STROMAR

Stromar Offshore Wind Farm

Geophysical and Benthic Survey Campaign 2024

European Protected Species (EPS) and Protected Species Risk Assessment (Inshore and Offshore Regions)

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Term	Definition
BEIS	Business, Energy and Industrial Strategy
CES	Crown Estate Scotland
ECC	Export cable corridor
EDR	Effective deterrent range
EIA	Environmental Impact Assessment
EPS	European protected species
FCS	Favourable conservation status
GW	Gigawatt
HRA	Habitats Regulations Appraisal
JNCC	Joint Nature Conservation Committee
JV	Joint Venture
MAG	Magnetometer
MMOb	Marine mammal observer
MD-LOT	Marine Directorate – Licensing Operations Team
nm	Nautical mile
OMC	Onshore Mission Control
OWF	Offshore wind farm
PO	Plan Option
PTS	Permanent Threshold Shift
RIB	Rigid inflatable boat
ROV	Remote operated vehicle
ROTV	Remotely operated towed vehicle
SBP	Sub bottom profiler
SEL	Sound exposure level
SMP	Sectoral Marine Plan
SPL	Sound pressure level
SSS	Side scan sonar
TTS	Temporary Threshold Shift

USBL	Ultra short baseline

Glossary of Terminology

Term	Definition
Array Area	The area of the OWF where wind turbine generators will be situated.
Array Area Buffer	An additional 1 km buffer zone around the Array Area. Inclusion of this buffer ensures sufficient space for a geophysical survey vessel to manoeuvre out with the Array Area on completion of the geophysical survey lines.
Offshore Export Cable Corridor (ECC)	The offshore ECC that runs from the Array Area to the point of landfall and comprises a 1km wide corridor within the offshore ECC Study Area.
Offshore ECC Study Area	The study area currently under consideration for the location of the preferred 1 km wide offshore ECC.

1 Introduction

1.1 Background

1. The Crown Estate Scotland (CES) launched a new offshore leasing round in 2021, the ScotWind leasing process. This new leasing round identified new areas of seabed suitable for offshore wind development in Scottish waters and released them for developers to bid on. These newly identified areas for development comprised a series of Plan Options (POs), which were identified within the 'Sectoral Marine Plan' (SMP) for offshore wind, as released by the Scottish Government. The ambition of this new leasing round was to support the development of approximately 10 Gigawatt (GW) of new offshore wind projects, comprising of fixed, floating, or hybrid technology. Developers submitted bid applications for available sites in July 2021, with 17 sites being awarded in January 2022. These awarded sites allowed for the potential development of just under 25 GW of new offshore wind projects in Scottish waters. The lease option agreements were signed by the successful bidders in April 2022.

2. An additional three sites were later awarded through the ScotWind Clearing process in August 2022, resulting in a final total award of 27.6 GW for new offshore wind developments. A review of the plan level Habitat Regulations Appraisal (HRA) is currently being processed.

3. Stromar Wind was formed from a joint venture between Ørsted, BlueFloat Energy, and Renantis (with Ørsted as the lead developer), hereafter referred to as the joint venture (JV). This JV was identified as one of the successful bidders in ScotWind and was awarded an option agreement for a proposed development location within the NE3 PO. The site is located approximately 50 km east of Wick and comprises an area of approximately 256 km^2, and water depths ranging from 60 to 100 m. The Stromar Offshore Wind Farm (OWF) may have a capacity of up to one GW of floating wind technology. The current intention is for the JV to apply for Section 36 Consent and Marine Licences for the project in 2025.

4. The JV has commissioned GoBe Consultants Limited (GoBe) as the Lead Environment Impact Assessment (EIA) Consultant, with responsibility for the consents management and delivery of both the onshore and offshore EIA. GoBe has subcontracted SLR Consulting Limited to undertake the onshore EIA aspects of the project.

5. The Stromar OWF is currently at the Scoping stages of the consents application. In conjunction with the Scoping stages, site-specific surveys have been programmed into the development timeline (including geophysical, benthic ecology, digital aerial, metocean and geotechnical) and these are either underway or currently being planned.

6. As the Stromar OWF will include a development footprint within both the inshore waters (within the 12 nautical mile (nm) limit) as well as the offshore waters (outwith the 12 nm limit), this EPS and Protected Species Risk Assessment covers both of these areas and will support any licence requirements for both areas that are submitted to Marine Directorate – Licensing Operations Team (MD-LOT).

1.1.1 Geophysical survey campaign

7. In 2023 geophysical survey data was collected from the Array Area and limited parts of the Offshore ECC area. The JV plans to obtain additional geophysical data of the Array Area and Offshore ECC to determine the seabed characteristics of the area and inform the project design going forward (Figure 1.1). The geophysical offshore ECC survey will comprise one Offshore ECC, with a corridor width of 1 km. This Offshore ECC will be located within the wider offshore ECC study area presented in Figure 1.1.

8. It is anticipated that the geophysical survey of the Array Area will be carried out between mid-March and end of September 2024.

9. There will be an anticipated 24 days of active surveying, but approximately 48 days are allocated to include weather standby periods, transit to site, equipment verification tests, and demobilisation.

10. Ahead of the geophysical surveys being executed, a European Protected Species (EPS) Licence may need to be secured, as follows:

    - Within 12 nm of the coast (within the territorial sea): An EPS Licence may be required under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended) where there is potential for activities to injure or cause disturbance to an EPS; and
    - Outwith 12 nm: An EPS Licence may be required under the Conservation of Offshore Marine Habitats and Species Regulations 2017 where there is potential for activities to injure an EPS or cause significant disturbance to an EPS population.

11. Additional to the EPS licensing requirements outlined above, a Basking Shark Licence (under the Wildlife and Countryside Act 1981, as amended) may also need to be secured.

12. The JV has commissioned GoBe to prepare this document which represents the necessary information required to support the inshore and offshore EPS Licence and Basking Shark Licence applications, which will be submitted to MD-LOT.

1.1.2 Benthic survey campaign

13. A benthic ecology survey comprising benthic grab sampling and drop-down video surveying within both the Array Area and the Offshore ECC will be undertaken from mid-March 2024. Although this benthic surveying will be covered by a Marine Licence Exemption Licence (and associated consultation), as the benthic ecology vessel may also use Ultra short baseline (USBL) equipment, there is a risk that an Licences may also need to cover this activity. As a result, this potential USBL activity within the benthic ecology survey campaign is also included within this EPS and Protected Species Risk Assessment.

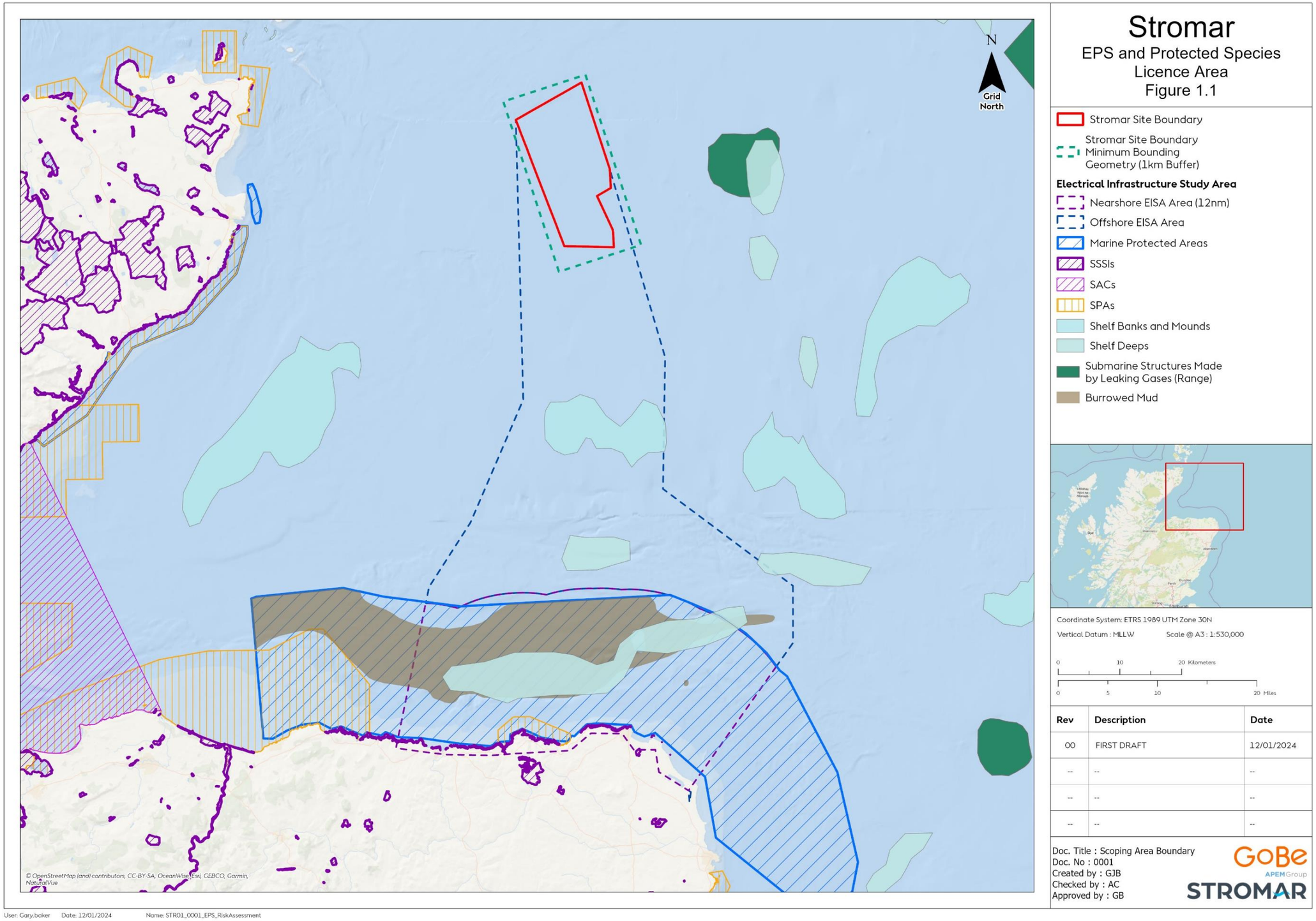

Figure 1.1 Location of the Stromar OWF Array Area, Offshore Export Cable Study Area and boundaries for the geophysical/ benthic survey campaigns (including a buffer to allow vessel turnaround).

1.2 European Protected Species (EPS)

1.2.1 EPS protection

14. All species of cetacean (whale, dolphin and porpoise) and the Eurasian otter (*Lutra lutra*) are listed in Annex IV of the Habitats Directive (European Commission Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna) as an EPS.

1.2.1.1 Offshore regulations

15. Species qualifying as EPS are recognised as species of community interest in need of strict protection, as directed by Article 12 of the Directive. This protection within Scottish offshore waters (12 nm to 200 nm) under the Conservation of Offshore Marine Habitats and Species Regulations 2017. Regulation 45(1) of the Offshore Habitats Regulations makes it an offence, with certain exceptions, to:

    - Deliberately or recklessly capture, injure or kill any wild animal of an EPS;
    - Deliberately or recklessly disturbs wild animals of any such species;
    - Deliberately takes or destroys the eggs of such an animal; or
    - Damages or destroys, or does anything to cause the deterioration of, a breeding site or resting place of such an animal.

16. Regulations 45(2) of the Offshore Habitats Regulations disturbance of animals includes, in particular, any disturbance which is likely:

    - To impair their ability
        - to survive, to breed or reproduce, or to rear or nurture their young; or
        - in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
    - To affect significantly the local distribution or abundance of the species to which they belong.

17. Seaward of 12 nm, individual disturbance is an offence, and would require an offshore EPS Licence.

1.2.1.2 Inshore regulations

18. Within the inshore regions (Scottish territorial waters out to 12 nm), under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) Regulation 39(1) of the Habitats Regulations makes it an offence, with certain exceptions, to:

    - Deliberately or recklessly capture, injure or kill a wild animal of an EPS;
    - Deliberately or recklessly:
        - Harass a wild animal or group of wild animals of an EPS;
        - Disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;
        - Disturb such an animal while it is rearing or otherwise caring for its young;

- 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;
- 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;
- Disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed, or reproduce, or rear or otherwise care for its young; or
- Disturb such an animal while it is migrating or hibernating.

