European Protected Species (EPS) Risk Assessment

2026 Export Cable Corridor and Windfarm Site Survey Campaign

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Summary

As part of the offshore export cable corridor (ECC) and Windfarm Site investigation surveys at Green Volt Offshore Windfarm, the use of a Sub-Bottom Profiler (SBP) is considered worst case from these survey types.

- Taking into account the operating frequency of the SBP, the hearing range of cetacean species that could be in the area and the proposed mitigation, there is no risk of auditory injury to cetaceans (see **Section 3.2.1**).
- Taking into account the potential for temporary disturbance of cetaceans, it is present but there is no risk of significant disturbance that could affect the cetacean populations or their Favourable Conservation Status (FCS).
- There is no predicted significant effect on designated sites where bottlenose dolphin or minke whale are qualifying features.
- There is no potential for increased collision risk to marine mammals, as vessels will be slow moving and follow the proposed best practice.

Therefore, it is considered that European Protected Species (EPS) licence to disturb is required and the criteria are met. There is no requirement for an EPS licence for injury.

1 Introduction

This European Protected Species (EPS) Stage 1 Risk Assessment (RA) has been undertaken to support the Marine EPS Licence application submitted to the Marine Directorate - Licensing Operations Team (MD-LOT) regarding the geophysical and geotechnical surveys being undertaken for the Green Volt Offshore Windfarm (OWF) and associated works.

The purpose of this EPS Stage 1 RA is to determine whether there is potential for the proposed marine surveys to cause deliberate harm or inadvertently cause disturbance to cetaceans or other protected species and if mitigation would be required for survey activities. The need for a Marine EPS Licence will be determined by the MD-LOT, with advice from Marine Directorate Science, Evidence, Data and Digital (MD-SEDD) and NatureScot, based on findings from the EPS Stage 1 RA. MD-LOT's consideration of whether an EPS Licence will be required will comprise three tests:

1. To ascertain whether the licence is to be granted for one of the purposes specified in Regulation 44 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended);
2. To ascertain whether there are no satisfactory alternatives to the activity proposed (that would avoid the risk of offence); and
3. That the licencing of the activity will not be detrimental to the maintenance of the population of the species concerned at a *Favourable Conservation Status* (FCS)[1].

[1] *The Habitats Directive defined the conservation status of a species to be taken as 'favourable' when population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, when the natural range of the species is not being reduced for the foreseeable future and there is, a sufficiently large habitat to maintain its populations on a long-term basis.*

1.1 EPS Protection

All species of cetacean (whale, dolphin, and porpoise) occurring in United Kingdom (UK) waters and otters are listed in Annex IV of the Habitats Directive as EPS, meaning that they are species of community interest in need of strict protection, as directed by Article 12 of the Directive.

This protection is afforded in Scottish territorial waters (out to 12 nautical miles (nm)) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Regulation 39(1) of these Regulations make it an offence to:

a. Deliberately or recklessly capture, injure or kill a wild animal of an EPS;

b. Deliberately or recklessly:

   i. Harass a wild animal or group of wild animals of an EPS;

   ii. Disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;

   iii. Disturb such an animal while it is rearing or otherwise caring for its young;

   iv. Obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;

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

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

   vii. Disturb such an animal while it is migrating or hibernating.

Further protection is afforded through an additional disturbance offence given under Regulation 39(2) which states that "*it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)*".

Outside of 12 nm, the extent of legislative protection against injury is the same as within 12 nm. However, the definition of disturbance outside of 12 nm does not extend to individual animals. Therefore, whilst disturbance of a single animal within 12 nm may be considered an offence and thus require an EPS licence, for an EPS licence to be required outside of 12 nm there must be disturbance of a significant group of animals.

1.1.1 What constitutes disturbance?

Within 12 nautical miles

Whether or not a specific activity could cause 'disturbance' depends on the nature of the particular activity and the impact on the particular species. Whilst 'disturbance' is not defined in the Habitats Regulations, Marine Scotland (2020) advise that the following matters should be taken into account when considering what constitutes disturbance:

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

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

Marine Scotland (2020) advise 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 so assessments 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).

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 occur, an EPS RA must be carried out and the need for a Marine EPS Licence determined.

Outside of 12 nautical miles

As Regulation 39(2) of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) is not applicable to offshore waters, disturbance of an individual animal would not necessarily qualify as significant disturbance requiring a Marine EPS Licence. Instead, under the Conservation of Offshore Marine Habitats and Species Regulations 2017, disturbance must occur to a sufficiently large or important group of animals that the ability of that group of animals to survive, breed or rear or nurture their young would be compromised. Alternatively, disturbance could be also considered to occur if the local distribution or abundance of the species was significantly changed.

1.2 Site Investigation Survey Works

Site investigation surveys will be undertaken within the Green Volt offshore export cable corridor (ECC) and Windfarm Site (**Figure 1**). Geophysical and geotechnical surveys will be conducted using up to three survey vessels. The total survey area within the ECC is 177.94 km², and the survey area for the Windfarm Site is 11.4 km². The overall survey area, including a 2 km buffer to allow for vessel turning, extends across a wider area of up to 374.2 km². At its nearest point to the coastline, the survey area is located approximately 1.5 km from the coastline. The geotechnical survey area is full encompassed within the ECC and Windfarm Site Geophysical Survey Area (**Table 1**).

Table 1 Site investigation survey area

Description	Survey Area (km²)
ECC	177.94
Windfarm Site	11.4
Total survey area (including 2 km buffer)	374.2

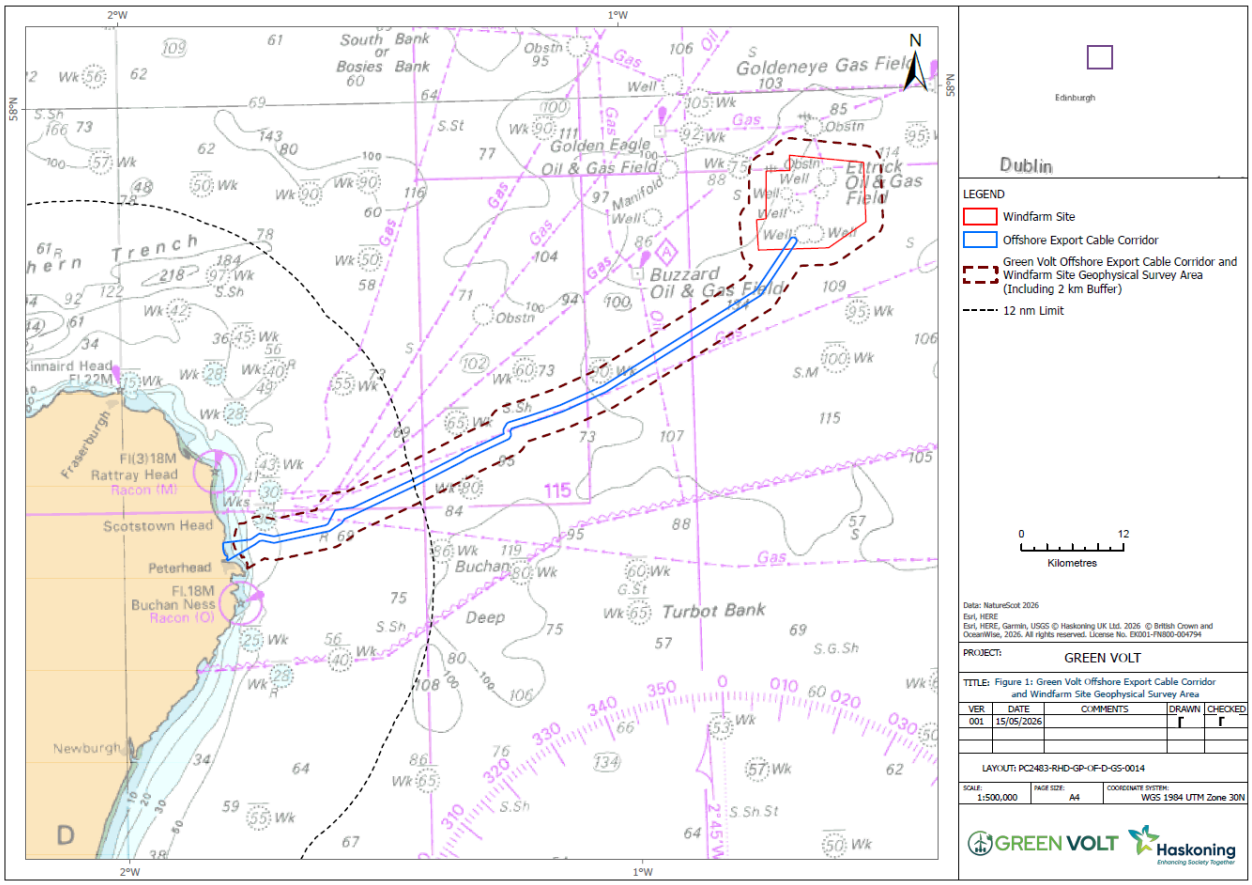

Figure 1 Green Volt Export Cable Corridor and Windfarm Site 2026 Survey Campaign

1.2.1 ECC and Windfarm Site survey vessels and duration

The geophysical survey will be undertaken using up to two survey vessels to meet the survey requirements. An additional vessel will be used to undertake geotechnical investigations. The estimated number of days that the vessels are expected to be on site, excluding weather downtime, are outlined for each survey vessel. As a worst case, three vessels may be on site at any one time:

- Vessel 1 and 2 for geophysical survey (estimated 31 working days); and
- Vessel 3 for the geotechnical survey (estimated 48 working days).

