realistic case.

The potential impacts to marine mammals via sound generated by the use of the SBP have been identified and assessed. The maximum number of animals predicted to be in the behavioural change impact zone is <1 for all species present. Considering the biogeographical population located in UK waters and the wider abundance of animals in the entire management unit, the likelihood of behavioural changes based on numbers of mammals is <0.001% for all cetacean populations present.

Table 3-9 Estimated Number of Cetaceans Experiencing Behavioural Changes Based on a Single Pulse of the GeoAcoustic GeoPulse 5430A (Hammond et al., 2021; IAMMWG, 2021)

Species	SCANS-III Density estimates per km^2	Maximum number of animals predicted to be in the behavioural change impact zone at any one time (density x behavioural change area) *	Management Unit (MU) / Biogeographical Population Estimate	Percentage of reference population potentially affected (%)	UK MU Population Estimate	Percentage of UK MU population potentially affected (%)
Harbour porpoise	0.599	0.014	346,601	0.000004	159,632	0.000009
Bottlenose dolphin	0.0298	0.001	2,022	0.000035	1,885	0.000038
White beaked dolphin	0.243	0.006	43,951	0.000013	34,025	0.000017
Atlantic white-sided dolphin	0.0209	0.001	18,128	0.000003	12,293	0.000004
Minke whale	0.0387	0.001	20,118	0.000005	10,288	0.000009
* Based on a disturbance area of 0.024 km^2						

3.5 Mitigation

3.5.1 Overview

It should be considered that the survey equipment is designed to produce a downward focused sound source; with sound levels reducing with horizontal distance. Thus, relative to a fixed point in the route survey, the sound levels will gradually increase as the survey vessel approaches, reaching a peak when the vessel is directly above, and reducing to background levels moves away. Therefore, marine mammals or fish within the wider route survey area would be subject to varying sound levels over time as the survey vessel and source moves around the route survey, rather than being subject immediately to the levels considered in the assessment and will have the opportunity to vacate the area. The gradual increasing sound levels with the approaching vessel could also be considered akin to a soft-start procedure.

The JNCC guidelines for minimising the risk of disturbance and injury to marine mammals from geophysical surveys (JNCC, 2017) are summarised below. Compliance with these guidelines is considered to constitute best practice and will in most cases, reduce the risk of deliberate injury to marine mammals to negligible levels. Whilst guidelines do not deal with disturbance directly it is considered that the mitigation measures as recommended will also assist in reducing the potential for disturbance.

3.5.2 Marine Mammal Observer (MMO) and Passive Acoustic Monitoring (PAM)

MMOs on board the survey vessel will monitor for the presence of marine mammals, during the pre-source start search and survey, and will recommend delays in the commencement of source activity should any marine mammals be detected within the 500 m mitigation zone. Dedicated PAM operators may also be required to cover the hours of darkness and during periods when day-time conditions are not conducive for visual surveys (e.g. fog or increased sea states). The survey contractor will be providing a team to cover 24-hour observations / PAM during the survey.

3.5.3 Pre-Source Start Search & Mitigation Zone

All observations (MMO or PAM) will be undertaken during a pre-source start search of 30 minutes i.e. prior to the commencement of any use of the seismic sources / high resolution surveys (e.g. SBP) in waters < 200 m. This will involve a visual (during daylight hours) and/or acoustic assessment (during hours of darkness / reduced visibility) to determine if any marine mammals are present within the 500 m mitigation zone from the centre of the device deployed. If marine mammals are detected in the mitigation zone during the pre-source start search then operations must be delayed until their passage, or the transit of the vessel, results in the marine mammals being outside of the mitigation zone. Either way there should be a minimum of a 20-minute delay from the time of the last sighting within the mitigation zone and the commencement of the soft-start and / or start of operations, to allow animals unavailable for detection to leave the area.

3.5.4 Line Changes

In line with the JNCC guidelines, where line turns are expected to take longer than 40 minutes:

- Sound source is to be terminated at the end of the survey line;
- A pre-source start search will be undertaken during the line change;
- The soft start procedure is to be delayed if marine mammals are sighted within the 500 m mitigation zone during pre-source start; and
- A full 20-minute soft-start will be undertaken before the start of the next data acquisition line.