19. Further protection is afforded through an additional disturbance offence given under Regulation 39(2) which states:

> "…it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)".

1.2.2 Disturbance of an EPS

20. Whether or not an activity could cause disturbance depends on the nature of the particular activity and the impact on the particular species. The guidance document 'The Protection of Marine EPS from injury and disturbance. Guidance for Scottish Inshore Waters' (Marine Scotland, 2014) advises 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 Favourable Conservation Status (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 implicit that activity during periods 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 Habitats Regulation 39(1) and 39(2). Therefore, when considering what constitutes 'disturbance', thought should be given to Habitats 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 that could be considered an offence may occur in other circumstances and, therefore, be covered under Habitats Regulation 39(2) (see paragraph 1.2.3).

21. The 2020 updated guidance document (Marine Scotland, 2020) advises that while the likelihood of acute injury can be relatively easy to determine, auditory injury accumulated over a period of time, and disturbance are not so straightforward. Therefore, assessments of potential disturbance will need to be based on a number of factors including:

    - The spatial and temporal distribution of the animal in relation to the activity;
    - The duration of the activity;
    - Any behaviour learned from prior experience with the activity;
    - Similarity of the activity to biologically important signals (particularly important in relation to activities creating sound); and
    - The motivation for the animal to remain within the areas (e.g., food availability).

22. As noise can cause disturbance to cetaceans, any application for an EPS Licence will require detailed information on the source level of the sound and its frequency. Where there is the possibility for disturbance to any individual EPS to occur, an EPS risk assessment must be carried out and the need for an EPS Licence determined.

23. For offshore waters, under the Conservation of Offshore Marine Habitats and Species Regulations 2017, disturbance must occur to an individual such that the ability of that individual to survive, breed or rear or nurture their young would be compromised.

1.2.3 Determining the requirements of an EPS

24. Where there is potential to harm or disturb a group of EPS, it is necessary to assess and determine whether an EPS Licence is required before an activity takes place. The need for an EPS Licence will be determined by MD-LOT as the licensing authority (for purely marine species) with advice from NatureScot based on findings from this EPS and Protected Species Risk Assessment. The findings from the assessment presented in this document are designed to support the decision-making process regarding the requirement for an EPS Licence, where granting of an EPS Licence depends on the following three tests:

    - That the licence is to be granted for one of the purposes specified in the Regulations;
    - That there are no other satisfactory alternatives to the activity proposed; and
    - That the licensing of the activity will not be detrimental to the maintenance of the population of the species concerned at an FCS.

1.3 Basking Shark Protection

25. Basking sharks (*Cetorhinus maximus*) are listed on Schedule 5 of the Wildlife and Countryside Act (WCA) 1981, which prohibits the killing, injuring or taking by any method of those wild animals. Basking shark are protected from disturbance up to 12 nm offshore from the Countryside and Rights of Way Act (2000) in England and Wales, and from the Nature Conservation (Scotland) Act (2004). 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.

1.3.1 Determining the need for a basking shark licence

26. Where there is potential to harm or disturb a basking shark, it is necessary to assess and determine whether a Basking Shark Licence is required before an activity takes place. The need for a Basking Shark Licence will be determined by MD-LOT as the licensing authority with advice from NatureScot based on findings from the EPS and Protected Species Risk Assessment. The grating of a Basking Shark Licence is dependent on the same three tests required for granting of an EPS Licence (see paragraph 1.2.3).

2 Description of the Proposed Activities

2.1 Location of the Proposed Activities

27. The proposed geophysical and benthic survey works will be carried out across the array area, located approximately 50 km west of Wick, and covers an area of 256 km^2 (Figure 1.1). The survey area associated with the Array Area will include an additional 1 km buffer which in total covers a total area of approximately 406.4 km^2. The survey area co-ordinates are provided in Appendix A.

28. The proposed geophysical and benthic surveys for the Offshore ECC will be carried out within the preferred Offshore ECC located within the Offshore ECC study area presented in Figure 1.1. Therefore, for the purpose of this EPS and Protected Species Risk Assessment it is assumed that the geophysical and benthic ecology survey will be located within:

    - A provisional cable corridor length between 91 to 125 km from the array area to a landfall in the vicinity of Rosehearty and the Fraserburgh coastline; and
    - A provisional cable corridor width of 1 km.

2.2 Survey Vessels

29. Details pertaining to those vessels currently being considered for use within the geophysical and benthic survey campaigns are shown in the following table (**Table 2-1**).

Table 2-1 Vessels currently being considered for completion of the geophysical and benthic survey campaign.

Vessel	Description
EGS Ventus. Call sign: V7II9. MMSI: 538007957 Operator: EGS International Ltd, 27 Wolmer Way, Bordon Hampshire, GU35 9QE, UK www.egssurvey.co.uk	This vessel has a length of 49.8m and a width of 9.6m, with a draught of 5.6m The vessel has a maximum transit speed of 12 knots. The maximum crew members which will be present on the vessel at any one time is 32. The survey equipment to be utilised in this survey includes: • Multi Beam Echosounder (MBES), which will be a Kongsberg EM2040 (or equivalent) mounted to the hull. • Sub Bottom Profiler (SBP) which will be a Innomar Medium 100 mounted to the hull. • Side Scan Sonar (SSS) which will be a Edgetech 4205, towed. • Magnetometer (MAG), which will be Geometrics G-882, towed.

30. It should be noted that the proposed vessel listed above is provided as a guideline. The final choice of vessel is dependent on the chosen survey approach and vessel availability at the time of the survey. The vessel provided here gives a likely indication of the vessel and crew size. The survey equipment and methodology will remain the same regardless of the final vessel used.

2.3 Survey Techniques

31. The offshore geophysical survey will comprise the survey equipment listed below and further described in **Table 2-2**:

    - Multibeam echosounder (MBES) – geophysical surveying only;
    - Side Scan Sonar (SSS) – geophysical surveying only;
    - Sub-bottom profiler (SBP) – geophysical surveying only;
    -

32. Table 2-2The benthic survey will also use some, but not all, of this equipment (noting that benthic sampling equipment is covered in a separate Marine Licence Exemption Notification):

    - Ultra short baseline (USBL) – geophysical and benthic surveying.

Table 2-2 Details of survey techniques

Survey equipment	Description
USBL	USBL systems are used to determine the position of subsea survey items, including remote operated vehicles (ROVs), towed sensors, etc. This involves the emission of sound from a hull-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. A complete USBL system consists of a small transducer array, which is mounted under a ship and a transponder attached to the subsea unit. An acoustic pulse is transmitted by the transducer, travels through the water and is detected by the shipboard transducer on an onboard computer, which calculates the time from the transmission of the initial acoustic pulse until the reply is detected and is measured by the USBL system. This is converted into a range and bearing, 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. This survey technique does not interact with the seabed. The USBL proposed for the use of the geophysical survey is the Sonardyne Ranger 2 which will operate at 19-34 kHz.
MBES	MBES are used to obtain detailed 3-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. The frequencies used by shallow water MBES (<1000 m) are generally very high and outside of the main hearing range of all marine mammal hearing groups (Joint Nature Conservation Council (JNCC) et al., 2010). This survey technique does not interact with the seabed. The proposed system for the geophysical survey is the Kongsberg EM2040 which operates at 400 kHz. The benthic ecology survey will not use this equipment. MBES will be carried out using a system capable of achieving an effective cell/bin size better than 1m, with use of beam-forming system preferred (Wessex Archaeology Ltd, 2007).
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 ROV. The frequencies used by SSS are generally very high and outside of the main hearing range of all marine species (JNCC et al., 2010; National Oceanic and Atmospheric Administration (NOAA), 2018). The higher frequency systems provide higher resolution, but shorter-range measurements. This survey technique does not interact with the seabed. The proposed system for the geophysical survey us the Edgetech 4205 Side-scan Sonar which operates at 230-850 kHz. The benthic ecology survey will not use this equipment. SSS will be carried out at frequency, range and gain settings capable of resolving all objects that have relief of more than 0.5m above the seabed throughout the survey area (Wessex Archaeology Ltd, 2007)
SBP	SBP are used to identify and characterise physically and geologically the layers of sediment and rock under the seafloor (up to a few meters). For this purpose, the survey will utilise either a parametric echosounder type SBP, or a frequency-modulated chirp type SBP. The proposed SBP systems are the Innomar Medium 100 The Innomar Medium-100 parametric SBP is characterised by a very narrow downward beam with a cone approximately 3 degrees wide. In combination with the high frequency of the generated sound (focused on Primary band 85-115 kHz & Secondary band 2-22 kHz) the lateral propagation of sound source is extremely limited. Additionally, it should be noted that the parametric SBPs is a non-impulsive sound source which reduces the risk of any potential injury to marine mammals and harmful impacts are considered unlikely. These survey techniques do not interact with the seabed. The benthic ecology survey will not use this equipment.

	SBP survey line, crossline spacing and orientations will be sufficient to resolve the extents and characteristics of Quaternary deposits (Wessex Archaeology Ltd, 2007). .
MAG	MAG surveys are used during the geophysical survey to detect any ferrous metal objects on the seabed, such as wrecks, unexploded ordinance or any other obstructions. Marine MAG 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 MAG allow for a wider range of detection at the price of precision accuracy that is afforded by the near-bottom MAG. These surveys use equipment to record spatial variation in the Earth's magnetic field. This survey technique does not interact with the seabed. The proposed MAG system is a Geometrics G-882 Marine MAG at an operating range of 20,000 to 100,000 nT, with an absolute accuracy of <2 nT, either a USBL or manual layback, a depth sensor and 500 kHz Altimeter. The benthic ecology survey will not use this equipment. Magnetometer survey will be carried out using caesium gas or equivalent system capable of resolving anomalies of 5 nT and above (Wessex Archaeology Ltd, 2007).
The Stromar geophysical surveys aim to achieve a 100% coverage (90% for SSS) of the seabed survey area and to detect objects on the seabed to 1.0m.	

33. The proposed survey is anticipated to provide approximately full coverage of the Stromar Array Area and Offshore ECC. For the Offshore ECC, a 1 km wide corridor centred on the planned export cable route(s) will be surveyed. The chosen vessel will be able to undertake the survey with the full spread of geophysical sensors to a nominal water depth of approximately 15 m using the primary survey solution.

34. The MBES and SBP system will be mounted to the vessel hull, whereas the interferometric echosounder, seabed imaging sonar and the magnetometer will be towed in the water column behind the vessel.

2.4 Activity Schedule

35. For the geophysical survey campaign within Scottish inshore waters (shoreward of the 12 nm limit) and Scottish offshore waters (seaward of the 12 nm limit), it is estimated that the works would take approximately 24 days in total, potentially increasing up to approximately 48 days when including weather/ equipment downtime. The anticipated survey window period is mid-March to end of September 2024.

3 EPS Risk Assessment

3.1 Overview

36. This section outlines the presence of EPS and their associated use in both the Scottish offshore region, which supports the Array Area and Offshore ECC Study Area, and the Scottish inshore region, which includes an area of the Offshore ECC and Calibration Area. This section includes an assessment of the potential effects of the proposed geophysical and benthic survey activities on those EPS prior to the application of any survey-specific related mitigation (pre-mitigation). As part of the survey campaign, the survey activities include the following key categories:

    - Vessel activity during the geophysical and benthic ecology surveys; and
    - Geophysical and benthic ecology surveys of the seabed.

3.2 EPS Presence in the Survey Areas

3.2.1 Cetacean species potentially present in the survey area

37. As listed in Annex IV of the Habitats Directive, all cetacean species are of community interest in need of strict protection as EPS. These species are fully protected in Scottish Territorial Waters (out to 12 nautical miles) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), and are protected by the Conservation of Offshore Marine Habitats and Species Regulations 2017 outwith 12 nm. Harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*) are listed individually, while the remaining cetacean species are encapsulated in the Habitats Directive as “all other cetacea”.