The proposed survey campaign is scheduled to commence from 10 August 2026 at the earliest and conclude no later than 30 November 2026, depending on the start date.

1.2.2 Types of noisy survey equipment

The site investigation survey will involve different types of survey equipment, summarised in **Table 2**.

Table 2 Types of survey equipment

Type of survey equipment	Description
Sub-Bottom Profilers (SBP)	SBP systems are used to identify and characterise layers of sediment or rock under the seafloor. A transducer emits a sound pulse vertically downwards towards the seafloor, and a receiver records the return of the pulse once it has been reflected off the seafloor.
Multibeam Echo Sounder (MBES)	MBES are used to obtain detailed 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.
Side Scan Sonar (SSS)	SSS is used to generate an accurate image of the seabed. 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 higher frequency systems provide higher resolution, but shorter-range measurements.
Ultra-high resolution (UHR) Sparker	Sparker systems use the same methodology as SBP, but operate in much higher frequencies, thus enabling a high resolution and deep penetration of the seabed.
Ultra-short Baseline (USBL)	USBL is an acoustic positioning system, consisting of a vessel mounted transceiver and a transponder mounted on the towed survey array or ROV. This system is necessary for the correct positioning of the other survey equipment for reliable data collection.

Type of survey equipment	Description
High frequency imaging sonar (ROV)	ROV-mounted acoustic imaging system which is used to create high-resolution 'video-like' imaging of objects or structures. The high frequency range of the equipment allows increased image resolution with a trade-off of shorter working range.
Geotechnical Works: Shallow Core Penetration Test (CPT), Vibrocoring, Piston coring	Geotechnical samples to be taken to a depth of up to 6.1m below seabed.

Table 3 outlines the frequency ranges and sound levels using sound pressure level (SPL / L_p) peak SPL (SPL_{peak} / $L_{p\,-pk}$) and/or sound exposure level (SEL / $L_{E,p}$) for the survey equipment required for the surveys. It can be concluded from the sound levels that the equipment is sufficient to cause injury and disturbance to EPS that may be present in the survey area while the surveys are being conducted.

SBP has been used as a worst-case for the survey for this EPS RA, based on the frequency range and sound levels. The frequency range for the SBP,USBL, and UHR Sparker are within cetacean hearing range (of less than 100 kilohertz (kHz), as noted in the Joint Nature Conservation Committee (JNCC) 2017 *'Guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys'*.

There is also the requirement for MBES, SSS and high frequency imaging sonar to be used for the geophysical survey which will be out with the hearing range of cetaceans (**Table 3**) with frequencies ranging from 150 kHz up 3000 kHz.

The geotechnical equipment to be utilised for the geotechnical survey would barely be audible above the sound of the vessel and therefore has no potential to cause disturbance.

Table 3 Survey equipment frequency ranges and sound levels (n/a = information not available)

Equipment	Frequency range	Sound Level (peak SPL or RMS)
SBP	85 – 115 kHz (primary high frequency (HF)) 2 - 22 kHz (secondary low frequency)	SPL / L_p: at maximum duty cycle: 248 dB re 1uPa @ 1m peak SPL / $L_{p\,-pk}$ SEL / $L_{E,p}$: for 1 pulse :0.166 ms in 1 s = 218 dB re re $1uPa^2s$
USBL	21 – 31 kHz	SPL / L_p: 200 dB re 1µPa @ 1m peak SPL / $L_{p\,-pk}$
MBES	150 – 700 kHz	SPL / L_p: up to 221 dB re 1µPa @ 1 m pulse length: 3-200 microseconds peak SPL / $L_{p\,-pk}$ SEL/ $L_{E,p}$: up to 185 dB re$1\mu Pa^2s$ @ 1 m
SSS	210 – 250 kHz 510 – 570 kHz	SPL / L_p: up to 220 dB re 1µPa at 1 m peak SPL / $L_{p\,-pk}$ SEL/ $L_{E,p}$: up to 205 dB re$1\mu Pa^2s$ at 1 m
Ultra-high resolution (UHR) Sparker	0.4 – 8 kHz	SPL / L_p: 226 dB re 1 µPa @ 1 m root mean square (RMS)
High frequency imaging sonar (ROV)	1.8 – 3.0 megahertz (MHz)	N/A

Equipment	Frequency range	Sound Level (peak SPL or RMS)
Geotechnical equipment (Shallow CPT, vibrocore, piston core)	Vibrocore – 25 – 30 Hz Others – N/A	N/A

To summarise, it is considered that the vessel undertaking geotechnical work has no potential for EPS licence requirements. Whereas the vessels undertaking geophysical survey work have the potential to require an EPS licence. However, for completion, this risk assessment includes all vessels in assessments of potential disturbance due to vessel presence.

2 Protected Species

2.1 Cetacean Species (EPS)

As noted above, all cetacean species are listed as EPS. The cetacean species that could be present in and around the ECC and Windfarm Site includes (e.g. Small Cetaceans in European Atlantic waters and the North Sea (SCANS) surveys; Waggitt *et al*., 2019):

- Harbour porpoise (*Phocoena phocoena*)
- Bottlenose dolphin (*Tursiops truncatus*)
- White-beaked dolphin (*Lagenorhynchus albirostris*)
- Atlantic white-sided dolphin (*Lagenorhynchus acutus)*
- Risso's dolphin (*Grampus griseus*)
- Minke whale (*Balaenoptera acutorostrata*)
- Humpback whale (*Megaptera novaeangliae*)
- Fin whale (*Balaenoptera physalus*).

Assessments have not been undertaken for other cetacean species as they are considered to be rare in the area and the potential to be affected is considered unlikely. However, if individuals of other cetacean species (EPS species) were present in the area, then the mitigation measures will be suitable for these species, as the assessments have been carried out on all the representative functional hearing groups for porpoise, dolphin and whale species.

Table 4 summarises the cetacean species, density estimates, reference populations, and management units (MU) used in the assessments.

Table 4 Marine mammal species, density estimates and reference populations

Species	Density Estimate	Reference Population
Harbour porpoise	**0.76** / km^2 (site-specific aerial survey annual density estimate by HiDef)	North Sea (NS) MU UK portion = 159,632 (IAMMWG, 2023)
Bottlenose dolphin	**0.0298** / km^2 (CV = 0.861) (SCANS-III Survey Block R; Hammond *et al*., 2021)	Greater North Sea (GNS) MU UK portion = 1,885 (IAMMWG, 2023) CES MU 226 (Cheney *et al*. (2024)

Species	Density Estimate	Reference Population
White-beaked dolphin	**0.1775** / km^2 (CV = 0.383) (SCANS-IV Survey Block NS-E; Gilles *et al*., 2023)	Celtic and Greater North Seas (CGNS) MU UK portion = 34,025 (IAMMWG, 2023)
Atlantic white-sided dolphin	**0.0146**/ km^2 (CV = 1.028) (SCANS-IV Survey Block NS-E; Gilles *et al*., 2023)	CGNS MU UK Portion = 12,293 (IAMMWG, 2023)
Risso's dolphin	**0.0702** / km^2 (CV = 0.974) (SCANS-IV Survey Block NS-E; Gilles *et al*., 2023)	CGNS MU UK Portion = 8,687 (IAMMWG, 2023)
Minke whale	**0.0419** / km^2 (CV = 0.594) (SCANS-IV Survey Block NS-D; Gilles *et al*., 2023)	CGNS MU UK Portion = 10,288 (IAMMWG, 2023)
Humpback whale	**0.000015** / km^2 (North Atlantic; SCANS-III Survey Block T; Hammond *et al*., 2021 Hague *et al*., 2020)	North Atlantic = 35,000 (NAMMCO, 2022; Hague *et al*., 2020)
Fin whale	**0.0009** / km^2 (CV = 0.947) (SCANS-IV Survey Block NS-D; Gilles *et al*., 2023	North Atlantic (UK population) = 3,330 (JNCC, 2019)

2.2 Other Protected Species

2.2.1 Basking Shark

Basking shark (*Cetorhinus maximus*) are listed on Schedule 5 of the Wildlife and Countryside Act (WCA) 1981. The WCA was enacted in the UK to implement the Birds Directive and Bern Convention and applies to the terrestrial environment and inshore waters (up to 12 nm from land). Basking sharks are protected under Schedule 5 of the WCA which means it is an offence to: intentionally or recklessly kill, injure or take, or intentionally or recklessly disturb or harass.

This protection was enhanced further by the Nature Conservation (Scotland) Act 2004. Under Schedule 6 of this legislation, it is an offence to deliberately or recklessly capture, kill, or disturb basking sharks. Furthermore, the Wildlife and Natural Environment (Scotland) Act 2011 added a new licensing purpose to the 1981 Act, at section 16(3) (i)): 'for any other social, economic or environmental purpose' for certain protected species including basking shark.