3.5.5 Reporting

All recordings of marine mammals will be made using JNCC Standard Forms and a close-out report will be submitted via the Marine Noise Registry. At the end of the survey, a monitoring report detailing the marine mammals recorded, methods used to detect them, and details of any problems encountered will be submitted to the JNCC. The report will also include feedback on how successful the mitigation measures were. This requirement will be communicated to the MMO at project start up meetings and at crew change. If the MMO have any queries on the application of the guidelines during the survey they will contact the JNCC for advice.

3.5.6 Cumulative Impacts

The underwater sound assessment has considered the sound emitted during survey activities. Other activities were considered in the vicinity of the route survey which may have the potential to generate underwater sound; however, no geophysical surveys are known to occur in the same timeframe within the vicinity of the operations (BEIS, 2023).

Due to the mitigation measures in place and the low numbers of marine mammals that are likely to be affected by any sound emitted from the survey activities, there are unlikely to be any significant cumulative effects in terms of other activities in the area.

3.6 Conclusions

As a part of the proposed cable route operations and required surveys, an underwater sound impact assessment for the proposed use of SBP during survey operations has been conducted. The nearshore route survey, in the CNS, is a relatively shallow water site with typical water depths of <100 m and therefore sound propagation will be influenced by interactions with the seabed. As the survey vessel approaches a fixed point the sound levels will gradually increase until they reach the predicted threshold levels. It is therefore considered that marine mammals or fish will have the opportunity to vacate the region.

Marine mammals are sensitive to sound levels associated with the SBP. Bottlenose dolphin, harbour porpoise, minke whale, white-sided dolphin and white-beaked dolphin have been recorded within the route survey. Grey seals have been recorded at moderate densities (<50 animals per 25 km^2) in the very nearshore area.

The sound assessment indicates that, based on the peak SPL, the operation of GeoAcoustic GeoPulse 5430A would result in the greatest impact ranges for all hearing groups; with no impacts predicted for the medium frequency cetaceans. The maximum predicted distance at which sound level decreases to below the PTS threshold value was 424 m for HF cetaceans, reducing to 133 m following soft start procedures.

Potential behavioural impact distances have been assessed based on a 160 dB threshold, the latter providing a hearing group specific threshold. Based on the 160 dB threshold the RMS behavioural distance is predicted to be 87 m for the use of the GeoAcoustic GeoPulse 5430A at 3.5 kHz.

The potential impacts to marine mammals via sound associated with proposed survey activities have been identified and assessed. This concluded that the likelihood of behavioural changes based on numbers of mammals is <0.001% for all species present. Therefore, for disturbance, the restricted period of operations, mitigation measures implemented and the low number of animals likely to be affected means impact at the population level is likely to be very small.

No cumulative impacts are expected from the proposed operations. Should marine mammal behaviour be affected by any aspect of the proposed operations whether cumulative or from a specific source, it is possible that transboundary effects will occur since cetaceans are mobile species in nature, ranging over many hundreds or thousands of kilometres (Reid *et al.*, 2003). However, the likelihood of the operations impacting upon cetacean species in the area is low and consequently the actual risk of affecting residual transboundary impacts is low.

In light of the low levels of impact predicted from the proposed survey operations, and the management and control measures that will be in place, Harbour Energy consider that the proposed survey will not have any significant adverse impacts on the marine environment.

4 PROTECTED SITES RISK ASSESSMENT

4.1 Relevant Protected Sites

In addition to assessing potential impacts on protected species, potential impacts to protected sites (including seal haul-outs) from the proposed survey works need to be considered to inform the HRA process, if required.

The designated sites located in the vicinity of the proposed cable route survey which have the potential to be impacted by the survey activities are outlined in Table 4-1 and shown in Figure 1-1 and Figure 1-2. These have been selected based on the criteria outlined in Section 1.5.4. It should be noted that sites designated for benthic features outwith the route survey have not been included within this assessment, as geophysical surveys do not result in any interaction with the seabed and therefore are not considered to pose any risk of likely significant effects to these sites.

For each designated site that has the potential to be impacted by the nearshore survey, mitigation measures have been identified relevant to site-specific qualifying features and these are also included within Table 4-1. Further details of the mitigation measures are provided in Section 5. Some of the mitigation measures included in Section 5 may not be listed in Table 4-1. If they are not related to protecting designated features of those sites. However, all mitigation measures in Section 5 will be applied to all activities, regardless of proximity to protected sites.