38. A total of 19 cetacean species have been recorded in UK waters (Reid et al., 2003). Of these, there are 12 cetacean species known to be present off the east coast of Scotland (Reid et al., 2003; Hammond et al., 2017) comprising:

    - Harbour porpoise (*Phocoena phocoena*);
    - Bottlenose dolphin (*Tursiops truncatus*);
    - White-beaked dolphin (*Lagenorhynchus albirostris*);
    - Killer whale (*Orcinus orca*);
    - Risso’s dolphin (*Grampus griseus*);
    - Fin whale (*Balaenoptera physalus*);
    - Sperm whale (*Physeter microcephalus*);
    - Humpback whale (*Megaptera novaengliae*);
    - Long-finned pilot whale (*Globicephala melas*);
    - White-sided dolphin (*Lagenorhynchus acutus*);

- Minke whales (*Balaenoptera acutorostrata*); and
- Short-beaked common dolphin (*Delphinus delphis*).

39. Of these, harbour porpoise, bottlenose dolphin, common dolphin, white-beaked dolphin and minke whale regularly occur within the vicinity of the central North Sea (Reid et al., 2003; Hammond et al., 2021). Additionally, project specific Digital Aerial Surveys (DAS) undertaken across the Array Area and ECC during April to October 2022 recorded harbour porpoise, risso's dolphin, common dolphin and white-beaked dolphin.

3.2.2 Cetacean species present in the survey area

40. Small Cetaceans in European Atlantic waters and the North Sea (SCANS) IV aerial and ship-based surveys were carried out in 2016 and used to estimate the abundance of cetaceans across European Atlantic waters (Gilles et al., 2023). Together SCANS IV survey and project specific aerial surveys indicated the presence of the species listed in **Table 3-1** across the geophysical and benthic survey areas. This table summarises density (individuals/km^2) and abundance estimates for the species in survey Block CS-K that covers the northeast coast of Scotland and the Moray Firth which were surveyed during the summer of 2023 (Gilles et al., 2023) and the species identified in the project specific surveys between April and August 2022.

41. Harbour porpoise are found in abundance throughout Scottish waters, usually as pairs or groups of three with larger foraging groups sometimes appearing (Reid et al. 2003; Gilles et al. 2023). Globally, harbour porpoise appear on the International Union for Conservation of Nature (IUCN) Red List as a threatened species of 'least concern'; however, there is a gap in the knowledge regarding the current population trend (Braulik et al. 2020). The relevant ICES Assessment Unit for harbour porpoise covers the entire North Sea. JNCC reported North Sea harbour porpoise populations to be in an unknown condition and the Natura 2000 network is currently classified as unknown (JNCC, 2019). The estimated density of harbour porpoise in Block CS-K is 0.281 individuals/km^2 (Gilles et al., 2023).

42. For bottlenose dolphin, the Moray Firth is an important habitat to the resident population of bottlenose dolphin in the North Sea, which is within the Coastal East Scotland Management Unit (MU) (Inter-Agency Marine Mammal Working Group (IAMMWG), 2023). Whilst occupation of the Moray Firth by this population varies between years, recent survey data has confirmed that approximately half of the estimated population occupy the area regularly (Graham et al., 2016). Designation of the Moray Firth SAC provides protection of bottlenose dolphin and their habitat, with the aim of maintaining the FCS (NatureScot, 2021). The resident bottlenose dolphin of the Moray Firth SAC predominantly utilise the nearshore environment. Habitat modelling of survey data indicates that the southern coastline of the Moray Firth is particularly important habitat to this population (Thompson et al., 2014). Additionally, there is the Greater North Sea MU which covers the offshore area. The conservation status for bottlenose dolphin within the species range is currently favourable and the trend for the population covered by the Natura 2000 network is currently classified as stable (JNCC, 2019). Bottlenose dolphin were not recorded in survey Block CS-K during the SCANS IV survey (Gilles et al., 2023) and therefore the density estimate is based on SCANS III survey (Hammond et al., 2021).

Table 3-1 Density and population estimates for the regularly occurring cetaceans off the north coast of Scotland (Gilles et al., 2023; Hammond et al., 2021; Robinson et al., 2010) and the wider Management Unit (MU) (IAMMWG, 2023)

Cetacean	General Distribution	Density Estimates (individuals/km^2)	Estimated Population	
			Scottish Northeast Coast (Survey Block CS-K)	MU
Harbour porpoise	Individuals can be found in nearshore and offshore waters throughout the North Sea	0.281	11,357	346,601 (North Sea MU; IAMMWG, 2023)
Bottlenose dolphin	Predominantly nearshore species	0.0037	151	224 (Coastal East Scotland MU; IAMMWG, 2023)* 2,022 (Greater North Sea MU; IAMMWG, 2023)
White-beaked dolphin	Predominantly offshore species	0.135	5,460	43,951 (CGNS MU; IAMMWG, 2023)
Minke whale	Individuals can be found in nearshore and offshore waters throughout the North Sea	0.0116	467	20,118 (CGNS MU; IAMMWG, 2023)
Common dolphin	Predominantly offshore species	0.074	1,218	102,656 (CGNS MU; IAMMWG, 2023)
Risso's dolphin	Predominantly continental shelf water species	0.0376	1,519	12,262 (CGNS MU; IAMMWG, 2023)
*The Stromar array area is located in the GNS MU for bottlenose dolphin, the ECC is located in both the CES and GNS MUs				

43. White-beaked dolphins are usually found in small groups of 10 or less (however, they can be seen in groups of 50 or more) and they usually occupy depths of 50 to 100 m (Reid et al., 2003). They are usually found along the east coast of Scotland during the Summer months. The estimated density of white-beaked dolphin for Block CS-K was 0.135 individuals/km^2 (Gilles et al., 2023). The conservation status for white-beaked dolphin is currently unknown (JNCC, 2019).

44. Minke whales are geographically wide-ranging and are usually present along the east coast of Scotland during the summer months (June – September) (Reid et al., 2003; Hammond et al., 2017). Minke whale are found in water depths up to 200 m, usually individually or as pairs but they do form larger groups (up to 15 individuals) whilst foraging. The estimated density of minke whale in Block CS-K was 0.0116 individuals/km^2 (Gilles et al., 2023). The conservation status for minke whale is currently unknown (JNCC, 2019).

45. Common dolphin are abundant along shelf breaks and in deeper waters on the west coast of the UK and Europe (Reid et al., 2003). Recent data suggests an increasing occurrence of short-beaked common dolphin in the northern North Sea, including the Moray Firth (Robinson et al., 2010; Moray Offshore Renewables Limited, 2018). Common dolphin were not recorded in survey Block CS-K during the SCANS IV or during the SCANS III survey. Abundance estimates for this species occurring in the Moray Firth is approximately 0.074 individuals/km^2 (Robinson et al., 2010). Common dolphin are amongst the most gregarious cetacean species, often forming groups of 50 or more individuals, though groups of 200 or more are not uncommon (Robinson et al., 2010).

46. Risso's dolphin are predominantly sighted off the west coast of Scotland and Outer Hebrides in small groups of 12 or less however, they are occasionally sited off the northeast coast of Scotland. The estimated density of Risso's dolphin in Block CS-K was 0.0116 individuals/km^2 (Gilles et al., 2023) additionally, two individuals were sited during the project specific surveys in June 2022. The conservation status of Risso's dolphin is currently unknown (JNCC, 2019).

47. Additional species that may be present in the survey area include killer whale, humpback whale and fin whale. Between April and October 2022 these species have not been identified in the project specific DAS, neither were they sighted in the 2023 SCANS-IV survey for Block CS-K (Gilles et al., 2021) nor do they have a designated MU and associated density estimate (IAMMWG, 2023). Therefore, there are no reliable density estimates for which to undertake a quantitative assessment of disturbance from geophysical surveys on these species. The potential impacts to humpback whale and fin whale were they to be present in the survey area would be similar to those on minke whale as all baleen whales are classified as low-frequency cetaceans (Southall et al., 2019). The potential impact to killer whales were they to be present in the survey area would be similar to the those on bottlenose dolphin, white-beaked dolphin, common dolphin and Risso's dolphin as they are all classified as high-frequency cetaceans (Southall et al., 2019). As they have not been identified in the project-specific surveys is concluded that an EPS Licence is not required for killer whale, fin whale and humpback whale.

3.2.3 Otters

48. Otters 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).

3.2.3.1 Potential impacts

49. Otters may be present at some of the landfalls of the cable routes during geophysical surveys. The otters may be disturbed by the presence of vessels but are not particularly sensitive to noise. Each survey will only take place over a short period of time in the nearshore area adjacent to the landfalls (much shorter than the overall survey period) and therefore any disturbance will be temporary. Therefore, no adverse impacts to otter are expected and it is concluded that an EPS Licence is not required for otters.

3.2.4 Other protected species – basking sharks

50. Within UK waters, the basking shark is a seasonal visitor, arriving in significant numbers in May and remaining until October. In the early spring and summer months, warmer waters move from the Atlantic into the coastal waters of Scotland, England, and Wales, which encourages greater marine productivity,

which is thought to be the driver of for the higher abundancies of basking sharks during these months (The Shark Trust, 2018).

51. As an elasmobranch, the basking shark is part of a group which is generally to have low sensitivity to noise vibrations due to the fact they do not have a swim bladder (Popper et al., 2014). 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 with greatest sensitivities at lower frequencies (Mickle et al., 2020), this data may or may not be transferable to basking sharks (Macleod et al., 2011). As 20 Hz - 1 kHz only encompass a small proportion of the noise emitted during the proposed site investigation surveys, and the activities will be intermittent, noise disturbance is not expected to impact basking sharks. On this basis, the potential for noise emissions to impact upon basking sharks is screened out of further assessment.

52. Vessel collision also poses a threat to this slow-moving species and basking sharks have a medium sensitivity to collision (NatureScot, 2019). Collision risk increases with increasing vessel speed; as the survey vessels will be moving slowly, collision risk is generally low.

53. The NMPi (2022) reports basking sharks to be present off the East coast at an observed adjusted density in of 0.00-0.010 animals/km^2.

3.2.5 Potential impact on EPS

54. The objective of this EPS Risk Assessment is to identify the potential for injury and disturbance to individuals of EPS from the proposed geophysical and benthic ecology survey activities. This section highlights potential impacts to protected species, including EPS, regardless of their inclusion as qualifying features of protected sites. A summary of proposed survey activities and their potential impacts to EPS is provided in

55. **Table** 3-2.

56. The Marine Scotland (2020) guidance states the following two key factors that have the potential to cause death or injury to an animal:

    - Physical contact (e.g., collision with vessels); and
    - Anthropogenic sound (underwater noise).

57. Cetaceans are considered particularly susceptible to these impacts as underwater noise emitted by vessels and the physical presence of the vessels have the potential to cause injury or disturbance to EPS. While some survey techniques may introduce noise to the marine environment, other activities do not generate sufficient levels of noise to be considered as potential sources of noise-related injury or disturbance to EPS and have been screened out of the detailed assessment, as indicated in

58. **Table** 3-2.

Table 3-2 Summary of proposed survey activities and their potential impacts on EPS

Activity/Equipment	Potential Impacts	Predicted Source Levels	Further Information Required as part of the EPS Risk Assessment
Geophysical and benthic ecology survey vessel activities			
Noise impacts	Propellers, engines, and propulsion activities form the primary noise sources of survey vessels. Vessel noise is generally continuous and comes in both narrowband and broadband emissions. Potential impacts on EPS depend on the duration and location of the surveys and EPS potentially present in the area.	Vessel emissions typically range from 150 – 190 dB re 1µPa (root mean squared (rms)). Acoustic energy vessel noise emissions are strongest at frequencies <1 kHz (Prideaux, 2017).	Yes – although source levels are likely to be too low to result in injury, they will be audible to most species, and thus have the potential to result in disturbance.
Collision risk	Increased vessel activity also has the potential to cause injury from collision. The risk of collision with an EPS is influenced by the dimensions of the vessel and its speed.	Vessels will be most at risk of colliding with a cetacean whilst moving from port to the survey area and returning to port as this will be when the vessel is travelling at faster speeds.	Yes – Mitigation measures such as MMOb to reduce the risk of collision risks are detailed in Section 4.
Geophysical and benthic ecology survey			
USBL (geophysical and benthic)	USBL systems are used to determine the position of subsea items. This involves the emission of 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.	USBL source levels range from 188 – 204 dB re 1µPa (rms), with a frequency range of 17 – 50 kHz (NOAA, 2019). The Sonardyne Ranger 2 will operate at 19-34 kHz and has a source level of 200 dB re 1µPa at 1m.	Yes – The pressure levels and frequencies at which USBL emit are not of a level where injury is expected but have the potential to cause disturbance as the frequency it operates at is in the audible range.