Therefore, if an activity proposed to be undertaken within Scottish inshore waters (12 nm) is judged likely to cause disturbance or injury to basking sharks, a licence must be obtained from MD-LOT to undertake the activity legally subject to licence conditions being complied with. While the Windfarm Site lies out with the 12 nm boundary, the ECC is partly situated within the Scottish inshore waters within 12 nm from shore.

The basking shark is an elasmobranch (sharks and rays) which is a group with generally 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). Taking into account the hearing range of elasmobranchs, in between 20 Hz to 1 kHz with greatest sensitivities at lower frequencies (Mickle *et al*., 2020). As 20 Hertz (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 during the surveys to **injure or disturb basking shark is unlikely and has not been assessed further**.

Vessel collision can pose a threat to slow-moving species such as basking sharks, with collision risk increasing with increased vessel speed. However, as the survey vessels will be moving slowly, collision risk will be low. Any collision risk would be reduced by the proposed best practice measures to reduce vessel collision risk and the Scottish Marine Wildlife Watching Code (Scottish Natural Heritage (SNH), 2017), as outlined in **Section 4**. **Therefore, the potential impacts on basking shark have not been assessed further.**

2.2.2 Pinnipeds

Harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) are common throughout UK waters. Although both species are Annex II species, they are not listed on Annex IV of the Habitats Directive, and as such are not classified as EPS. Seals are protected in the UK under the Conservation of Seals Act 1970. Both species are listed under Annex II of the European Union (EU) Habitats Directive and are considered Scottish Priority Marine Features (PMFs). The Protection of Seals (Designated of Haul-Out Sites) (Scotland) Order 2014 introduces additional protection for seals at 194 designated haul-out sites, where harbour seal and grey seal come ashore to rest, moult or breed.

As harbour and grey seal are not classified as EPS they have not been assessed in the EPS Stage 1 RA (**Section 3**). However, potential effects on designated and protected sites where harbour and/or grey seal are a qualifying feature are assessed in **Section 2.3.3**.

2.3 Protected Sites

2.3.1 Southern Trench NCMPA

The Green Volt ECC and Windfarm Site Geophysical Survey Area overlaps with the Southern Trench Nature Conservation Marine Protected Area (NCMPA), a site designated for minke whale, along with benthic habitat and geology features. Survey activities could cause potential disturbance to minke whale during works in the ECC and Windfarm Site Geophysical Survey Area (see **Figure 2**).

The assessments in **Section 3.2** show the potential effects on minke whale, with no assessments having a population level effect of more than 0.02% of the CGNS MU (for 3 km Effective Deterrence Radius (EDR) as a worst-case survey type; **Table 11**) and up to 0.2% of the CGNS MU (for the daily disturbance; **Table 12**). The cumulative assessment in **Section 3.5** indicated that if all plans and projects were to be conducted at the same time, only 0.90% of the CGNS MU (details in **Table 14**) would be potentially disturbed. Given the wide-ranging window in which the site investigation survey could take place, it is not possible to know the exact plans and projects that could overlap. As such, it is highly unlikely that all the projects assessed in **Table 14** would be taking place at the same time and, therefore, there is **no potential for significant effect on the Southern Trench NCMPA.**

2.3.2 Moray Firth SAC

The Moray Firth Special Area of Conservation (SAC) in north-east Scotland supports the only known resident population of bottlenose dolphin in the North Sea (NatureScot, 2021). It comprises the CES MU, with a population estimate of 226 individuals, (Cheney *et al.,* 2024). The Green Volt ECC and Windfarm Site Geophysical Survey Area has no spatial overlap with the Moray Firth SAC, but there is potential for bottlenose dolphins (coastal ecotype) from the SAC to utilise the inshore part of the ECC Geophysical Survey Area. The coastal ecotype of bottlenose dolphins, as the name suggests, prefers shallow waters up to 5 km off the coast (Marini *et al*., 2015; Rodriguez-Ferrer *et al*., 2020).

Between the Green Volt ECC and Windfarm Site Geophysical Survey Area and the Moray Firth SAC lies a distance of approximately 105 km, following a line around the coast. There is the possibility that coastal bottlenose dolphins may be present and therefore disturbed from site investigation works and vessel activity occurring in the coastal parts of the ECC part of the Geophysical Survey Area. From photo-ID surveys, bottlenose dolphin have been recorded utilising the southern shore of the Moray Firth (Robinson *et al.,* 2012) and are moving further south within the coastal regions of eastern England (Aynsley, 2017). It is expected however, that the works would be highly localised and temporary, thus minimising the potential for disturbance.

The ECC and Windfarm Site Geophysical Survey Area overlaps with the CES MU. If the CES bottlenose dolphin population were in close proximity to the geophysical activities occurring in the inshore section of the ECC, up to one individual could potentially be disturbed, 0.44% of the CES MU, using the 3 km EDR (**Table 11**) or up to eight individuals; 3.5% using the daily disturbance range (**Table 12**). Geophysical activities occurring in the offshore section of the ECC and the Windfarm Site will be too distant to affect the CES MU. However, this is based on a precautionary approach of a disturbance range intended for the hearing sensitivity of harbour porpoise, thus disturbance ranges are used as a proxy. In addition, as above, this assessment assumes all bottlenose dolphin with the potential to be disturbed would be from the Moray Firth SAC (or CES MU) which is considered unlikely.

The cumulative assessment in **Section 3.5** as a precautionary approach included the CES bottlenose dolphin in all assessments, with exception to the operating windfarms (Moray West and Seagreen). The assessment indicated that if all plans and projects were to be conducted at the same time, up to 6.6% of the CES MU (details in **Table 14**) would be potentially disturbed. Given the wide-ranging window in which the site investigation survey could take place, it is not possible to know the exact plans and projects that could overlap. As such, it is highly unlikely that all the plans and projects assessed in **Table 14** would be taking place at the same time. Additionally, some plans are likely to occur offshore and therefore unlikely to have any impact on the CES population. Each project would apply mitigation to ensure no marine mammals are in the proximity area of the project works.

Therefore, there is no potential for significant disturbance, or adverse effect, to the bottlenose dolphins associated with the Moray Firth SAC.

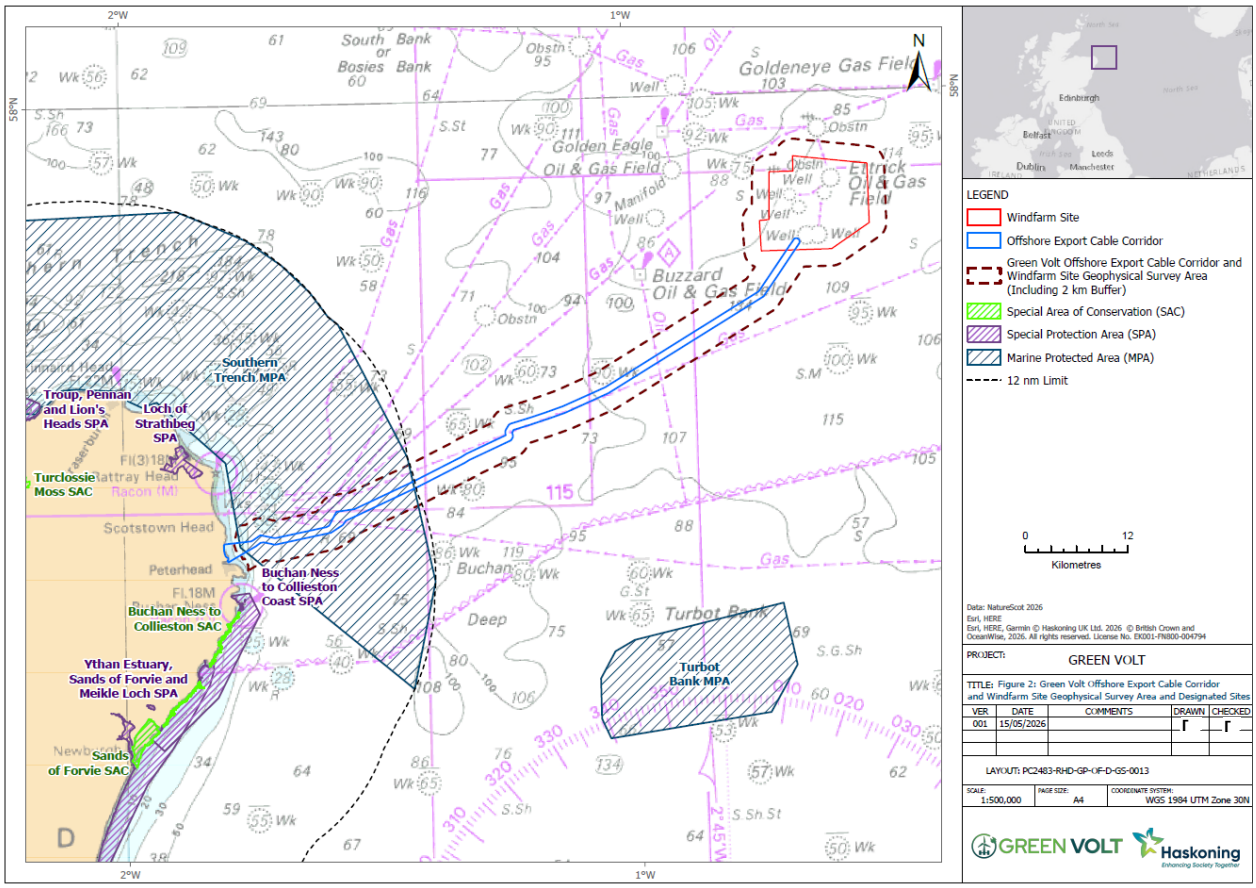

Figure 2 Green Volt ECC and Windfarm Site Geophysical Survey Area and Designated Sites

2.3.3 Protected seal haul-out sites

Harbour seal and grey seal are common throughout UK waters. Although both species are Annex II species, they are not listed on Annex IV of the Habitats Directive, and as such are not classified as EPS. Seals are protected in the UK under the Conservation of Seals Act 1970. Both species are listed under Annex II of the EU Habitats Directive and are considered Scottish Priority Marine Features (PMFs). The Protection of Seals (Designated of Haul-Out Sites) (Scotland) Order 2014 introduces additional protection for seals at 194 designated haul-out sites, where harbour seal and grey seal come ashore to rest, moult or breed.