Table 4-1 Protected Sites in the Vicinity of the Planned Neashore Cable Route Survey

CLOSEST PART OF SURVEY	DESIGNATED SITE POTENTIALLY AFFECTED	CRITERIA FOR POTENTIAL CONNECTIVITY TO THE SITE	DISTANCE FROM THE NEAREST PART OF THE SURVEY	QUALIFYING FEATURES OF DESIGNATED SITES	PROPOSED MITIGATION MEASURE	POTENIAL FOR LIKELY SIGNIFICANT EFFECT
Route survey transects site	Buchan Ness to Collieston Coast SPA	SPA with breeding birds	0	Fulmar *Fulmarus glacialis*; Guillemot *Uria aalge*; Herring gull *Larus argentatus*; Kittiwake *Rissa tridactyla*	M7, M8, M9	No
Route survey	Southern Trench	NCMPA with mobile designating features	<1 km	Minke whale, burrowed mud, fronts, shelf deeps	M1, M2, M3, M4, M5, M6	No
It **should be noted that it is deemed Sites of Special Scientific Interest (SSSI) and National Scenic Areas (NSA) etc. are wholly or partially encompassed by associated SACs and/or SPAs, and hence do not require specific assessment within this EPS Risk Assessment.**						

4.2 Assessment of Impacts on Protected Sites

4.2.1 Protected Sites with Cetaceans or Basking Sharks as a Qualifying Feature

The proposed cable route survey is located, at the closest point, approximately <1 km south of the Southern Trench NCMPA. The Southern Trench NCMPA is protected for the presence of mink whale, burrowed mud habitat, front and shelf deep (NatureScot, 2020). As discussed in Section 3.2.1, minke whales (features of the NCMPA) are frequently sighted in the region of the proposed survey. However, the assessment (Section 3.4.4) concluded that disturbance, resulting from the proposed cable route survey to the minke whale population would be extremely limited, with <1 individual being impacted and <0.001% of the MMMU and UK MMMU population impacted. Therefore, the proposed cable route survey is considered unlikely to significantly affect the minke whale population by negatively affecting the favourable condition of the NCMPA.

A full assessment of the potential impact on cetaceans from the survey activity is provided in Section 3.2.1 It can be concluded that there is unlikely to be impacts to basking sharks as they do not frequent the area.

4.2.2 SACs with Otters as a Qualifying Feature

Although the proposed cable route survey starts nearshore from near the Longhaven landfall site, the route survey is located outwith any SAC with otters as a designated feature. Therefore, no impacts to otter species are predicted and no further assessment of otters is included.

4.2.3 Protected Sites with Seals as a Qualifying Feature and Seal Haul-Out Sites

Seal haul-outs are locations on land where seals come ashore to rest, moult or breed. There are a number of designated seal haul-outs sites which are present along the southeast coast of Scotland. The nearest site designated for seals is located 18 km from the proposed cable route survey (NMPi, 2023). All other designated seal-haul-out sites along the Scottish coastlines are located further beyond 100 km from the route survey. Although the survey is conducted in nearshore waters the route is >18 km from the nearest site, therefore no further assessment of seal haul outs is required.

4.2.4 Protected Sites with Seabed and/or Benthic Protected Features

As described in Section 1.5.4, any sites with vegetation or ground features that overlap or are located within proposed route survey should be assessed. The proposed nearshore cable route survey is located outwith any SACs or NCMPAs with seabed and/or benthic protected features. However, the Southern Trench NCMPA is located <1 km from the proposed nearshore cable route survey. A separate notice of intention to carry out an exempted activity will be submitted to MS-LOT to cover the environmental/benthic survey.

Therefore, impacts to the seabed will be small and is unlikely to cause any significant and/or lasting damage. Thus, seabed impacts are not assessed further.

4.2.5 SPAs and NCMPAs with Birds as Qualifying Features

The start of the proposed cable route survey transects the Buchan Ness to Collieston Coast SPA. This SPA is designated for the breeding of fulmars, guillemots, herring gulls and kittiwakes. The proposed activities will start no earlier than 1st June 2023 with activities expected to finish by end of July 2023 at the latest. However, given the mobile nature of the planned survey and the short-term duration of the activities (6 days, including transit and standby for the nearshore survey), no impacts to birds are expected.