MBES (geophysical only)	High frequency pulses created by MBES equipment generate sound waves which produce impulsive underwater noise. Depending on the frequency of the pulses, location and duration of the operations, and the species present, there could be potential impacts on EPS.	MBES source levels typically range from 200 – 240 dB re 1µPa (rms) (Hartley Anderson Ltd, 2020). The equipment specifications describe the MBES options to emit noise at a frequency of 400 kHz, the source level for the proposed models are not known but for similar equipment from other brands it is ~200 dB re 1µPa at 1m	No – The MBES used for the proposed survey will operate above the hearing threshold of all species identified in **Table 3-1**, hence no potential for injury or disturbance exists and no further assessment is required (NOAA, 2018).
SSS (geophysical only)	SSS equipment produces impulsive sound emissions through high frequency pulses used to image the seabed habitat. Potential impacts to EPS depend upon the frequency, location, and duration of the pulses.	SSS source levels (peak) range from 205 – 230 dB re 1µPa at 1m (Hartley Anderson Ltd, 2020). The SSS specifications report frequencies between 230-850 kHz.	No – The SSS used for the proposed survey will operate above the hearing threshold of all species identified in **Table 3-1**, hence no potential for injury or disturbance exists and no further assessment is required (NOAA, 2018).
SBP (geophysical only)	SBP involves the vertical emission of sound pulses (impulsive noise) to characterise the layers of sediment comprising the seabed. Such activities introduce noise emissions into the marine environment. The potential impacts of this sound depend upon the type of profiler technology used, as well as the abundance, distribution and sensitivity of the species, and the duration of the operations.	SBP typically emit noise within the frequency range for the primary band 85-115 kHz & Secondary band 2-22 kHz. SBP source levels (peak) typically range between 185 – 250 dB re 1µPa at 1m (Hartley Anderson Ltd, 2020). The specifications for the Innomar Medium 100 report frequencies 100-115 kHz with source level <243 dB (SPL) re 1µPa at 1m.	Yes – SBP frequency ranges are within cetacean auditory range and have pressure level identified as potential to cause injury and disturbance
MAG	A MAG will be employed to detect magnetic anomalies in the seabed.	Not applicable	No - MAG do not emit noise as a part of their normal functioning, so there is no possibility of injury or disturbance from noise emissions. The altimeter operates at 500 kHz which is out with the hearing range of cetaceans.

3.3 Impact Ranges for EPS associated with Geophysical and Benthic Ecology Survey

59. A desk-based review of available data sources has been carried out to determine the estimated impact ranges of the geophysical and benthic ecology survey activities on cetaceans. The estimated number of individuals within the inshore and offshore regions are provided in **Table 3-3**, whilst **Table 3-4** indicates the estimated number of EPS that may be impacted by the geophysical/ benthic ecology surveys.

60. Noise modelling based on the maximum source levels and bandwidths obtained from a range of SBPs was included within a review of wind farms present within the Southern North Sea SAC which has been designated for the protection of harbour porpoise (Department for Business, Energy and Industrial Strategy (BEIS), 2020). This indicated that PTS onset begins between 17 and 23 m from the source. The potential for harbour porpoise to be disturbed is over a greater distance of 2.5 km, which covers an area of 18.3 km^2. The report concluded that there was a low risk of harbour porpoise being physically disturbed by SBPs (BEIS, 2020).

61. Assessment guidance from JNCC for noise disturbance against conservation objectives of SACs designated for harbour porpoise recommends a 5 km effective deterrent range (EDR) for high resolution geophysical surveys, based on SBP sources (JNCC et al., 2020). This gives an overall coverage of 78.5 km^2 from one potential location (assuming a spherical range). The number of individuals that could potentially be impacted in and around the survey area is presented in **Table 3-3**.

62. Several studies have indicated that displacement effects of surveys on cetaceans do not have significant impacts and that cetaceans return to survey areas a few hours after displacement (Thompson et al., 2013; Pirotta et al., 2014). A study by Thompson et al. (2013) indicated that noise produced by seismic surveys did not lead to significant displacement over a large spatial scale. Cetaceans were detected within the survey area several hours after displacement and cetacean response levels to the sound from surveys decreased throughout the survey. The geophysical surveys are much smaller than seismic surveys therefore it is likely there will be even further reductions in the impacts. The results of these surveys indicate that any impacts from this geophysical survey will be temporary, small-scale and reversible in nature. The transitory nature of the geophysical surveys means that following initial displacement, cetaceans will be able to return to an area relatively quickly.

63. The Array Area is in Block S of the SCANS III surveys (Hammond et al., 2021) and project specific DAS have taken from April to October 2022. The assessment of disturbance to cetaceans in the Array Area is the same for harbour porpoise, bottlenose dolphin, white-beaked dolphin and minke whale. This is due to species all being sampled within the SCANS III survey block and all having a MU that covers the Array Area and the ECC. The assessment for common dolphin has been based off Robinson et al., (2010) and Risso's dolphin has been based off the MU population.

64. For some types of equipment for geophysical surveys, the sources can be relatively loud but as these are highly directional sources with expected low levels of horizontal sound propagation with most operating at high frequencies and therefore subject to high transmission loss (e.g. Crocker & Fratantonio 2016, Crocker et al. 2019). However, several systems produce medium frequencies likely to propagate longer distances and therefore have the potential to cause disturbance. This has been presented in CSA (2020) and

available evidence comes from noise modelling has resulted in a 5 km, likely conservative EDR, that is recommended by JNCC (2020).

Table 3-3 Estimated number of species within survey area and inshore and offshore areas using SCANS-III (Hammond et al., 2021) density data and indicative percentage of abundance/populations (IAMMWG, 2022) that could be affected.

Cetacean	Max density	Total individuals*	Individuals in inshore	Individuals in offshore	Abundance animals in UK portion of MU	Inshore %	Offshore %	Total %**
Harbour porpoise	0.281	150.27	26.0	124.07	NS 159,632	0.02	0.10	0.12
Bottlenose dolphin	0.0037	1.97	0.34	1.63	CES 224; GNS 1885	0.15	0.08	-
White-beaked dolphin	0.135	72.2	12.5	59.7	CGNS 34,025	0.03	0.17	0.20
Minke whale	0.0116	6.2	1.0	5.2	CGNS 10,288	0.01	0.05	0.06
Common dolphin	0.074	39.57	6.9	32.67	CGNS 57,417	0.01	0.05	0.06
Risso's dolphin	0.0376	20.1	3.5	16.6	CGNS 8,687	0.04	0.09	0.19

*Based on total area of Array and ECC being surveyed multiplied by density

**this figure was calculated by number of individuals within inshore/offshore waters and dividing by the abundance of animals within the UK portion of the Management Units (MU) and multiplying by 100 to calculate the percentage

Table 3-4 Assessment of disturbance to cetaceans based on 5 km EDR (78.5km^2)

Cetacean	Density Estimates (individuals/km^2)	No. Individuals Within Potential Impact Area	Estimated Population abundance		% of Population Potentially Disturbed		Potential for Significant Disturbance
			Scottish Northeast Coast (Survey Block CS-K)	MU	Scottish Northeast Coast (Survey Block S)	MU	
Harbour porpoise	0.281	22	11,357	159,632	0.2%	0.013%	No – Less than 1% of NS MU or North Coast population temporarily disturbed.
Bottlenose dolphin	0.0037	<1	151	224 (CES MU) 1,885 (GNS MU)	0.2%	0.13% (CES MU) 0.015% (GNS MU)	No – Less than 1% of CES, GNS MU or North Coast population temporarily disturbed.
White-beaked dolphin	0.135	11	5,460	34,025	0.2%	0.032%	No – Less than 1% of CGNS MU or North Coast population temporarily disturbed.
Minke whale	0.0116	<1	467	10,288	0.2%	0.0089%	No – Less than 1% of CGNS MU or North Coast population temporarily disturbed
Common dolphin	0.074	6	NA	57,417	NA	0.01%	No – Less than 1% of CGNS MU
Risso dolphin	0.0376	3	1,519	8,687	0.2%	0.03%	No – Less than 1% of CGNS MU

3.4 Impact Assessment for EPS – Underwater Noise

65. Noise emissions present the highest potential risk of disturbance to cetaceans within the vicinity of the Array Area and Offshore ECC Study Area. Underwater noise has the potential to impact cetaceans, either through injury or disturbance. Injury from noise emissions includes physiological damage to auditory or other internal organs while disturbance can result in temporary or continuous disruption to behavioural patterns such as migration, breathing, nursing, feeding, foraging, socialising and sheltering.

3.4.1 Types of noise

66. According to Southall et al. (2019), sound can be categorised into distinct 'types', as detailed in **Table 3-5**.

Table 3-5 Types of sound as defined by Southall et al., (2019)

Noise type	Description
Impulsive	Sounds which are short in duration (i.e. less than 1 second long) and temporary, occupy a broadband bandwidth, and have rapid rise and decay times with a high peak pressure level. This can be further defined as: • Multiple pulsed sound – sound comprising two or more discreet acoustic events in a 24-hour period (e.g., from MBES, SSS or SBP); and • Single pulse sound – sound comprising a single discreet acoustic event in a 24-hour period (e.g., an underwater explosion).
Non-impulsive	Sounds which may occupy a broadband, narrowband or tonal bandwidth, can be brief, prolonged, continuous or intermittent in nature, and are not characterised by rapid rise and decay times or a high peak pressure level. Vessel noise would be an example of non-impulsive/continuous sound.

3.4.2 Assessment criteria – lethal and auditory injury thresholds

67. To determine the potential for noise to impact cetaceans, perceived sound levels are compared to available empirically estimated thresholds for injury and disturbance. JNCC et al., (2010) and Scottish Government (2020) recommends using the injury and disturbance criteria proposed in 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).

68. Updated guidance presented in Southall et al. (2019) has been adapted from Southall et al., (2007). Southall et al. (2019) present the sound level at which it is expected that a marine mammal may be at risk of experiencing hearing impairment as a result of the received sound. Hearing impairment, specifically, a change in the hearing sensitivity (or threshold at which a sound can be detected) can either be temporary (Temporary Threshold Shift; TTS) or permanent (Permanent Threshold Shift; PTS). PTS is considered to

be an injury under UK guidance. All experimental studies are limited to identification of TTS-onset, with no studies able to directly identify PTS-onset as this would be unethical; as such, PTS-onset is extrapolated from the measured TTS-onset values. The likelihood of individual animals experiencing PTS and TTS is dependent on both the received sound level and the frequency of the sound received.

69. PTS and TTS thresholds are based on a dual-criteria approach involving two metrics:

    1. Energy-based metric – a measure of the accumulated sound energy an animal is exposed to over a period of time (exposure period). For single pulses, this is referred to as the SEL. For multiple pulses over an exposure period, this is referred to as the cumulative Sound Energy Level (SEL_{cum}). The SEL thresholds for PTS therefore take into account received noise levels and duration of exposure over a 24-hour period and are weighted to take into account the different hearing sensitivities of each function hearing group (see **Table 3.5**); and
    2. Pressure-based metric – referred to as the SPL. This is measured as peak sound pressure level (SPL_{peak}). Any single exposure at or above this pressure-based metric is considered to have the potential to cause PTS regardless of exposure duration (Southall et al., 2019). The peak SPL criterion is for unweighted received sound level.

3.4.3 Disturbance

70. Behavioural disturbance has been assessed using a qualitative approach based on the consideration of factors such as source level, mitigation measures and length of operations. In addition, factors likely to influence interaction between the survey works and cetaceans likely to be present in the survey area is assessed.

71. European Commission (2007) guidance indicates that a disturbance must significantly impact the local distribution or abundance of a species, including temporary impacts, while guidance proposed by JNCC et al. (2010) states the following:

    "any action that is likely to increase the risk of long-term decline of the population(s) of (a) species could be regarded as disturbance under the Regulations".