Seal haul-out sites are coastal locations that seals use to breed, moult and rest. Almost 200 seal haul-out sites have been designated through The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 which was amended with additional sites in 2017. These haul-out sites are protected under Section 117 of the Marine (Scotland) Act 2010. The Act is designed to assist in protecting the seals when they are at their most vulnerable, and as such provide additional protection from intentional or reckless harassment.

The closest protected seal haul-out site to the ECC and Windfarm Site Geophysical Survey Area is Ythan River Mouth; a grey seal haul-out site located approximately 27 km from the survey area. Given the distance between the ECC and Windfarm Site Geophysical Survey Area and Ythan River Mouth, there is no potential for direct effect due to the site investigation works.

3 European Protected Species Stage 1 Risk Assessment

3.1 Potential Impacts

Potential impacts to cetaceans during site investigation surveys are:

- Permanent change in hearing sensitivity / auditory injury (Permanent Threshold Shift (PTS)) from underwater noise;
- Temporary change in hearing sensitivity (Temporary Threshold Shift (TTS)) from underwater noise;
- Disturbance from underwater noise;
- Possible behavioural response from underwater noise;
- Disturbance from presence of vessels; and
- Increased collision risk with vessels.

Underwater noise has the potential to impact cetaceans if the frequency is within their hearing range (**Table 5**) and/or the sound levels are greater than thresholds for the species (**Table 6**) (National Marine Fisheries Service (NMFS) *et al*.,, 2024).

Table 5 Cetacean hearing ranges (from NMFS et al., 2024)

Species Hearing Group	Generalised Hearing Range
Very high-frequency (VHF) cetaceans Harbour porpoise	200 Hz to 165 kHz
High-frequency (HF) cetaceans Bottlenose dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin	150 Hz to 160 kHz
Low-frequency (LF) cetaceans Minke whale, humpback whale and fin whale	7 Hz to 36 kHz

The potential for auditory injury is not just related to the level of the underwater sound and its frequency relative to the hearing bandwidth of the animal but is also influenced by the duration of exposure. NMFS *et al*. (2024) gives individual criteria based on whether the noise source is considered impulsive or non-impulsive. NMFS *et al*. (2024) categorises impulsive noises as having high peak sound pressure, short duration, fast rise-time and broad frequency content at source, and non-impulsive sources as steady-state noise. Seismic airguns are considered impulsive noise sources. Sonars, vessels and other low-level continuous noises are considered non-impulsive. A non-impulsive noise does not necessarily have to have a long duration.

NMFS *et al*. (2024) presents unweighted peak criteria for Sound Pressure Level (L_p) ($L_{p\,-pk}$) and cumulative (i.e. more than a single sound impulse) weighted Sound Exposure Level ($L_{E,p}$) criteria ($L_{E,p,t}$) for PTS, where unrecoverable hearing damage may occur, and TTS, where a temporary reduction in hearing sensitivity may occur in individual receptors (**Table 6**).

Table 6 Cetacean threshold and criteria for underwater noise (from NMFS et al., 2024)

Species Hearing Group	Unweighted $L_{p\text{-}pk}$ (dB re 1 µPa)		Weighted $L_{E,p,t}$ (dB re 1 µPa^{2}s)			
	Impulsive		Impulsive		Non-impulsive	
	Auditory Injury	TTS	Auditory Injury	TTS	Auditory Injury	TTS
Harbour porpoise (VHF cetacean)	202	196	159	144	181	161
Dolphin species (HF cetacean)	230	224	193	178	201	181
Minke whale, humpback whale and fin whale (LF cetacean)	222	216	183	168	197	177

Table 7 summarises the potential impact to cetaceans from the different types of survey equipment, taking into account frequency range and sound levels in **Table 3**.

JNCC *et al*. (2010) assessed MBES systems to have the potential to emit sound sources of up to 248 dB re 1µPa @ 1 m, with frequencies of between 10 kHz and 200 kHz; the proposed MBES equipment for the survey will be operating at a range of 150 kHz to 700 kHz (**Table 3**). Due to the high amplitude of MBES, there is the potential for auditory injury to cetaceans, however this is highly unlikely as an animal would need to be within very close proximity of the source.

It is also unlikely that the MBES could cause disturbance when active for a short period due to the operating frequencies being outside the audible range of all cetaceans (JNCC *et al*., 2010). MBES surveys that are carried out in waters of less than 200 m in depth are not considered to be a risk to cetaceans, as it is thought that the higher frequencies typically used fall outside of their hearing ranges, and the sounds are likely to attenuate quickly due to the high frequencies used. JNCC therefore advise that mitigation is unlikely to be required for MBES surveys in shallow (less than 200 m water depth) surveys (JNCC, 2017).

Similarly, the high frequency of the SSS, 210 to 570 kHz (**Table 3**), falls outside of the hearing ranges for cetaceans except for harbour porpoise, however, the sounds are likely to attenuate quickly due to the high frequencies used. Therefore, as for the MBES, mitigation in shallow waters (less than 200 m) is not required.

The frequencies used by the high frequency imaging sonar, 1.8 – 3.0 MHz (**Table 3**), falls outside of the hearing ranges for all cetaceans.

Frequency ranges of the SBP to be used in the survey will vary from 85-115 kHz or 2-22 kHz and the UHR Sparker at 0.4 – 8 kHz (**Table 3**). This will be within cetacean hearing range and will therefore be audible to cetacean species that could be present in the area. There is therefore the potential for disturbance impacts to occur. Most of the sound energy generated by the SBP equipment will be directed towards the seabed and the pulse duration is extremely short, with the continuous movement of the survey equipment. Auditory injury effects are not predicted, as an animal would need to remain in the very small zone of ensonification for a prolonged period, which is highly unlikely (JNCC *et al.,* 2010).

The USBL is used for positioning, and is within the hearing range for cetaceans (21-31 kHz; **Table 3**), with source levels predicted to be less than those of the SBP. Therefore, the SBP has been assessed as worst-case for the site investigation survey equipment.

Seismic airguns will not be used in any of the proposed survey work.

Table 7 Summary of potential impacts to cetacean species from site investigation survey equipment

Equipment	Potential Impacts to Cetacean Species	Assessed Further
SBP	HF SBP could have a frequency of 85-115 kHz (primary) and 2-22 kHz (secondary), depending on the band selected, with peak source level of 248 dB re 1uPa@1m. The SBP frequency ranges are within cetacean hearing range and will therefore be audible to the marine mammal species that could be present in the area.	**Yes** Potential risk of PTS assessed further. Potential disturbance assessed further.
UHR Sparker	UHR Sparker will be operating with a frequency of 0.4 - 8 kHz. The frequencies used by UHR within cetacean hearing range and will therefore be audible to the marine mammal species that could be present in the area.	**Yes** There is the potential for injury and disturbance impact, however SBP assessed for PTS as worst-case. The EDR assessment for disturbance is applicable to both SBP and UHR Sparker.
USBL	For the proposed surveys the USBL operating frequency would be typically 21 - 31 kHz, with SPL of 226 dB re 1µPa @ 1m. The USBL has operating frequencies within marine mammal hearing range.	**Yes** There is the potential for injury and disturbance impact, however SBP assessed for PTS as worst-case. The EDR assessment for disturbance is applicable to both SBP and USBL.
MBES	The MBES system will be hull mounted and emit a sound source in the range of 150 kHz to 700 kHz, with a SPL_{peak} of 221 dB re 1 µPa. The frequencies used by MBES are generally very high and outside of the main hearing range of cetacean species.	No As the equipment is outside main hearing range of cetaceans, no further assessment required.
SSS	SSS will be operating with a frequency between 210 - 570 kHz and SPL of 220 dB re 1uPa @ 1m. The frequencies used by SSS are generally very high and outside of the main hearing range of cetacean species.	No As the equipment is outside main hearing range of cetaceans no further assessment required.
High frequency imaging sonar (ROV)	The high frequency imaging sonar will be operating with a frequency range of 1.8 – 3.0 MHz. This falls outside of the hearing ranges for all cetaceans.	No As the equipment is outside hearing range of cetaceans no further assessment required.
Magnetometer	Magnetometer does not emit noise as a part of their normal functioning, so there is no possibility of injury or disturbance.	No

Equipment	Potential Impacts to Cetacean Species	Assessed Further
Pipetracker (ROV)	ROVs do not emit noise as a part of their normal functioning, so there is no possibility of injury or disturbance.	No
Geotechnical equipment (Shallow CPT, vibrocore, piston core)	The vibration of geotechnical equipment is not expected to result in a significant noise emission and would be less than SBP which is occurring in the same ECC and Windfarm Site Geophysical Survey Area and has been assessed as worst case	No
Survey vessels	Source noise levels are likely to be too low to result in PTS or TTS, however, they will be audible to most species and thus have the potential to result in disturbance. Increase in number of vessels on site and transits to and from survey area could increase collision risk.	**Yes** Potential for disturbance from underwater noise and presence of vessels. Potential for increased collision risk.