LSE on Protected Sites with Birds as Qualifying Features

Several seabird species have the potential to be disturbed by the physical presence of vessels during the geophysical survey activities. However, despite the potential overlap between the survey vessel and breeding birds utilising the marine environment, the short duration of the survey activities, both spatially and temporally, will not result in killing of individuals or disturbance of eggs and nests as survey operations will be wholly within the marine environment. Furthermore, the survey vessel will be moving slowly, limiting any potential collision risks to birds and disturbance to foraging potential.

Therefore, with the implementation of the mitigation measures set out in Section 5, the survey activities are highly unlikely to cause significant effects on the FCS of the qualifying bird features of the SPAs or potential Special Protection Areas (pSPA)s and the conservation objectives of the protected sites will not be compromised.

4.2.6 Cumulative Effects

There are several assets in the region of the proposed surveys and wider area, which could potentially result in cumulative effects to the qualifying features of the designated sites identified above. However, any disturbance to the qualifying features of the designated sites listed in Table 4-1 is anticipated to be extremely spatially and temporally limited. It is not expected that these survey activities could result in a significant increase in the potential for LSE to occur at the designated sites, and as such, no cumulative effects are anticipated.

4.2.7 Conclusions

The route survey lies within the distance for assessment (Section 1.5.4) of protected sites with cetaceans and birds as qualifying features.

Following the implementation of the mitigation outlined in Section 5, there will be no risk of injury to cetacean species, and the potential disturbance resulting from underwater sound emissions will be extremely localised and temporary. As such, no LSE are expected for cetaceans in the area.

The route survey does overlap with a SPA which has bird species or vegetation / benthic features as a qualifying factor. Given the distance to the nearest site, there may be the potential for disturbance of birds whilst foraging at-sea. However, any disturbance to birds will be localised and temporary, and these impacts are not expected to have

any long-term significant effects on the bird species for which these sites are designated, and therefore no LSE are anticipated.

Due to the temporary and localised nature of the proposed survey activities and the mitigation measures outlined in Section 5, no significant impact is anticipated on the conservation objectives of any protected site, with no potential for cumulative effects identified. The proposed cable route survey operations are required to facilitate cable route selection for a proposed offshore electrification project, which will allow a large CO_2 abatement potential and will enable provision of hydrocarbons produced at a low CO_2 intensity. Hence, the survey activities constitute work of an imperative reasons of overriding public interest, whilst presenting a minimal and temporary disturbance in a limited area.

5 PROTECTED SITES AND SPECIES PROTECTION MEASURES

5.1 Overview

This section summarises the proposed mitigation measures to be implemented for avoiding and reducing potential impacts on species that may be present in the vicinity of the survey works.

Species and task specific mitigation are provided below; however, the following measures will be implemented during all survey works:

- The survey vessel will adhere to the provisions of the Scottish Marine Wildlife Watching Code (SNH, 2017); and the Basking Shark Code of Conduct; and
- Survey teams will be made aware of all protected species within the marine environment, and their responsibility to implement the mitigation in this document.

5.2 Marine Mammals

Harbour Energy will adhere to the JNCC (2017) guidelines in order to reduce risk of injury and disturbance to marine mammals resulting from SBP operations, for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017). The key components of the Marine Mammal Protection Plan (MMPP) for the geophysical survey include:

- Deployment of MMO to monitor for the presence of cetaceans and seals, prior to the commencement of the geophysical operations;
- Survey operations will be run 24/7, however it is noted that up to a maximum of 12 hours a day occurring only during hours of daylight is the best practice;
- 500 m mitigation zone for cetaceans;
- 500 m mitigation zone for seals; and
- Reporting of survey activities and marine mammal sightings.

5.2.1 M1 – Marine Mammal Monitoring

There will be MMO coverage for the commencement of the geophysical operations. They will have experience of working at sea and be equipped with binoculars offering at least 8x magnification. The MMO(s) will be located at a suitable vantage point, providing good all-round visibility.

5.2.2 M2 – Marine Mammal Observer

The MMO(s) will carry out visual observations to monitor for the presence of cetaceans and seals before the geophysical equipment is activated and will recommend delays in the commencement of the operation should any cetaceans be detected within the 500 m mitigation zone. This 500 m distance will also be applied for seals, except in the event of a need to avoid critical delay to the project in which case the mitigation zone for both species' groups.