72. In order to consider the possibility of a disturbance offence as a result of the proposed geophysical/ benthic ecology survey, it is necessary to consider the likelihood that exposure of the animal(s) produces a response which is likely to generate a significant population-level effect.

73. Assessment of population-level impacts from a temporary disturbance is complex due to the highly variable nature of the introduced disturbance, the variability of the behavioural response between different species and individuals, and the availability of population estimates for EPS in a given area of the North Sea.

74. A method for assessing a potential disturbance is to compare the frequency and source levels for the proposed geophysical and benthic ecology survey works that are predicted with empirical studies (Southall et al., 2007). However, there are currently no agreed thresholds or criteria for modelling the disturbance of marine mammals from underwater noise specific to the UK. Noise propagation modelling has therefore not been undertaken for this assessment.

3.5 Assessment of Potential Impacts on Cetaceans

75. The results of the impact assessment for the proposed geophysical / benthic ecology survey works within the Array Area and Offshore ECC (and any Calibration Area requirement) are outlined below in the following sections. The assessment considers both injury and disturbance impacts to EPS (cetaceans) under each of the following activities and geophysical survey techniques:

    - Vessels;
    - USBL;
    - SSS and MBES; and
    - SBP.

3.5.1 Vessels

76. The presence of vessels potentially impacts cetaceans through underwater noise and collision risk. The risk of collision along with the level of noise emitted into the marine environment by a vessel depends on the vessel type, size, mode of propulsion, operational factors and speed. Different frequencies of sound are emitted from different sizes of vessels, where larger vessels tend to emit lower frequency noise, though vessel noise tends to be below 1 kHz (Prideaux, 2017).

77. Injury to cetaceans is also a risk through collision with survey vessels and this includes blunt trauma to the body or contact with propeller strikes. The risk of collision is directly influenced by the type of vessel and the speed with which it is travelling (Laist et al., 2001) and indirectly by ambient noise levels underwater and the behaviour the marine mammal is engaged in.

78. Monitoring for cetaceans will take place throughout daylight hours, with particular focus on the 30 minutes prior to the survey taking place. Monitoring and with soft starts (prior to full power geophysical/ benthic surveys) will further reduce the risk of impacting EPS. Please see Section 4 for further details of mitigation.

3.5.1.1 Injury impact

79. Laist et al. (2001) predicted that the most severe injuries resulting from collision are with vessels travelling at over 14 knots, and the probability of lethal injury of a large whale species decreases from 0.79 at a speed of 15 knots, to 0.21 at 8.6 knots (Vanderlaan and Taggart, 2007). The risk of collision with a cetacean appears to increase with increased vessel speeds and also vessel size. There is also a correlation between increased severity of injury and vessel speed and size.

80. Given that the geophysical survey vessel will be moving along defined line spacings at slow speeds (3 to 6 knots), the potential for collisions is negligible. For benthic surveying, the vessel will transit from sampling station to sampling station at relatively low speeds where it will then remain stationary during sampling activities. Furthermore, Van Waerebeek et al. (2007) have reported that non-lethal collisions do occur between vessels and marine mammals, suggesting that in the instance of vessel collisions with marine mammals, they are not necessarily always fatal.

81. In relation to PTS in cetaceans as a result of vessel noise, Sinclair et al., (2021) reported that noise levels were typically in the range of 10 to 100Hz (although higher frequencies may also be produced) (Sinclair et

al., 2021) with an estimated source level of 161 to 168 SEL_{cum} dB re 1µPa@1m (RMS). As such, it is concluded that physical and auditory injury impacts are highly unlikely to occur, as this would require an animal to be in close vicinity of the noise source for a prolonged duration.

82. Therefore, it is predicted that there will be no risk of injury to any species of cetacean as a result of underwater noise from vessels or collision risk from the geophysical surveys. **Consequently, there is no potential to commit an offence with regards injury or impact on the FCS of any EPS, and thus no requirement for an EPS Licence in this respect.**

3.5.1.2 Disturbance impact

83. Despite noise levels from the geophysical / benthic ecology survey vessel being unlikely to cause physical or auditory injury, it could be sufficient to cause local disturbance to marine mammals that are in close proximity to the vessel, depending on ambient noise levels. Thomsen et al. (2006) used species hearing detection thresholds to conclude that noise from larger vessels (around 0.25 kHz) will be detected by harbour porpoise at distances of, approximately, 1 km, and noise from smaller vessels around (2 kHz) will be detected at around 3 km.

84. Harbour porpoise have been reported to be more sensitive to vessels that produce medium to high frequency noise (e.g., Hermannsen et al., 2014). Where porpoise are exposed to vessel noise that contains low levels of high frequencies, they appear to avoid vessels (e.g., Dyndo et al., 2015). Wisniewska et al. (2018) have also recorded changes in harbour porpoise foraging rates in response to vessel presence, indicating the potential for a reduction in foraging activity where animals are exposed to vessel noise greater than 96 dB re 1 µPa for prolonged periods of time.

85. Behavioural responses can vary greatly depending on context and as data specific to harbour porpoise is also limited, the distance at which animals may react to vessels is challenging to predict. However, Thomsen et al. (2006) documented that harbour porpoise might be expected to respond to geophysical survey vessels at, approximately, 400 m.

86. There is a possibility that responses from marine mammals can arise due to the simple presence of vessels. A study by Graham et al. (2019) indicated that harbour porpoise were effectively displaced by, approximately, 1 km due to the presence of construction vessels which would be of a similar size to geophysical survey vessels. Pirotta et al. (2015) concluded that the response of bottlenose dolphin in the Moray Firth was related to the number of boats present, rather than the levels of overall noise. However, while this study provides evidence that a perception of risk can be related to the presence of boats, silent and stationary boats did not elicit a response.

87. Although the predicted source levels associated with the survey vessels have the potential to elicit a behavioural response in cetacean species, previous studies (e.g. Graham et al. 2019) have shown that disturbance effects from vessels are highly localised and short-term. Therefore, any disturbance is not considered likely to result in significant disturbance to either individual or populations of any EPS.

88. Due to the temporary and transient nature of the geophysical and benthic ecology survey works, it is unlikely that vessel noise emissions would influence the ability of an animal to survive or reproduce or result in significant impacts to the population abundance or distribution. **It has therefore been concluded that there will be no negative impact of the FCS of any EPS and thus no requirement for an EPS Licence in this respect.**

3.5.2 USBL

89. The length of time the USBL systems will be required is dependent on the specific survey activities, however there is potential that a USBL could be used continuously throughout the geophysical/ benthic ecology survey works. The potential impacts of continuous sound from USBL equipment on cetaceans that may be present in the Array Survey Area and Offshore ECC Study Area are described in the sections below.

90. The USBL system is used for controlling the position of subsea equipment during the survey, and it operates by emitting a low frequency acoustic pulse between the transponder on the vessel and the transducer on the subsea unit. As low frequency emissions travel further than high frequency sounds, cetaceans may be exposed to these noise emissions over a greater spatial area than they would with higher frequency sounds, if the frequencies fall within species auditory bandwidth.

91. The low frequency sound generated by the USBL system are within the hearing range of the cetacean species anticipated to be within the project area. As such, there is potential for USBL survey activities to potentially cause a disturbance response in animals that are present during the proposed geophysical survey works (JNCC et al., 2010).

3.5.2.1 Injury impact

92. The USBL is targeted with very small beamwidth and therefore there is limited propagation and risk of injury to marine mammals. Additionally, USBLs are classed as non-impulsive sound sources which reduces the risk of potential injury due to the relatively high thresholds required at which injurious effects would occur (Southall et al., 2019). It can be concluded that any injurious zone would therefore be limited to the immediate vicinity of the vessel. Consequently, there would be no risk of injury and any effect would be contained fully within the disturbance area from the presence of the vessel itself (Graham et al., 2019). As per the JNCC (2017) guidelines, a trained MMOb will be onboard the survey vessel monitoring the presence of marine mammals within a 500 m mitigation zone, further reducing the risk of injury impact (see Section 4).

93. As such, there is no potential to commit an offence with regards to injury or to affect the FCS of any EPS through the use of the USBL system. **Therefore, there is no risk of injury and an EPS Licence to injure will not be required**.

3.5.2.2 Disturbance impact

94. The survey period is anticipated to span up to 12 days for the Array Area main lines, one day for Array Area cross lines excluding weather downtime, plus additional days for the Offshore ECC with nine days for ECC main lines and three days for ECC cross lines. During this time, the survey vessel will be traversing the survey routes, resulting in localised and temporary noise generation.

95. The utilisation and frequencies of USBLs result in a short propagation distance and therefore the sound is unlikely to impact marine mammals (CSA Ocean Sciences Inc, 2020). It has been demonstrated in CSA Ocean Sciences Inc, (2020) that emitted sound levels from non-impulsive sound sources, such as USBLs, will attenuate to 120 dB sound pressure level (SPL) root-mean square (rms) (i.e., 120 dB re 1µPa SPLrms) within 50 m from the source (National Marine Fisheries Service (NMFS), 2018). It can therefore be concluded that any disturbance to marine mammals would therefore be limited to the immediate vicinity of the vessel equipment. Consequently, any small displacement effect would be contained fully within the

disturbance area from the presence of the vessel itself (Graham et al., 2019) and that the potential for impact on marine mammals at an individual or population level is no greater than that of a transiting vessel.

96. If the short-term USBL operations resulted in a response by a solitary animal, this would be unlikely to impair the ability of an animal to survive, reproduce or result in any significant impacts to the local population and distribution. There would therefore be no impact on the FCS of any cetacean species at a population level. However, as there is still a potential for disturbance to cetaceans**, an EPS Licence to disturb is considered to be required.**

3.5.3 SSS and MBES

97. SSS and MBES techniques use continuous sound and generally operate at higher frequencies, the potential impacts from this are outlined in the following sections.

98. For the proposed geophysical survey works, the expected frequency range for SSS and MBES operations is anticipated to be above 190 kHz. This is based on the offshore geophysical survey tender specification submissions. These frequencies are generally beyond the hearing range of most cetaceans, including high-frequency sensitive species such as harbour porpoise. **The potential to commit an offence is negligible and thus it is considered there is no requirement for an EPS Licence for injury or disturbance.**

3.5.4 SBP

99. The potential impacts that SBP might have on cetacean species present within the survey area are detailed below. The frequencies used for these surveys are in the sensitive hearing range of cetaceans and so this is a key assessment within this EPS risk assessment.

3.5.4.1 Injury impact

100. SBP emit a low frequency sound to maximise seabed penetration. Cetaceans will be exposed to this low frequency sound over a greater spatial area than they would as a result of higher frequency sounds (e.g., from SSS and MBES). Modelling of SBP systems suggests that an animal swimming at a constant speed of 1.5 m/s from the noise source, showed that injury may occur at a range of 20 m for the majority of cetaceans and up to 400 m for harbour porpoise. These results are dependent on the cetacean swimming in a direct and narrow ‘beam’ from the transducer (BEIS, 2020). Additionally, CSA (2020) showed that the risk of injury for was limited to the immediate area (few metres) so would be within the vessel disturbance area of 1 km (Graham, 2019).

101. The majority of acoustic energy will be directed at the seabed rather than being emitted horizontally which reduces the impacts of noise emissions on nearby animals. SBP are designed to have a highly focused beam that aims directly at the seabed, meaning there is limited horizontal transmission of noise, limiting the potential impact ranges compared to spherical spreading.

102. Section 4 outlines the mitigation measures that will be used to significantly reduce the risk of cetacean injury as a result of SBP geophysical survey activity. Measures include the deployment of an MMOb to monitor the presence of cetaceans within a 500 m mitigation zone ahead of surveys commencing as well as during survey activity (see Section 4). The combination of mitigation measures and the characteristics of the noise resulting from SBP activity mean that the potential risk of injury offence to cetaceans is significantly reduced. **An EPS Licence to injure is considered to not be required**.

3.5.4.2 Disturbance impact

103. Survey activity will be short-term and temporary in nature. It is anticipated to span up to 24 days, excluding weather downtime. During this time the survey vessel will be traversing the survey routes, resulting in localised and temporary noise generation.