3.2 Assessment of potential effects of survey equipment on EPS

The Review of Consents (RoC) Habitats Regulations Assessment (HRA) for the Southern North Sea (SNS) SAC (Department for Business, Energy and Industrial Strategy BEIS[2], 2020) undertook underwater noise modelling to determine the potential impact ranges of site investigation surveys for harbour porpoise.

The BEIS (2020) assessment used the maximum source levels that could be expected from geophysical equipment: SBP, with a maximum source noise level of 250 dB re 1 µPa @ 1 m. The noise modelling undertaken by BEIS (2020) indicates that the PTS in harbour porpoise could occur within a maximum of 23 m (an area of 0.0017 km^2) from the source location (**Table 8**; BEIS, 2020). This is based on the PTS cumulative threshold of 155 dB SEL weighted (Southall *et al*., 2019).

Scottish and Southern Energy (2020) undertook noise modelling results for injury impacts from impulsive noise sources including SBP, the Innomar SES 2000. The worst-case operating SPL_{peak} was modelled as 445 m for PTS in harbour porpoise (very high frequency cetaceans) when operating at 4 kHz. The maximum predicted PTS range for dolphin species (high frequency cetaceans) was 98 m and 178 m for whale species (low frequency cetaceans). The maximum predicted impact ranges for PTS in **Table 8** have been used in the assessments.

The current guidance for assessing the significance of underwater noise disturbance in relation to SACs designated for harbour porpoise (JNCC *et al*., 2020), recommends the use of an updated EDR of 3 km for geophysical surveys (SBP and USBL) (JNCC, 2025). As a highly conservative worst-case approach, a disturbance range of 3 km (an area of 28.3 km^2) has been applied to determine the maximum potential disturbance area.

For site investigation surveys with SBP, it is realistic and appropriate to base the assessments on the potential impact area around the vessel, as the potential risk of PTS and disturbance would be around the vessel at any one time. Marine mammals would not be at risk throughout the entire area surveyed in a day, as animals would return once the vessel had passed, and the disturbance had ceased.

[2] *BEIS existed until 2023, now split into Department for Business and Trade (DBT), the Department for Energy Security and Net Zero (DESNZ) and the Department for Science, Innovation and Technology (DSIT).*

In the Marine Noise Registry (MNR) report (JNCC, 2023), it was estimated that in the unlikely event that an SBP is used continuously over a period of 24 hours with a vessel speed of 7.4 km/h (4 knots) a total area of approximately 256 km^2 per day could be affected (JNCC, 2023). However, this is a highly precautionary scenario as it is very unlikely that a SBP would be undertaken along a single transect line of 178 km in a single day, as assumed by JNCC (2023). The expected transect length for the Green Volt ECC is expected to be 100 to 150 km, and for the Windfarm Site 10 to 100 km.

Up to two vessels may be required for the ECC and Windfarm Site geophysical surveys (see **Section 1.2**). The geophysical survey vessels will operate SBP and other acoustic equipment within both the ECC and the Windfarm Site. These activities have the potential to cause disruption to cetaceans and are therefore assumed to represent the worst-case scenario for the purposes of the assessment. The vessel undertaking geotechnical work is unlikely to cause any disturbance to cetaceans.

Table 8 presents a summary of the desk-based review of potential impact ranges for SBP, as potential worst-case for proposed geophysical and geotechnical surveys.

Table 8 Summary of the desk-based review of potential impact ranges for SBP

Equipment	Species	Potential effect	Threshold (and source)	Reported range of effect	Reference
SBP	Harbour porpoise	PTS onset	155 SEL_{cum} dB re 1 µPa (NMFS, 2018)	23 m	BEIS (2020)
SBP (4 kHz) (235 SPL_{peak} dB 1µPa)	Harbour porpoise	PTS	230dB_{peak} / 185dB SEL_{cum} (Southall *et al.*, 2019)	445 m	Scottish and Southern Energy (2020)
	Dolphin species	PTS	219dB_{peak}, 183dB SEL_{cum} (Southall *et al.*, 2019)	98 m	
	Whale species	PTS	202dB_{peak} / 155dB SEL_{cum} (Southall *et al.*, 2019)	178 m	
SBP/USBL	Harbour porpoise	Disturbance	n/a	3 km	JNCC (2025)

3.2.1 PTS

Table 9 presents the PTS impact range and areas used in the assessments for a single vessel operating in the ECC and Windfarm Site, based on the worst-case for SBP.

Table 9 PTS impact ranges for SBP used in assessments

Species	Predicted maximum impact range for one vessel	Maximum predicted area of potential impact for one vessel	Maximum predicted area of potential impact for two vessels
Harbour porpoise (Very high frequency)	445 m	0.62 km^2	1.24 km^2
Dolphin species (High frequency)	98 m	0.03 km^2	0.06 km^2

Species	Predicted maximum impact range for one vessel	Maximum predicted area of potential impact for one vessel	Maximum predicted area of potential impact for two vessels
Minke whale, Humpback whale and fin whale (Low frequency)	178 m	0.10 km^2	0.20 km^2

Table 10 summarises the PTS assessment for cetaceans, based on worst case for SBP for both a single vessel and up to two vessels operating at the same time in the ECC and Windfarm Site, In addition, a combined assessment with the planned geophysical surveys occurring in the Green Volt Nearshore Survey Area is presented in **Table 10**. It is worth noting that in the nearshore survey area, only one vessel will be utilising SBP, and the other USBL.

Table 10 indicates that, with two vessels operating concurrently in the ECC and Windfarm Site Geophysical Survey Area, for all cetaceans, less than 0.001% of each cetacean MU could be exposed to PTS, including with combined surveys.

Table 10 PTS assessment for cetaceans

Species	Maximum number of individuals (% of ref pop) * for one vessel	Maximum number of individuals (% of ref pop) * for two vessels	Maximum number of individuals (% of ref pop) * combined assessment with nearshore survey
Harbour porpoise	<1 [0.05] (<0.001% NS MU)	<1 [0.1] (<0.001% NS MU)	<1 [0.2] (<0.001% NS MU)
Bottlenose dolphin	<1 [0.0009] (<0.001% GNS MU; <0.001% CES MU)	<1 [0.0018] (<0.001% GNS MU; <0.001% CES MU)	<1 [0.004] (<0.001% GNS MU; 0.001% CES MU)
White-beaked dolphin	<1 [0.005] (<0.001% CGNS MU)	<1 [0.01] (<0.001% CGNS MU)	<1 [0.02] (<0.001% CGNS MU)
Atlantic white-sided dolphin	<1 [0.0004] (<0.001% CGNS MU)	<1 [0.0008] (<0.001% CGNS MU)	<1 [0.002] (<0.001% CGNS MU)
Risso's dolphin	<1 [0.002] (<0.001% CGNS MU)	<1 [0.004] (<0.001% CGNS MU)	<1 [0.008] (<0.001% CGNS MU)
Minke whale	<1 [0.004] (<0.001% CGNS MU)	<1 [0.008] (<0.001% CGNS MU)	<1 [0.02] (<0.001% CGNS MU)
Humpback whale	<1 [0.000002] (<0.001% North Atlantic)	<1 [0.000004] (<0.001% North Atlantic)	<1 [0.000008] (<0.001% North Atlantic)
Fin whale	<1 [0.00009] (<0.001% North Atlantic)	<1 [0.00018] (<0.001% North Atlantic)	<1 [0.0004] (<0.001% North Atlantic)

**All numerical values have been rounded up to a whole number.*

The implementation of the mitigation measures outlined in **Section 4**, will reduce the risk of PTS to cetaceans as a result of the proposed surveys (with SBP assessed as the worst-case for all survey equipment).

However, with less than one individual being at risk of PTS and less than 0.001% of any population, **there will be no potential to commit an offence with regards to injury or to affect the FCS of any cetacean species and, therefore, there is no requirement for a Marine EPS licence for injury.**

3.2.2 Disturbance from underwater noise from the site investigation surveys

Brown *et al*. (2025) assessed the suitability of existing EDRs for harbour porpoise SACs and provided recommendations for default EDR values for high-resolution geophysical (HRG) surveys. The report undertook a comprehensive review of the available evidence underpinning EDRs for harbour porpoise. As a result, the EDRs for SBP surveys were updated and subsequently adopted in guidance (JNCC, 2025).