5.2.3 M3 - Passive Acoustic Monitoring (PAM)

When visibility is poor (i.e., due to fog or during hours of darkness) and/or during periods when the sea state is greater than Beaufort 3, SBP operations shall not be commenced unless a PAM system is deployed to facilitate detection of cetaceans. Where utilised, PAM system will be operated by a single MMO/PAM operator, and shall comprise of at least three hydrophone elements, allowing for directional localisation of detections, together with software allowing real time automated detection of marine mammal vocalisations (e.g., PAMGuard or equivalent).

5.2.4 M4 – Pre-Start Search

Visual observations (MMO) will be conducted for a pre-start search of 30 minutes (i.e., prior to the commencement of SBP operations). This will involve a visual (during daylight hours) to determine if any cetaceans or seals are within 500 m of the activities.

5.2.5 M5 – Cetacean, Seal and Basking Shark Mitigation Zone

The mitigation zone is defined as the area within 500 m of the survey equipment. Should any cetaceans, seals or basking sharks be detected within the mitigation zone prior to the commencement of the geophysical survey operations (or after breaks in SBP survey activity of more than 10 minutes), operations will be delayed until cetaceans, seals or basking sharks are no longer present within the mitigation zone. There will be a 20-minute delay from the time of the last sighting within the mitigation zone to the commencement/recommencement of the geophysical survey operations.

5.2.6 M6 – Reporting

All recordings of cetaceans and seals will be made using JNCC Standard Forms. At the end of the operations, a monitoring report detailing the cetaceans recorded, methods used to detect them, and details of any problems encountered will be submitted to Marine Scotland. The report will also include feedback on how successful the mitigation measures were. This requirement will be communicated to the MMO(s) at project start up meetings.

5.3 Seabirds

5.3.1 M7 – Rafting Seabirds

The survey vessels will be moving at a maximum speed of 4-8 knots during survey operations, to allow any rafting seabirds time to disperse before the vessel arrives. When not on survey effort, vessels will avoid bird rafts where operationally possible, and it is safe to do so.

5.3.2 M8 – Light Disturbance

When within the route survey, and where there is potential for 24-hour working, the following measures will be implemented to minimise the potential impacts to birds:

- Lighting on-board the survey vessel(s) will be kept to the minimum level required to ensure safe operations; and
- Lights will be directed or shielded to prevent upward illumination and minimise disturbance; and
- Blackout blinds and/or curtains will be used where possible when working in marine SPAs.

5.3.3 M9 – Breeding Birds

When within a SPA which has been designated for breeding birds that may nest or feed in close proximity to the route survey, further consultation will be undertaken with NatureScot on the requirement for any seasonal restriction to be implemented for equipment calibration and testing, as well as geophysical survey activities in order to avoid disturbance to qualifying species during the most sensitive time of the year.

6 CONCLUSIONS

This risk assessment has assessed the risk posed by the survey activities associated with the nearshore geophysical survey to cetaceans, seals, basking sharks, birds and protected sites. While the route survey comprises both nearshore and offshore elements, this document has been prepared for the neashore survey only. Harbour Energy are consulting separately with MS-LOT and NatureScot for the offshore survey element.

This document has included assessing the risk caused by sound emitted from the geophysical survey equipment, collision impact and disturbance to the following receptors:

- Cetaceans;
- Basking sharks;
- SACs with cetacean, seal and otter qualifying features;
- NCMPAs with cetacean, bird and otter qualifying features;
- Designated seal haul-outs and seal breeding sites; and
- SPAs.

This assessment has concluded that the nature of the survey works, and considering the proposed mitigation, means that no adverse impact through injury to EPS or other protected species is anticipated, and an EPS licence is not required in this regard. However, the use of the SBP survey equipment may cause disturbance to cetaceans and as such an application for EPS Licence under The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) for disturbance will be sought by Harbour Energy for the nearshore survey.

The proposed route survey overlaps with a SPA designated for birds, designated for benthic features and is located <1 km from a site with cetaceans as a qualifying features. No other relevant protected sites were identified for assessment according to the selection criteria outlined in Section 1.5.4. Due to the temporary and localised nature of the survey activities, there is expected to be no long-term impacts to the qualifying interests of protected sites. A number of mitigation strategies will also be followed to further reduce any potential impacts. It is therefore concluded that, the proposed works will not affect the conservation objectives of the above sites.

Overall, the proposed survey operations constitute work of an overriding public need while presenting minimal and temporary disturbance in a limited area.

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