104. Graham et al. (2019) indicated that vessel disturbance to cetaceans is 1 km and so a vessel moving into an area will cause a reduction in cetaceans found in an area. This would reduce the chance of cetaceans in the area being disturbed by the frequencies as they will leave the area. Failing this, the 'narrow' beam emitted by these systems that aims directly at the seabed means that a cetacean would need to swim directly through the beam to be disturbed. Additionally, the use of mitigation measures (see Section 4) reduce the risk of disturbance even further. The combination of mitigation measures and the characteristics of the noise resulting from SBP activity mean that the potential risk of disturbance offence to cetaceans is significantly reduced. However, as there is still a potential for disturbance to cetaceans **an EPS Licence to disturb is considered to be required**.

4 EPS Mitigation Strategy

4.1 Overview

105. The EPS Risk Assessment concluded that there is a need for an EPS Licence for the proposed surveys. The following measures will be implemented as best practice and in line with MD-LOT expectations.

4.1.1 Marine Mammal Observers

106. Marine mammal observers (MMObs) are required under the current guidance for marine mammal mitigation (JNCC, 2017).

4.1.1.1 Mitigation zone

107. In the event of an EPS or basking shark being detected within 500 m of a survey vessel, geophysical survey/ benthic survey activity will not commence until the EPS has passed through the area or the vessel has moved resulting in the EPS being further than 500 m away from the geophysical survey source. There will be a 20 minute delay from the time of the last sighting within the mitigation zone prior to the soft-start commencement (recommencement) of survey activities. Once the geophysical survey has started, activities will not be stopped should an EPS approach the vessel.

4.1.1.2 MMOb approach

108. When possible (i.e., during daylight hours and when visibility is good) and where an MMOb is employed, MMOb(s) will carry out visual observations to monitor the presence and occurrence of cetaceans, seals and basking sharks before the soft start commences and the MMOb will make recommendations for survey alterations, should an EPS be seen within a safety zone from the source. During the soft-start procedure, power will be reduced to the lowest possible setting if an EPS is seen within a radius of 2 km from the acoustic source and power will be shut off completely within 500 m from the acoustic source.

109. MMObs are trained personnel who will advise on how to minimise disturbance to mammals and will ensure mitigation guidelines are adhered to.

4.1.1.3 Pre-start search

110. MMObs will carry out visual monitoring (if required) prior to geophysical survey commencement for at least 30 minutes to assess the presence of EPS and basking sharks within the 500 m mitigation zone. If individuals are detected within the mitigation zone the soft start must be delayed until their passage of the transit of the vessel results in them being outside if the mitigation zone. There must be a minimum of a 20 minute delay from the time of the last detection within the mitigation zone and the commencement of soft start to allow animals to have moved outside of the mitigation zone.

4.1.2 PAM operator onboard

111. A designated PAM operator will be situated on the survey vessel to assist with marine mammal mitigation if required, the use of PAM will be followed in line with the JNCC (2017) guidance. In circumstances where

there is low visibility e.g. at night, and PAM is not available then Stromar OWF will commit to not undertaking the survey start-up until visibility improves.

4.1.3 Soft start

112. When feasible, the USBL and SBP systems will not be operated at full power straight away and will build up to full power over a 30 minute period. This will give the EPS and basking shark the opportunity to leave the survey area.

4.1.4 Reporting

113. JNCC Standard Forms will be used to report cetacean recorded. Monitoring reports will be submitted to MD-LOT and NatureScot and will include cetacean records, survey methodology and limitations. MMObs will contact MD-LOT or NatureScot if there are any queries about the application of guidance during surveys.

4.2 Survey Vessel Speed and Course

114. The operating speed of the survey vessels is between three to six knots during geophysical operations and will allow cetaceans to move away from the vessel if they are disturbed by vessel emissions and/or noise emissions.

115. During transit periods between port and the survey area, the vessel will be moving at speeds greater than six knots but this will not be different to normal vessel traffic.

4.3 Toolbox Talks

116. As part of routine Toolbox Talks, survey crew based onshore will be made aware of all potential EPS that may be encounter during surveys. Good practice measures of boat control near wildlife through the Scottish Marine Wildlife Watching Code (SNH, 2017a) and Guide to Best Practice for Watching Marine Wildlife (SNH, 2017b) will be adopted for any additional manned vessels that may be required.

5 Consideration of Likely Significant Effects (LSE)

5.1 Designated Sites

5.1.1 Moray Firth SAC

117. The Moray Firth SAC was designated in 2005 for Sandbanks which are slightly covered by sea water all the time (1110) and bottlenose dolphin (1349). The SAC extends from the inner firths to Helmsdale on the north coast and Lossiemouth on the south coast. The Moray Firth supports the only known resident population of bottlenose dolphin in the North Sea, with an estimated 150 individuals. The population is present year-round within the Firth, but they do appear to favour particular areas . The Conservation Objectives for the Moray Firth SAC are:

    - "*to avoid deterioration of the habitats of the qualifying species (bottlenose dolphin) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest".*

118. The SAC is 38.96 km from the Offshore Electrical Infrastructure Study Area and 92.2 km to the Array Area.

5.1.2 Dornoch Firth and Morrich Moore SAC

119. The Dornoch Firth and Morrich More SAC is designated for harbour seal (*Phoca vitulina*) and otter (*Lutra lutra*). Although seals are not EPS, an assessment in relation to the nearby Dornoch Firth and Morrich More SAC has been included in this report. Otter is an EPS, albeit they are typically associated with coastal/riverine waters (as opposed to the offshore marine environment).

120. Dornoch Firth and Morrich More consists of an estuarine system with extensive areas of bordering natural habitat including sand dune, woodland and small lochans. The River Evelix and the River Oykel, which both feed into the site, provide further otter habitat. The area supports a good population of otters in what is the only east coast estuarine site selected for the species in Scotland.

121. The Dornoch Firth is the most northerly large estuary in Britain and supports a significant proportion of the inner Moray Firth population of the harbour seal. The seals, which utilise sandbars and shores at the mouth of the estuary as haul-out and breeding sites, are the most northerly population to utilise sandbanks and their numbers represent almost 2% of the UK population.

122. The Conservation Objectives ensure that the obligations of the Habitats Regulations are met; that is, there should not be deterioration or significant disturbance of the qualifying interest. This will also ensure that the integrity of the site is maintained and that it makes a full contribution to achieving FCS for its qualifying interests. The total population of harbour seals in Scotland was 26,864 in 2015 to 2018, with 962 within the Moray Firth MU (Special Committee on Seals (SCOS), 2020).

123. The number of harbour seal that could potentially be disturbed due to the geophysical survey, based on the precautionary 5 km EDR, is up to 1.26 (based on 0.016 individuals/km^2, as calculated from Russell et al., 2017), or 0.13% of the Moray Firth MU. There is therefore a negligible risk of disturbance to the harbour seal population.

124. Otters are particularly sensitive to anthropogenic changes to their habitats, as their coastal habitat use is highly dependent on the inclusion of freshwater features (Roos et al. 2015). As such, the location of their holts (or dens) is restricted, and anthropogenic changes to their habitat may have dramatic repercussions, including localised extinctions. Given the distance of from the Stromar OWF survey area and considering the extremely limited nature of the potential effects on otters anticipated to result from the proposed geophysical survey activities, it is concluded that an EPS Licence will not be required for otters.

125. The SAC is 80.72 km from the Offshore Electrical Infrastructure Study Area and 120.45 km to the Array Area.

5.1.3 Southern Trench NCMPA

126. Southern Trench NCMPA is located on the east coast of Scotland, and protects minke whale, burrowed mud, fronts and shelf deeps. Fronts in the Southern Trench are created by mixing of warm and cold waters, which creates an area of high productivity, attracting a number of predators to the area. Minke whale are attracted by the fish species brought to the area by the fronts, as well as the abundance of sandeels in the soft sands. NatureScot advises that, in order to conserve minke whale, risk of injury and death should be minimised, access to resources within the site should be maintained, and supporting features should also be conserved.

127. The Conservation Objectives of this site are to conserve the features, specifically to ensure:

- *"Minke whale in the Southern Trench NCMPA are not at significant risk from injury or killing, conserve the access to resources (e.g. for feeding) provided by the NCMPA for various stages of the minke whale life cycle, and conserve the distribution of minke whale within the site by avoiding significant disturbance" .*

128. The supporting features of the minke whale is also protected under the Conservation Objectives for the Southern Trench NCMPA. Southern Trench NCMPA is located on the east coast of Scotland, and protects minke whale, burrowed mud, fronts and shelf deeps. Fronts in the Southern Trench are created by mixing of warm and cold waters, which creates an area of high productivity, attracting a number of predators to the area. Minke whale are attracted by the fish species brought to the area by the fronts, as well as the abundance of sandeels in the soft sands. NatureScot advises that, in order to conserve minke whale, risk of injury and death should be minimised, access to resources within the site should be maintained, and supporting features should also be conserved.

129. The supporting features of the minke whale is also protected under the Conservation Objectives for the Southern Trench NCMPA.

130. This SAC is 0 km from the Offshore Electrical Infrastructure Study Area and 57.14 km to the Array Area. Based on **Table 3-4** <1 individual in the potential impact area of the geophysical survey is predicted to be disturbed.

5.1.4 Basking shark sites

131. There are no designated sites for basking sharks in the vicinity of the survey areas, although there is the potential for this species to be present in Moray Firth. However, the assessment found the proposed survey works have a very low potential to result in adverse impacts on this species, due to the localised and temporary nature of the proposed works. Impacts have been further reduced through implementation of mitigation.

5.2 Potential Effects

132. As outlined in Section 3.4, there are potential effects from underwater noise produced by survey equipment and vessels to cause disturbance of the qualifying/protected features of the above designated sites. However, with adequate mitigation in place, as outlined in Section 3, there would be **negligible disturbance effects as a result of underwater noise during the proposed geophysical survey works and no potential for any LSE**.

133. Due to the proximity of these designated sites to the proposed survey areas (i.e., the Stromar OWF survey area), there is potential for interaction with qualifying and interest features associated with these designated sites. However, as there is **no potential for injury or significant disturbance to marine mammals in the vicinity of the survey, it is considered that there is no potential for any adverse effect on the integrity of the designated sites in relation to the conservation objectives for marine mammals**.

6 Assessment of Potential Offence

134. The proposed geophysical and benthic survey works for Stromar OWF will both be completed within and outwith the 12 nm boundary of Scottish Waters. The mitigation measures being implemented here indicate that any potential impacts of the survey work are unlikely to result in harassment, disturbance, injury or mortality of an EPS as defined under Regulation 39(1) of the Habitats Regulations.

135. In relation to Regulation 39(2) of the Habitats Regulations, the percentage of the total population which has the potential to be disturbed by the geophysical survey activity is considered to be negligible (less than 1% all cetaceans occurring in Blocks S and less than 1% of the MU of all species). Therefore, the impact is considered to not be detrimental to the maintenance of the population of the species concerned at a FCS. It is also thought that disturbance will be short-term and small-scale in nature.

136. However, without the application of mitigation, as there is potential to disturb multiple individuals of the EPS species identified, it is therefore assumed that disturbance will cause an individual level effect and therefore an EPS Licence (to disturb) can be issued under Section 39 of the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) and under Section 45 of the Offshore Regulations.

137. As stated in Section 1.2, three tests must be passed before an EPS Licence can be granted, as discussed below.

6.1 Test 1 – Licence Must Relate Relevant Purpose (Regulation 44)

138. The Scottish Government can only issue EPS Licenses under Regulation 44(2) of the Habitats Regulations (as amended) for specific purposes. These purposes include:

a) Scientific, research or educational purposes;

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

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

d) Conserving natural habitats;

e) Protecting any zoological or botanical collection;

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

g) Preventing the spread of disease; or

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

139. The Stromar OWF meets the Regulation 44(2)(f) requirement listed above as the planned wind farm demonstrates a direct environmental benefit on a national and international scale and complies with national and international environmental policies. There is an overarching requirement for sustainable energy supply from renewables within Scotland subject to national planning and energy policy. The Stromar OWF will have long-term environmental benefits and will significantly reduce carbon emissions (Scottish Government, 2022).