The updated harbour porpoise EDR of 3 km, corresponding to an affected area of 28.3 km², has been applied to assess potential disturbance from SBP or USBL activity for a single vessel operating in the ECC and Windfarm Site. As a precautionary, worst-case approach, this EDR has been applied to all cetaceans, reflecting the species considered most sensitive to underwater noise.

Table 11 summarises the disturbance assessment for cetaceans, based on worst case for SBP, for a single vessel.

Table 11 Disturbance assessment for cetaceans from SBP

Species	Maximum number of individuals (% of ref pop) * for a single vessel	Maximum number of individuals (% of ref pop) * for two vessels	Maximum number of individuals (% of ref pop) * combined assessment with nearshore survey
Harbour porpoise	22 (0.01% NS MU)	44 (0.02% NS MU)	87 (0.05% NS MU)
Bottlenose dolphin	1 (0.05% GNS MU; 0.4% CES MU)	2 (0.1% GNS MU; 0.8% CES MU)	4 (0.15% GNS MU; 1.5% CES MU)
White-beaked dolphin	6 (0.02% CGNS MU)	11 (0.04% CGNS MU)	15 (0.03% CGNS MU)
Atlantic white-sided dolphin	<1 [0.4] (0.003% CGNS MU)	1 (0.006% CGNS MU)	3 (0.01% CGNS MU)
Risso's dolphin	2 (0.02% CGNS MU)	4 (0.04% CGNS MU)	8 (0.09% CGNS MU)
Minke whale	2 (0.02% CGNS MU)	4 (0.04% CGNS MU)	5 (0.04% CGNS MU)
Humpback whale	<1 [0.0004] (<0.001% of North Atlantic)	<1 [0.0008] (<0.001% of North Atlantic)	<1 [0.0016] (0.001% of North Atlantic)
Fin whale	<1 [0.03] (<0.001% of North Atlantic)	<1 [0.05] (<0.001% of North Atlantic)	<1 [0.1] (<0.001% of North Atlantic)

**All numerical values greater than 0.5 have been rounded up to a whole number.*

Any disturbance would be temporary, and cetaceans would be expected to return to the area once the vessel had passed and the noise source ceased. It is possible that a small number of individual animals (less than 1% of the relevant species MU, except for bottlenose dolphin of the CES MU, with up to 1.5% disturbed) may experience some level of disturbance. **As such, a Marine EPS Licence may be required for disturbance.**

3.2.3 Disturbance from daily survey area based on JNCC (2023)

The JNCC (2023) daily disturbance area of 256 km^2 for geophysical surveys has been applied to assess the potential for short-term behavioural disturbance associated with high-resolution geophysical survey activity. This approach represents the maximum area likely to be affected during a single day of survey operations, reflecting the mobile and transient nature of geophysical surveys. Given the size of the ECC and Windfarm Site Geophysical Survey Area, this approach is considered precautionary and is included as a standard method only.

Table 12 summarises the disturbance assessment for cetaceans, based on JNCC (2023) worst-case daily survey area. In addition, a combined assessment has been undertaken considering geophysical surveys within the ECC and Windfarm Site together with the Green Volt Nearshore Survey.

Table 12 Disturbance assessment to cetaceans based on JNCC (2023) worst-case daily survey area

Species	Maximum number of individuals (% of ref pop) *	Combined maximum number of individuals (% of ref pop) * combined assessment with nearshore survey
Harbour porpoise	195 (0.1% NS MU)	390 (0.2% NS MU)
Bottlenose dolphin	8 (0.4% GNS MU; 3.5% CES MU)	16 (0.9% GNS MU; 7.1% CES MU)
White-beaked dolphin	46 (0.14% CGNS MU)	67 (0.2% CGNS MU)
Atlantic white-sided dolphin	4 (0.03% CGNS MU)	12 (0.09% CGNS MU)
Risso's dolphin	18 (0.2% CGNS MU)	36 (0.41% CGNS MU)
Minke whale	11 (0.1% CGNS MU)	22 (0.2% CGNS MU)
Humpback whale	<1 [0.004] (<0.001% of North Atlantic)	<1 [0.008] (0.001% of North Atlantic)
Fin whale	<1 [0.23] (0.007% of North Atlantic)	<1 [0.5] (0.7% of North Atlantic)

**All numerical values have been rounded to the nearest whole number.*

Any disturbance would be temporary and cetaceans would be expected to return to the area once the vessel had passed and the noise source ceased. It is possible that a small number of individual animals (less than 1% of the relevant species MU) may experience some level of disturbance, with exception to bottlenose dolphin, with up to 7.1% of the CES MU population being disturbed. It should be noted this is a highly precautionary estimate; the daily disturbance area is not anticipated to be achieved for any vessel within the Nearshore Geophysical Survey Area, or the ECC and Windfarm Site Survey Area. In addition, the majority of the ECC and Windfarm Site Survey Area is outwith the range of the CES MU population (**Figure 1**), and beyond the range of potential disturbance effects. **As such, a Marine EPS Licence is required for disturbance**.

3.3 Disturbance from underwater noise and presence of vessels

Any disturbance from underwater noise and presence of vessels would be less than the potential disturbance areas assessed for the site investigation surveys. Although noise levels from vessels are highly unlikely to cause physical or auditory injury, they could be sufficient to cause local disturbance to sensitive marine mammals in the immediate vicinity of the vessels, 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.

The distance at which cetaceans may react to vessels is difficult to predict. Behavioural responses can vary a great deal depending on context and data specific to harbour porpoise are limited. According to Thomsen *et al*. (2006), harbour porpoise might be expected to respond to vessels of this type at approximately 400 m. A most recent publication by Fernandes-Betelu *et al*. (2024) showed that in relation to decommissioning activities, harbour porpoise were displaced up to 2 km.

As a precautionary approach, based on the studies by Brandt *et al*. (2018) and Benhemma-Le Gall *et al*. (2021) that harbour porpoise could be disturbed up to 2 km from operating vessels, assessments in **Table 13** have been based on a disturbance impact range of 2 km and an area of 12.57 km^2 per vessel for all cetaceans.

Up to three vessels will operate within the ECC and Windfarm Site at any given time for this scope of works. In addition, separate survey activities may be occurring within the Green Volt Nearshore Survey Area, so a combined disturbance assessment has been undertaken assuming a maximum of six vessels operating simultaneously, representing a precautionary worst-case scenario for increased vessel activity (**Table 13**).

Table 13 Vessel disturbance based on Benhemma-Le Gall et al. (2021)

Species	Maximum number of individuals (% of ref pop) * One vessel	Combined maximum number of individuals (% of ref pop) * combined assessment with nearshore survey (six vessels total)
Harbour porpoise	10 (0.006% NS MU)	58 (0.04% NS MU)
Bottlenose dolphin	<1 [0.4] (0.02% GNS MU; 0.2% CES MU)	3 (0.16% GNS MU; 1.33% CES MU)
White-beaked dolphin	3 (0.009% CGNS MU)	10 (0.03% CGNS MU)
Atlantic white-sided dolphin	<1 [0.2] (0.008% CGNS MU)	2 (0.02% CGNS MU)
Risso's dolphin	1 (0.01% CGNS MU)	6 (0.07% CGNS MU)
Minke whale	1 (0.01% CGNS MU)	4 (0.04% CGNS MU)
Humpback whale	<1 [0.0002] (<0.001% of North Atlantic)	<1 [0.001] (<0.001% of North Atlantic)

Species	Maximum number of individuals (% of ref pop) * One vessel	Combined maximum number of individuals (% of ref pop) * combined assessment with nearshore survey (six vessels total)
Fin whale	<1 [0.01] (<0.001% of North Atlantic)	<1 [0.07] (0.001% of North Atlantic)

**All numerical values have been rounded to the nearest whole number.*

It should be noted that it is extremely unlikely that the Nearshore Geophysical survey, and the ECC and Windfarm Site survey will be operating simultaneously in the same area, so the combined estimate for vessel disturbance for bottlenose dolphin within the CES MU is highly precautionary.

While the predicted source levels associated with the survey vessels have the potential to elicit a behavioural response in cetacean species, the vessel noise would need to be emitted over an extended period to cause a significant disturbance offence as defined under the Regulations 39(1) or 39(2). As the survey vessels will not be stationary, animals within a particular area will not be exposed to extended periods of noise from the vessels, **there would be no risk of PTS and as such a Marine EPS Licence for injury is not required**.

The level of disturbance for vessels in isolation will be lower than the predicted disturbance impact range and areas, based on the worst-case for SBP. Any disturbance would be temporary and cetaceans would be expected to return to the area once the vessel(s) had passed and the noise source ceased**. As such, vessel noise is not anticipated to negatively impact the FCS of any EPS.**

3.4 Increased collision risk with vessels

Vessels that travel at speeds greater than 14 knots have shown to cause the most lethal and severe injuries to cetaceans (Laist *et al.*, 2001). The probability of a vessel strike being fatal increases from approximately 21% to 79% as vessel speed increases from 8.6 to 15 knots, respectively (Vanderlaan and Taggart, 2007). Although these studies focused on large cetacean species, Winkler *et al*. (2020) demonstrated that vessel strikes have also been recorded for toothed whales, albeit at a lower proportion (25.4%) compared with baleen whales (62.8%), reflecting the taxonomic composition of detected vessel-strike records rather than species-specific mortality probabilities. These statistics stem from the International Whaling Commission (IWC) ship strike database (1820-2019) and highlighted that fin whales, humpback whales, sperm whales and beaked whales were the most reported species to have been involved in a ship strike.

Any increased collision risk with vessels is unlikely, as vessels would be relatively slow moving at a very slow speed of approximately 4 knots and maintaining a fixed route during the surveys. The potential for collision to occur is therefore negligible as it gives any marine mammals ample opportunity to detect and avoid the vessels.

Although vessel collision is a threat for basking sharks, potential collision risk for basking sharks will be limited by the slow vessel speed and the use of mitigation measures as outlined in **Section 4.**

Additionally, all vessel operators will use good practice to reduce any risk of collisions with marine mammals, this includes following the Scottish Marine Wildlife Watching Code (SNH, 2017).

Given that there is predicted to be no risk of injury to any species of cetacean or to basking shark as a result of collision risk, there is no potential to commit an offence with regards injury. There will, therefore, **be no impact on the FCS of any species. As such, there is no offence and therefore no requirement for a Marine EPS licence for injury.**

3.5 Cumulative Effect Assessment (CEA)

The proposed Green Volt ECC and Windfarm Site geotechnical and geophysical surveys are unlikely to contribute to significant cumulative effects. Acoustic attenuation increases with frequency, meaning sound emitted from equipment such as SBP, MBES and USBL is expected to be highly localised. As a result, the potential for auditory injury is limited, as an EPS would need to be in very close proximity to the noise source. Standard mitigation measures (see **Section 4**) further reduce this already low risk.

PTS effects from cumulative exposure to underwater noise are expected to remain highly localised around each individual activity, based on modelled impact ranges. Consequently, the potential for cumulative PTS injury to cetaceans arising from multiple noise sources; including geophysical surveys, piling, and OWF operations and maintenance activities is considered negligible. However, where multiple noisy activities occur, there remains the potential for temporary behavioural disturbance as a result of the cumulative effects of underwater noise. As such, a qualitative cumulative disturbance assessment has been undertaken.

Information obtained from the Marine Directorate Licensing Application website and the JNCC MNR website has been used to identify other relevant projects and plans for consideration within the cumulative assessment. As a precautionary assumption, it has been assumed that operation and maintenance activities may be occurring concurrently at Moray West OWF and Seagreen OWF. To assess potential cumulative disturbance from these OWFs, a 4 km disturbance impact range (corresponding to an area of 50.27 km²) has been applied to the cetaceans and densities presented in **Table 4** to account for additional vessels associated with operation and maintenance activities that could occur at the same time as the proposed survey works within the ECC and Windfarm Site (**Table 14**). These two projects have not been included in the cumulative assessment for the CES MU of bottlenose dolphin, as they are too distant to affect this coastally restricted population.

In addition, it has been assumed that, including the Green Volt ECC and Windfarm Site survey campaign, up to seven geophysical surveys could occur concurrently. These include those within the Green Volt Nearshore Survey Area, as well as operational surveys at Beatrice OWF, Hywind Scotland Pilot Park, Bellrock Offshore Transmission Development Area as well as site investigation surveys associated with Bowdun OWF and Offshore Grid projects (Bowdun Offshore Wind Farm, 2025) for which EPS licence applications have been submitted. Estimates of the number of animals potentially disturbed by these activities have been derived from the relevant EPS RAs available via the Marine Directorate Licensing Application website and incorporated into the cumulative assessment (**Table 14**).

Inch Cape OWF may also be undertaking piling activities concurrently with the proposed Green Volt ECC and Windfarm Site geophysical survey. Predicted impact ranges and population exposure estimates reported in the Inch Cape piling strategy (Inch Cape, 2025) have been included in the cumulative assessment. Finally, piling activities may also occur at Peterhead Smith Quay. Although cetacean impacts were not explicitly assessed within the associated Environmental Impact Assessment (EIA), predicted impact ranges and density estimates reported in that assessment (Peterhead Port Authority. (2025) have been used to derive indicative exposure estimates and included on a precautionary basis (**Table 14**).

Table 14 presents the estimated number of cetaceans that could potentially experience disturbance as a result of cumulative underwater noise. These estimates have been assessed with reference to the species-specific populations presented in **Table 4**. The cumulative assessment is highly precautionary, as it is unlikely that all identified activities would occur simultaneously, given constraints such as vessel availability, project scheduling, and weather conditions.

Furthermore, the identified projects included in the cumulative assessment are located at sufficient distance from the Green Volt ECC and Windfarm Site; that spatial overlap of disturbance zones is unlikely when recommended EDRs are applied, particularly for operational and maintenance activities and geophysical surveys. As such, the potential for true cumulative overlap is expected to be limited.

The cumulative assessment presented in **Table 14.**

Table 14 Potential for cumulative impact from noisy activities

Cumulative impacts	Potential area of impact	Number of animals (% of reference population)							
		Harbour porpoise	Bottlenose dolphin	White-beaked dolphin	Atlantic white-sided dolphin	Risso's dolphin	Minke whale	Humpback whale	Fin whale
Green Volt ECC and Windfarm Site geophysical survey (assuming two geophysical vessels)	28.3 km^2	44	2	11	1	4	4	<1 [0.0008]	<1 [0.05]
Green Volt nearshore geophysical survey (assuming two geophysical vessels)	28.3 km^2	43	2	5	2	2	4	<1 [0.0009]	<1 [0.05]
Inch Cape piling *	706 km^2	422	0	56	*Not assessed*		30	*Not assessed*	
Operational work at Moray West OWF	50.27 km^2	38	1	4	1	3	2	<1	<1
Operational work at Seagreen OWF	50.27 km^2	30	2	4	1	3	2	<1	<1
Geophysical survey at Beatrice OWF **	56 km^2	16	0.22	8	*Not assessed*		1	*Not assessed*	
Geophysical survey at Bowdum OWF***	78.5 km^2	47	*Not assessed*	6			3		
Geophysical survey at Offshore Grids – Netherton Corridor****	78.5 km^2	47	2.3	6			30.3		
Geophysical survey at Hywind	113.2 km^2	68	*3*	9	*1*	*Not assessed*	5		
Geophysical survey at Bellrock Offshore Transmission Development Area	226.4 km^2	136	7	55	Not assessed		10	*Not assessed*	1
Piling at Peterhead Smith Quay*^	10.02 km^2	6	*Not assessed*	1	*Not assessed*		1	*Not assessed*	
Total		**897 (0.56 % NS MU)**	**19.52 (1.03% GNS MU) 15 (6.6% CES MU)**	**165 (0.48% CGNS MU)**	**6 (0.09% CGNS MU)**	**12 (0.14% CGNS MU)**	**92.3 (0.90% CGNS MU)**	**4 (0.01% North Atlantic)**	**5 (0.15% North Atlantic)**

**Numbers taken from Inch Cape piling strategy using 15 km disturbance EDR (Inch Cape, 2025)*

***Numbers taken from Beatrice OWF EPS RA for geophysical surveys and are based on a potential disturbance area of 56 km^2.*

**** Numbers taken from Bowdum OWF EPS RA and are based on a 5 km EDR for harbour porpoise (Bowdun Offshore Wind Farm, 2025).*

***** Numbers taken from* Offshore Grids – Netherton Corridor *EPS RA based on a 5 km EDR for harbour porpoise*

**^Numbers calculated from EPS RA, using the projects density and impact range of 10.02 km^2.*

The overall impact of disturbance (a temporary impact) to the overall cetacean population is considered to be negligible, or no potential for a significant effect on the overall population, if less than 1% of the reference population is anticipated to be exposed to effect. If between 1% to 10% of the reference population is potentially temporary disturbed, it is considered to be low or no potential for a significant effect on the overall population.

Cetacean species are not as sensitive to disturbance impacts as they are to the potential for injury, and they would not be permanently disturbed from any area as the impact is temporary and individuals will return to the area once the relevant activity has ceased.

As assessed in **Table 14**, there would be no potential for a population level impact to any of the cetaceans, with exception to the bottlenose dolphin CES MU. Up to 6.6% of the CES MU could be temporary disturbed due to cumulative effects from noisy activities.

It should be noted that the cumulative assessment undertaken is highly precautionary and represents an upper-bound scenario. In practice, it is unlikely that all identified noise-generating activities would occur concurrently due to constraints related to vessel availability, project scheduling, and weather conditions. Furthermore, the separation distances between Green Volt ECC and Windfarm Site and the identified projects included in the cumulative assessment are such that spatial overlap of disturbance zones for cetaceans is unlikely when the recommended EDRs are applied.

Additionally, all assessments of potential disturbance to bottlenose dolphin within the cumulative assessment have applied EDRs derived for harbour porpoise, representing a precautionary approach given inter-species differences in hearing sensitivity and behavioural response. Exposure of this coastal population is expected to be limited, and the likelihood of disturbance approaching the upper-bound estimates presented (e.g. 6.6%) is considered very low.