6.2 Test 2 – Must Be No Satisfactory Alternative (Regulation 44(3)(a))

140. There are no satisfactory alternatives to these proposed geophysical / benthic surveys. Alternative equipment could be used; however, this may limit the effectiveness of the geophysical surveys and the survey results.

141. The Stromar geophysical surveys aim to achieve a 100% coverage (90% coverage for SSS) of the seabed survey area and to detect objects on the seabed to 1.0m. The geophysical survey results will be used to identify any potential hazards that should be avoided by the development and will also be used to feed into the benthic survey scope and determine the spread of sample stations in this survey. Additionally, the geophysical survey results will be used within the Environmental Impact Assessment (EIA) to offer a robust archaeological assessment.

142. The key areas where the geophysical survey results will be used within the EIA are within the baseline characterisation of multiple technical topics. For example, within the modelling of coastal processes, benthic ecology and marine archaeology. This survey is fundamental to ensure a robust EIA is carried out for the Stromar OWF. It is therefore considered that the 'no satisfactory alternative test' has been met and the project cannot be safely developed without the survey.

6.3 Test 3 – Action Authorisation Must Not Be Detrimental To Maintenance Of Relevant Species Population At A FCS In Their Natural Range (Regulation 44(3)(b))

143. The percentage of the reference population of each species which has the potential to be disturbed by use of the geophysical survey techniques is considered to be negligible (<1% for all species) and, therefore, not detrimental to the maintenance of the population of the species concerned at a FCS level.

7 Conclusion

144. The conclusions of this EPS and Protected Species Risk Assessment are as follows:

- The geophysical surveys will create a temporary, localised disturbance to EPS in the area. However, the overwhelming benefits that the Stromar OWF will have to Scotland and the UK's renewable energy contributions are significant and in accordance with Scottish planning policies (e.g. draft NPF4). The proposed development will align with the UK Government's Energy Security Strategy and Scotland's National Marine Plan;
- A low percentage of the population of EPS in a localised area will be impacted for a short period of time. This disturbance will likely arise as a result of noise impacts arising from geophysical survey operations;
- There is potential for individuals to be disturbed therefore an EPS Licence for disturbance for inshore and offshore surveys, and Basking Shark Licence for disturbance will be required;
- The mitigation measures (detailed in Section 4) will significantly reduce the risk of injury to EPS as a result of the geophysical survey work and therefore an offence will not be caused and an EPS Licence for injury will not be required;
- There is no potential for injury or disturbance to EPS in the vicinity of the geophysical survey works where there is a designated nature conservation site.

145. In conclusion, the **impacts are not considered to cause significant long-term disturbance or be detrimental to the FCS of EPS within the region**. An EPS Licence is required for activities where there is potential for disturbance to cetaceans as per Habitats Regulation 39(2); as there is disturbance to individuals an EPS Licence to disturb is required.

146. As there is **no potential for injury or significant disturbance to EPS in the vicinity of the survey works, it is considered that there is no potential for any LSE on nature conservation designated sites** in relation to the Conservation Objectives for marine mammals.

147. There is also the potential for injury or fatality to basking shark due to vessel collision. However, mitigation will be in place to reduce the risk of injury. **Given the short-term nature of the surveys, and that a small number of individuals would be at risk (due to the proposed mitigation measures), and that there would be no potential for a population level impact**, it is concluded that a Basking Shark Licence can be issued.

8 References

Braulik, G., Minton , G., Amano, M. and Bjørge, A (2020), 'Phocoena phocoena. The IUCN Red List of Threatened Species 2020: e.T17027A50369903'. Available online at: https://www.iucnredlist.org/species/17027/50369903 [Accessed March 2023].

CSA Ocean Sciences Inc (2020) 'Orsted Wind Power North America, LLC Application for Incidental harassment Authorization for the Non-Lethal Taking of Marine Mammals: Site Characterization Surveys Lease OCS-A 0486, 0517, 0487, 0500 and Associated Export Cable Routes'.

DECC (Department of Energy & Climate Change) (2016). UK Offshore Energy Strategic Environmental Assessment. March 2016.

Department for Business, Energy and Industrial Strategy (BEIS) (2020), 'Record of the Habitats Regulations Assessment undertaken under Regulation 65 of the Conservation of Habitats and Species 2017, and Regulation 33 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. Review of Consented Offshore Wind Farms in the Southern North Sea Harbour Porpoise SAC'.

Dyndo, M., Wiśniewska, D.M., Rojano-Doñate, L. and Madsen, P.T (2015), 'Harbour porpoises react to low levels of high frequency vessel noise'. Scientific Reports 5:11083.

Graham, I. M., Cheney, B. Hewitt, R.C., Cordes, L.S., Hastie, G.D., Russell, D.J.F., Arso Civil, M., Hammond, P.S. and Thompson, P.M (2016), 'Strategic Regional Pre-Construction Marine Mammal Monitoring Programme Annual Report 2016'. University of Aberdeen.

Graham, I. M., Merchant, N. D., Farcas, A., Barton, T. R., Cheney, B., Bono, S., Thompson, P. M (2019), 'Harbour porpoise response to pile-driving diminish over time'. Royal Society Open Science Vol, 6, Issue, 6.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J., and Øien, N (2017), 'Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys'.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J. and Øien, N (2021), 'Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. June 2021'. Available online at: https://scans3.wp.st-andrews.ac.uk/files/2021/06/SCANS-III_design-based_estimates_final_report_revised_June_2021.pdf [Accessed March 2023].

Hartley Anderson Ltd (2020), 'Underwater acoustic surveys: review of source characteristics, impacts on marine species, current regulatory framework and recommendations for potential management options'. NRW Evidence Report No: 448, 119pp, NRW, Bangor, UK.

Hermannsen, L., Beedholm, K., Tougaard, J. and Madsen, P.T (2014), 'High frequency components of ship noise in shallow water with a discussion of implications for harbor porpoises (Phocoena phocoena)'. The Journal of the Acoustical Society of America 136: 1640-1653.

Gilles, A., Authier, M., Ramirez-Martinez, N. C., Araújo, H., Blanchard, A., Carlström, J., Eira, C., Dorémus, G., Fernández-Maldonado, C., Geelhoed, S. C. V., Kyhn, L., Laram, S., Nachtsheim, D., Panigada, S., Pigeault, R., Sequeira, M., Sveegaard, S., Taylor, N. L., Owen, K., Saavedra, C., Vázquez-Bonales, J. A., Unger, B. and Hammond, P. S. 'Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys'

Inter-Agency Marine Mammal Working Group (IAMMWG) (2022), 'Updated abundance estimates for cetacean Management Units in UK waters'. JNCC report No. 680.

Joint Nature Conservation Committee (JNCC), Natural England and Countryside Council for Wales (2010), 'The Protection of Marine European Protected Species from Injury and Disturbance. Draft Guidance for the Marine Area in England and Wales and the UK Offshore Marine Area'.

Joint Nature Conservation Committee (JNCC) (2017), 'JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys'.

Joint Nature Conservation Committee (JNCC) (2019), 'Article 17 Habitats Directive Report 2019: Species Conservation Status Assessments 2019'. Available online at: https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-species/#regularly-occurring-species-vertebrate-species-mammals-marine [Accessed March 2023].

Joint Nature Conservation Committee (JNCC), Department of Agriculture, Environment and Rural Affairs (DAERA) and Natural England (2020), 'Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Waters and Northern Ireland)'.

Kastelein, R. A., and Hagedoorn, M (2003), 'Audiogram of a striped dolphin (Stenella coeruleoalba)'. JASA 113.

Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M (2001), 'Collisions between ships and whales'. Marine Mammal Science 17 (1): 30-75.

Macleod, K., Lacey, C., Quick, N., Hastie, G. and Wilson, J. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 2. Cetaceans and Basking Sharks. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.

Moray Offshore Renewables Ltd (2018), 'Moray West Offshore Windfarm. EIA Report Volume 2 – EIA Report Main Text'. Available online at: https://www.webarchive.org.uk/wayback/archive/20161001194100/http://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest [Accessed March 2023].

Marine Scotland (2014), 'The protection of Marine European Protected Species from injury and disturbance Guidance for Scottish Inshore Waters. March 2014'. Available online at: https://webarchive.nrscotland.gov.uk/3000/https://www.gov.scot/Resource/0044/00446679.pdf [Accessed March 2023].

Marine Scotland (2020), 'The protection of Marine European Protected Species from injury and disturbance. Guidance for Scottish Inshore Waters (July 2020 Version)'. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/07/marine-european-protected-species-protection-from-injury-and-disturbance/documents/marine-european-protected-species-guidance-july-2020/marine-european-protected-species-guidance-july-2020/govscot%3Adocument/EPS%2Bguidance%2BJuly%2B2020.pdf [Accessed March 2023].

Mickle, M.F., Pieniazek, R.H. and Higgs, D.M. (2020). Field assessment of behavioural responses of southern stingrays (*Hypanus americanus*) to acoustic stimuli. Royal Society open science, 7(1), p.191544.

Nachtigall, P. E., Mooney, T. A., Taylor, K. A., Miller, L. A., Rasmussen, M. H., Akamatsu, T., Teilmann, J., Linnenschmidt, M., Vikingsson, G. A (2008), 'Shipboard measurements of the hearing of the white-beaked dolphin Lagenorhynchus albirostris'. Journal of Experimental Biology 211(4): 642-647.

National Oceanic and Atmospheric Administration (NOAA) (2018), 'Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing, Technical Memorandum NMFS-OPR-55, 2018' [Accessed March 2023].

National Oceanic and Atmospheric Administration (NOAA) (2019), 'Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Site Characterization Surveys of Lease Areas OCS–A 0486, OCS–A 0487, and OCS–A 0500'. DEPARTMENT OF COMMERCE - Federal Register / Vol. 84, No. 144 / Friday, July 26, 2019 / Notices [Accessed March 2023].

NatureScot (2021), 'Conservation and Management Advice. Moray Firth SAC'. Available online at: https://sitelink.nature.scot/site/8327 [Accessed March 2023].

NMPi (National Marine Plan Interactive) (2022). Marine Scotland Maps NMPI. https://marinescotland.atkinsgeospatial.com/nmpi/ [Accessed March 2023].

Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D. A., Bartol, S., Carlson, T. J., Coombs, S., Ellison, W. T., Gentry, R. L., Halvorsen, M. B., Løkkeborg, S., Rogers, P. H., Southall, B. L., Zeddies, D. G. and Tavolga, W. N. (2014), 'Sound exposure guidelines for Fishes and Sea Turtles', Springer Briefs in Oceanography, DOI 10.1007/978-3-319-06659-2.

Pirotta, E., Merchant, N.D., Thompson, P.M., Barton, T.R. and Lusseau, D (2015), 'Quantifying the effect of boat disturbance on bottlenose dolphin foraging activity'. Biological Conservation 181: 82-89.

Prideaux, G (2017), 'Technical Support Information to the CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities'. Convention on Migratory Species of Wild Animals, Bonn.

Reid, J.B., Evans, P.G.H. and Northridge, S.P (2003), 'Atlas of Cetacean distribution in north-west European waters', JNCC, Peterborough, ISBN 1 86107 550 2.

Robinson, K.P., Eisfeld, S.M., Costa, M. and Simmonds, M.P (2010), 'Short-beaked common dolphin (Delphinus delphis) occurrence in the Moray Firth, north-east Scotland'. Marine Biodiversity Records 3(55): 1-4.

Russell, D.J.F, Jones, E.L. and Morris, C.D (2017), 'Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals'. Scottish Marine and Freshwater Science Vol 8 No 25, 25pp. DOI: 10.7489/2027-1.

Scottish Government (2020), - 'Marine Scotland. The protection of Marine European Protected Species from injury and disturbance. Guidance for Scottish Inshore Waters (July 2020 Version)'. Available online at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/07/marine-european-protected-species-protection-from-injury-and-disturbance/documents/marine-european-protected-species-guidance-july-2020/marine-european-protected-species-guidance-july-2020/govscot%3Adocument/EPS%2Bguidance%2BJuly%2B2020.pdf [Accessed March 2023].

Scottish Government (2022), 'National Planning Framework 4'. Available online at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2022/11/national-planning-framework-4-revised-draft/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4-revised-draft.pdf [Accessed March 2023].