It is possible that a small number of individual animals may experience some level of disturbance. **As such, an application for a Marine EPS Licence for disturbance may be required**. The characterisation of effects as presented in this report has identified that the potential for impact will be highly localised and short term in nature and not result in significant effects. The potential for the proposed site investigation survey works contributing to cumulative impacts is, therefore, highly unlikely. It is, therefore, predicted that the relatively localised areas of disturbance, and the short period of time that cumulative effects could arise, are such that they will not cause an impact that will affect the FCS of any EPS.

Based on the assumption that all the planned projects and activities with the potential for injury will have mitigation in place, which is similar to or more extensive than the measures being undertaken for the proposed site investigation surveys, no EPS will be at risk of injury from these activities.

4 Mitigation Requirements

As noted in the assessment section, the survey equipment (**Table 2**) to be used for one or multiple vessels does not result in a significant population change, even when based on the worst case of an SBP.

The following mitigation measures for geophysical surveys are outlined within the JNCC (2017) '*Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys'*, especially when using SBP, and will be adhered to for the proposed geophysical surveys:

- As the geophysical surveys are short-term in nature and are using low energy sources (such as SBP), a non-dedicated **Marine Mammal Observer** (MMO) can be used. A non-dedicated MMO refers to a JNCC qualified MMO who may undertake other roles on the vessel when not conducting their mitigation role. This person can be a member of the vessel's crew provided that during the mitigation period, they do not undertake any other roles on the vessel.

  - Note that the pre-survey watch can only be undertaken in periods of daylight and good visibility.

- **Passive Acoustic Monitoring (PAM)** shall be deployed as an additional mitigation measure (for example, PAM pre-survey searches to be undertaken during hours of darkness and in poor visibility).
  - Note that PAM will be used for pre-survey searches for surveys starting in darkness or poor visibility.
- Prior to any noisy equipment commencement, a 30-minute pre-survey search of a 500 m mitigation zone around the moving acoustic source is required. If a marine mammal is sighted or detected within the mitigation zone during the pre-survey search, the survey cannot commence until:
  - the 30-minute pre-survey search is complete; and
  - the mitigation zone has been clear of marine mammals for a period of 20 minutes prior to start of survey.

A **soft-start** will be undertaken (wherever practical) once the pre-survey search of 30 minutes has been completed and there have been no marine mammal or basking shark sightings for at least 20 minutes. The soft-start will consist of a gradual and consistent ramp-up of power over a minimum of a 15-minute period, and the line must be commenced within 25 minutes of the start of the soft-start procedure. Once soft- start has commenced, there is no requirement to stop or delay the acoustic survey due to marine mammal or basking shark presence within the 500 m mitigation zone.

- If a line change is expected to take more than 40 minutes, the survey should be halted at the end of the survey line, and a full pre-survey search and soft-start procedure should begin prior to the next line.
  - The pre-survey search of the 500 m mitigation zone can commence while on the line turn, so that survey equipment can be switched on ready for the next line. Note that the same delay and soft-start procedures apply for line changes as outlined above.
- If a line change is expected to take less than 40 minutes, surveys can continue if the shot point interval is increased to a maximum of 5 minutes and is decreased gradually in the final 10 minutes of the line change.
  - The survey equipment can alternatively be switched off during line changes of less than 40 minutes, and the mitigation procedures undertaken as per the line changes of more than 40 minutes as outlined above.

If several types of survey equipment are started sequentially, or interchanged during the operation, only one pre-survey search is required prior to commencement of the first acoustic output, and only if there are no gaps in data acquisition of more than 10 minutes.

Whilst not considered specifically in this assessment due to their low likelihood of occurrence, any assessment of, or mitigation measures put in place for the species assessed, are considered to be appropriate/relevant for other less commonly occurring species of cetacean that may be present in the survey area. Mitigation will also be applied to non-EPS, such as seals and basking shark.

Best practice to reduce vessel collision risk and disturbance at protected seal haul-out sites:

- Vessel movements, where possible, will follow set vessel routes and hence areas where marine mammals are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will use good practice to reduce any risk of collisions with marine mammals.

- The Scottish Marine Wildlife Watching Code (SNH, 2017) will be followed, to reduce the potential for a vessel collision, by reducing vessel transit speeds and by maintaining speed and course when in the presence of marine mammal species. This code will be followed for all vessels transiting to and from the ECC and Windfarm Site. In the unlikely event that a collision event occurs, this will be reported on, and full information of the incident, including the marine mammal species, will be recorded.

5 EPS and licensing tests

The purpose of the EPS RA presented in this report is to determine whether, when considering appropriate mitigation as presented, there is still potential for the marine survey activities to cause deliberate harm, or inadvertently cause disturbance to cetaceans or other protected species. The need for a Marine EPS Licence will be determined by MD-LOT, with advice from NatureScot, based on findings from this EPS RA.

MD-LOT's consideration of whether an EPS Licence will be required will comprise three tests:

1. To ascertain whether the licence is to be granted for one of the purposes specified in the Regulation 44;
2. To ascertain whether there are no satisfactory alternatives to the activity proposed (that would avoid the risk of offence); and
3. That the licensing of the activity will not be detrimental to the maintenance of the population of the species concerned at a FCS.

Test 1: The licence must relate to one of the purposes referred to in Regulation 44.

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

- 44(2I) 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.

The Green Volt OWF meets the requirements of Regulation 44(2)(e) by demonstrating a direct environmental benefit on a national and international scale and complies with international and national environmental policies. There is an overarching European, UK and Scottish policy requirement for sustainable energy supply from renewables. This need is the subject of national planning and energy policy.

While the proposed survey works will mean a potential disturbance to cetacean species, it will only be temporary in nature, be a risk to a small number of individuals and, with the mitigations that will be put in place, there is no potential for injury. The benefit of undertaking this survey and allowing for the site investigation works to progress has the potential for long-term benefit to Scotland and the renewables industry and helping Scotland to reach the overall target for greenhouse gas emissions.

Test 2: There must be no satisfactory alternative (Regulation 44, 3a).

Alternative options were considered prior to the inclusion of the noisy equipment with regards to the scope and extent of the works within the Green Volt ECC and Windfarm Site. The proposed works are required in order to obtain a clear understanding of the physical characteristics of the seabed, in order to assess where and how the installation of seabed infrastructure will be technically, financially, and environmentally feasible. The use of the audible equipment is considered essential due to the need to accurately assess the site prior to the laydown of infrastructure, and the proposed methods outlined in this document are the only viable way to ensure the accurate planning of the works required.

There are no satisfactory alternatives to the use of the required equipment during the works. These works are required to provide sufficient detail prior to undertaking construction activities. However, it is important to note:

- **Works location, duration and extent**: the smallest working area possible has been proposed, and works will be undertaken as quickly and efficiently as possible. Reducing the size of the working area would impair the ability to appropriately site infrastructure and undertake construction works.

- **Survey equipment and methodology**: the combination of the level of geophysical survey and intrusive geotechnical site investigations have been chosen to provide the most efficient dataset that can be used to assess engineering and environmental feasibility. The design of the survey considers the provision of the required data for the preliminary phase but without survey techniques which may be superfluous for the current objectives. The results of the survey will allow the most effective development and design decisions to be made. For future site investigations, it will provide data to allow the design of the most effective surveys. Overall, the proposed works meet the objectives of the survey with the minimal practicable impact to marine mammals.

Test 3: The action authorised must not be detrimental to the maintenance of the population of the species concerned at a FCS in their natural range (Regulation 44, 3b).

The potential to be disturbed would be temporary (approximately three months) and over a relatively small area. The percentage of the reference population of each species, based on the maximum predicted impact ranges for the worst case operation of a SBP, is considered to be negligible for all species (less than 2% of the reference population, temporarily disturbed), with exception to bottlenose dolphin where 6.6% of the population could be temporarily disturbed.

Any disturbance during the surveys is not considered detrimental to the maintenance of the populations or their FCS.

6 Conclusions

While the noisy equipment associated with the proposed geophysical and geotechnical surveys will result in a temporary disturbance effect within a localised area, this work is required to enable constructing the Green Volt OWF, which will be in support of Scotland and the UK government's national and international commitments to reduce greenhouse gasses.

The assessment above demonstrates that, with the implementation of the mitigation measures detailed in **Section 4**, there will be no injury resulting from the proposed activities due to underwater noise and, thus, no offence related to injury of any cetacean species under either the inshore or offshore regulations. In this context, **a Marine EPS Licence for injury would not be required.**

It is possible that a small number of animals may experience some level of disturbance for the short period they may encounter noise emissions. Given the short term and temporary nature of the effects on cetaceans, it is considered that there is no potential for a significant effect on the UK populations of harbour porpoise, bottlenose dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin, minke whale, humpback whale and fin whale, with a negligible risk of disturbance to any species of cetacean predicted.

There is potential for cumulative effects from a number of different sources, although there is significant uncertainty when these may arise. Based on current and likely future activities and the predicted level of effect, along with the potential mitigation that will be in place, the level of cumulative disturbance is predicted to be relatively small. However, the effects arising from disturbance from each activity will be temporary and there will be no effect on the FCS of any EPS.

Therefore, **a Marine EPS Licence may be required for activities where there is potential for disturbance to cetaceans as per Regulation 39(2); this disturbance however will not cause population level effects, and thus it is considered that an EPS licence to disturb could be issued, if it is deemed to be necessary**.

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