Scottish Natural Heritage (SNH) (2017a), 'The Scottish marine wildlife watching code'. Available online at: https://www.nature.scot/sites/default/files/2017-06/Publication%202017%20-%20The%20Scottish%20Marine%20Wildlife%20Watching%20Code%20SMWWC%20-%20Part%201%20-%20April%202017%20%28A2263518%29.pdf [Accessed March 2023].

Scottish Natural Heritage (SNH) (2017b), 'A guide to best practice for watching marine wildlife'. Available online at: https://www.nature.scot/sites/default/files/2017-06/Publication%202017%20-%20A%20Guide%20to%20Best%20Practice%20for%20Watching%20Marine%20Wildlife%20SMWWC%20-%20Part%202%20-%20April%202017%20%28A2263517%29.pdf [Accessed March 2023].

Sinclair, R. Kazer, S. Ryder, M. New, P. and Verfuss, U. (2021). 'Review and recommendations on assessment of noise disturbance for marine mammal', NRW Evidence Report No. 529.

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr, C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A. and Tyack, P.L (2007), 'Marine Mammal Noise-Exposure Criteria: Initial Scientific Recommendations'. Aquatic Mammals 33(4): 411-521.

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L (2019), 'Marine mammal noise exposure criteria: updated scientific recommendations for residual hearing effects'. Aquatic Mammals 45(2): 125-232.

Special Committee on Seals (SCOS) (2020), 'Scientific Advice on Matters Related to the Management of Seal Populations: 2019'. Available online at: http://www.smru.st-andrews.ac.uk/files/2020/08/SCOS-2019.pdf [Accessed March 2023].

The Shark Trust. (2018). Basking Shark Project. Available at: https://www.sharktrust.org/Handlers/Download.ashx?IDMF=55251894-a915-4f33-b7f5-6bbba0cf495b [Accessed April 2023].

Thompson, P.M., Brookes, K.L., Graham, I.M., Barton, T.R., Needham, K., Bradbury, G. and Merchant, N.D. (2013), 'Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises'. Proc R Soc Lond. B. Biol Sci. 2013, 280:20132001.

Thomsen, F., Lüdemann, K., Kafemann, R. and Piper, W (2006), 'Effects of offshore windfarm noise on marine mammals and fish, on behalf of COWRIE Ltd'.

Van Waerebeek, K., Baker, A.N., Félix, F., Gedamke, J., Iñiguez, M., Sanino, G.P., Secchi, E., Sutaria, D., van Helden, A. and Wang, Y (2007), 'Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, an initial assessment'. Latin American Journal of Aquatic Mammals 6:43-69.

Vanderlaan, A.S. and Taggart, C.T (2007), 'Vessel collisions with whales: the probability of lethal injury based on vessel speed'. Marine Mammal Science 23:144-156.

Wessex Archaeology Ltd. (2007). Historic Environment Guidance for the Offshore Renewable Energy Sector. Commissioned by COWRIE Ltd (project reference ARCH-11-05).

Wisniewska, D.M., Johnson, M., Teilmann, J., Siebert, U., Galatius, A., Dietz, R. and Madsen, P.T (2018), 'High rates of vessel noise disrupt foraging in wild harbour porpoises (Phocoena phocoena)'. Proc. R. Soc. B 285: 20172314.

Appendix 1

The location co-ordinates (WGS84) of the Stromar OWF study area are presented below in **Table A.1**.

Table A.1: The WGS84 latitude and longitude co-ordinates for the survey area boundary.

WGS84 Longitude-Latitude Co-ordinates				
No.	**Long (DDM)**	**Lat (DDM)**	**Long (DD)**	**Lat (DD)**
Array Area				
1	2° 1.775' W	58° 25.157' N	-2.02959	58.4193
2	2° 1.677' W	58° 23.806' N	-2.02794	58.3968
3	2° 1.918' W	58° 23.810' N	-2.03196	58.3968
4	2° 2.143' W	58° 23.814' N	-2.03571	58.3969
5	2° 2.829' W	58° 23.830' N	-2.04714	58.3972
6	2° 3.749' W	58° 23.849' N	-2.06248	58.3975
7	2° 5.372' W	58° 23.885' N	-2.08953	58.3981
8	2° 5.410' W	58° 23.886' N	-2.09017	58.3981
9	2° 5.454' W	58° 23.887' N	-2.0909	58.3981
10	2° 7.135' W	58° 23.919' N	-2.11892	58.3987
11	2° 8.830' W	58° 23.947' N	-2.14717	58.3991
12	2° 9.149' W	58° 23.953' N	-2.15249	58.3992
13	2° 9.929' W	58° 23.965' N	-2.16548	58.3994
14	2° 9.930' W	58° 23.966' N	-2.16549	58.3994
15	2° 9.937' W	58° 23.976' N	-2.16562	58.3996
16	2° 9.947' W	58° 23.992' N	-2.16579	58.3999
17	2° 9.978' W	58° 24.035' N	-2.1663	58.4006
18	2° 10.313' W	58° 24.536' N	-2.17188	58.4089
19	2° 10.722' W	58° 25.098' N	-2.17869	58.4183
20	2° 11.151' W	58° 25.727' N	-2.18585	58.4288
21	2° 11.519' W	58° 26.252' N	-2.19199	58.4375
22	2° 12.492' W	58° 27.595' N	-2.2082	58.4599
23	2° 12.551' W	58° 27.683' N	-2.20918	58.4614
24	2° 12.595' W	58° 27.744' N	-2.20992	58.4624
25	2° 12.636' W	58° 27.804' N	-2.2106	58.4634
26	2° 13.595' W	58° 29.152' N	-2.22658	58.4859
27	2° 13.744' W	58° 29.364' N	-2.22906	58.4894
28	2° 14.008' W	58° 29.735' N	-2.23346	58.4956
29	2° 14.853' W	58° 30.928' N	-2.24756	58.5155
30	2° 14.879' W	58° 30.963' N	-2.24798	58.5161
31	2° 14.884' W	58° 30.971' N	-2.24807	58.5162
32	2° 14.885' W	58° 30.972' N	-2.24808	58.5162
33	2° 14.886' W	58° 30.973' N	-2.2481	58.5162
34	2° 14.895' W	58° 30.986' N	-2.24825	58.5164
35	2° 14.908' W	58° 31.004' N	-2.24846	58.5167
36	2° 14.911' W	58° 31.008' N	-2.24852	58.5168
37	2° 14.914' W	58° 31.012' N	-2.24856	58.5169
38	2° 15.253' W	58° 31.489' N	-2.25421	58.5248
39	2° 16.008' W	58° 32.588' N	-2.2668	58.5431
40	2° 16.327' W	58° 33.014' N	-2.27211	58.5502

WGS84 Longitude-Latitude Co-ordinates				
No.	**Long (DDM)**	**Lat (DDM)**	**Long (DD)**	**Lat (DD)**
41	2° 16.629' W	58° 33.440' N	-2.27715	58.5573
42	2° 16.969' W	58° 33.906' N	-2.28281	58.5651
43	2° 17.228' W	58° 34.287' N	-2.28714	58.5714
44	2° 17.430' W	58° 34.567' N	-2.29049	58.5761
45	2° 17.773' W	58° 35.042' N	-2.29622	58.584
46	2° 14.484' W	58° 35.998' N	-2.24141	58.6
47	2° 10.653' W	58° 37.103' N	-2.17756	58.6184
48	2° 7.952' W	58° 37.881' N	-2.13253	58.6314
49	2° 6.706' W	58° 38.239' N	-2.11176	58.6373
50	2° 2.174' W	58° 30.643' N	-2.03624	58.5107
51	2° 2.168' W	58° 30.632' N	-2.03613	58.5105
52	2° 2.167' W	58° 30.614' N	-2.03611	58.5102
53	2° 2.048' W	58° 28.989' N	-2.03413	58.4831
54	2° 2.048' W	58° 28.989' N	-2.03414	58.4831
55	2° 4.365' W	58° 28.304' N	-2.07274	58.4717
56	2° 1.864' W	58° 25.388' N	-2.03107	58.4231
57	2° 1.775' W	58° 25.157' N	-2.02959	58.4193
Note: co-ordinates no 53 and 54 are, approximately, 30 cm apart in the Stromar Lease Area dataset received from Crown Estate Scotland. DDM co-ordinates are not precise enough to reflect this and as such appear as duplicates in the table above.				
Array Area Buffer for Vessel Turning (1km Buffer)				
58	2° 6.027' W	58° 38.914' N	-2.10045	58.6486
59	1° 57.153' W	58° 23.979' N	-1.95254	58.3997
60	2° 10.868' W	58° 21.735' N	-2.18113	58.3623
61	2° 19.830' W	58° 36.655' N	-2.3305	58.6109
62	2° 6.027' W	58° 38.914' N	-2.10045	58.6486
Offshore ECC Study Area (no 1km buffer)				
63	1° 36.519' W	57° 46.642' N	-1.608655	57.777362
64	1° 33.293' W	57° 48.973' N	-1.554886	57.816225
65	1° 33.105' W	57° 53.954' N	-1.551742	57.899227
66	1° 54.168' W	58° 2.636' N	-1.902799	58.043926
67	1° 53.455' W	58° 14.137' N	-1.890915	58.23561
68	2° 2.168' W	58° 30.630' N	-2.036129	58.510501
69	2° 2.048' W	58° 28.989' N	-2.034137	58.483147
70	2° 4.365' W	58° 28.304' N	-2.072744	58.471726
71	2° 1.864' W	58° 25.388' N	-2.031069	58.42314
72	2° 1.775' W	58° 25.157' N	-2.029585	58.419282
73	2° 1.677' W	58° 23.806' N	-2.027943	58.396774
74	2° 9.929' W	58° 23.965' N	-2.165476	58.399414
75	2° 17.773' W	58° 35.042' N	-2.29622	58.58403
76	2° 17.019' W	58° 10.598' N	-2.283649	58.176639
77	2° 25.918' W	57° 59.900' N	-2.431975	57.998339
78	2° 32.807' W	57° 54.296' N	-2.546788	57.904941

WGS84 Longitude-Latitude Co-ordinates				
No.	**Long (DDM)**	**Lat (DDM)**	**Long (DD)**	**Lat (DD)**
79	2° 33.525' W	57° 52.491' N	-2.558753	57.874845
80	2° 28.221' W	57° 52.183' N	-2.470347	57.869719
81	2° 13.516' W	57° 53.254' N	-2.225262	57.887565
82	1° 58.311' W	57° 53.539' N	-1.97185	57.892324
83	1° 48.460' W	57° 51.898' N	-1.807667	57.864961
Nearshore ECC study Area (no 1km buffer)				
84	1° 49.682' W	57° 37.069' N	-1.82803	57.617822
85	1° 53.595' W	57° 39.635' N	-1.893247	57.660586
86	1° 55.926' W	57° 40.981' N	-1.932098	57.683018
87	1° 58.523' W	57° 40.700' N	-1.975385	57.678325
88	2° 0.085' W	57° 42.064' N	-2.001409	57.701063
89	2° 7.289' W	57° 42.226' N	-2.121477	57.703758
90	2° 11.107' W	57° 40.699' N	-2.185123	57.67832
91	2° 17.860' W	57° 41.913' N	-2.297672	57.698554
92	2° 21.927' W	57° 40.625' N	-2.365442	57.677077
93	2° 29.724' W	57° 40.498' N	-2.495405	57.674973
94	2° 31.399' W	57° 40.377' N	-2.523311	57.672957
95	2° 34.462' W	57° 41.049' N	-2.574368	57.684153
96	2° 38.082' W	57° 40.973' N	-2.634696	57.682884
97	2° 33.412' W	57° 52.777' N	-2.556867	57.879621
98	2° 28.139' W	57° 52.302' N	-2.468988	57.871693
99	2° 21.670' W	57° 53.427' N	-2.361161	57.890447
100	2° 13.564' W	57° 53.410' N	-2.226058	57.890171
101	2° 5.023' W	57° 53.878' N	-2.083722	57.897958
102	1° 56.402' W	57° 53.568' N	-1.940028	57.8928
103	1° 48.580' W	57° 52.012' N	-1.809666	57.866867
104	1° 41.152' W	57° 49.675' N	-1.685868	57.827914
105	1° 36.262' W	57° 46.829' N	-1.604371	57.780487