Offshore Petroleum Regulator
for Environment & Decommissioning

RECORD OF THE HABITATS REGULATIONS ASSESSMENT UNDERTAKEN UNDER REGULATION 5 OF THE OFFSHORE PETROLEUM ACTIVITIES (CONSERVATION of HABITATS) REGULATIONS 2001 (As Amended).

NEP Phase 1 Geophysical Survey

Issued 27 February 2025
Rev 2.0

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1 INTRODUCTION

1.1 Council Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and Council Directive 2009/147/EC on the conservation of wild birds (the Birds Directive) aim to ensure the long-term survival of certain habitats and species by protecting them from the adverse effects of plans and projects.

1.2 The Habitats Directive provides for the designation of sites for the protection of habitats and species of European importance. These sites are called Special Areas of Conservation (SACs) Special Protection Areas (SPAs). Together, along with Ramsar sites they form part of a network of protected sites across Europe called Natura 2000.

1.3 The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (as amended) transpose the Directives into UK law for activities consented under the Petroleum Act 1998. The Offshore Petroleum Activities (Conservation of Habitats) (Amendment) Regulations 2007 extend certain provisions of the 2001 regulations.

1.4 Since the departure of the UK from the EU the requirements under the Habitats Regulations remain largely unchanged with any amendments made under the Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019. European sites, formerly Natura 2000 network, are now part of the UK's National Site Network.

1.5 Any plan or project, which either alone or in-combination with other plans or projects would be likely to have a significant effect on a qualifying site must be subject to an Appropriate Assessment to determine the implications for a site's integrity and conservation objectives. Such a plan or project may only be agreed after ascertaining that it will not adversely affect the integrity of a European Site unless there are imperative reasons of overriding public interest for carrying out the plan or project.

1.6 Regulation 5(1) of the 2001 Regulations provides that: *The Secretary of State shall, before granting any Petroleum Act licence, any consent, any authorisation, or any approval, where he considers that anything that might be done or any activity which might be carried on pursuant to such a licence, consent, authorisation or approval is likely to have a significant effect on a relevant site, whether individually or in-combination with any other plan or project, including but not limited to any other relevant project, make an appropriate assessment of the implications for the site in view of the site's conservation objectives*.

1.7 An application to undertake a Marine Survey by BP Exploration Operating Company Limited (bp) was submitted to the Department of Energy Strategy and Net Zero (DESNZ) in December 2024 (bp 2025a).

1.8 This is a record of the Appropriate Assessment in the form of a Habitats Regulations Assessment (HRA), undertaken by the Secretary of State for DESNZ in respect of a proposed Marine Survey that may cause a significant effect on the qualifying features of the Southern North Sea SAC.

1.9 The proposed marine survey relevant to this assessment is not directly connected with, or necessary to, the management of any National sites but it may affect them. The purpose of this HRA is to determine whether the proposed marine survey will adversely affect the integrity of any National Site Network designated site.

2 SURVEY DESCRIPTION

2.1 The following is a brief summary of the proposed bp marine survey, further details may be found within the application (bp, 2025a, 2025b).

2.2 The proposed high-resolution (HR) marine survey will acquire data using a seismic source array comprising four 40 cubic inch (cu. in.) airguns (maximum combined airgun volume of 160 cu. in.), a parametric sub-bottom profiler (SBP), a multibeam echosounder (MBES) and a side scan sonar (SSS) device.

2.3 The proposed survey will be undertaken across one survey area (Figure 1). The survey area lies within the Southern North Sea in quadrants 42 and 43 off the east coast of England. The planned survey is located within UKCS Blocks: 42/25, 42/30, 43/21 and 43/26. The Permit area (Greater Working Area) covers approximately 357 km^2, with the survey area covering 73.5 km^2 in total.

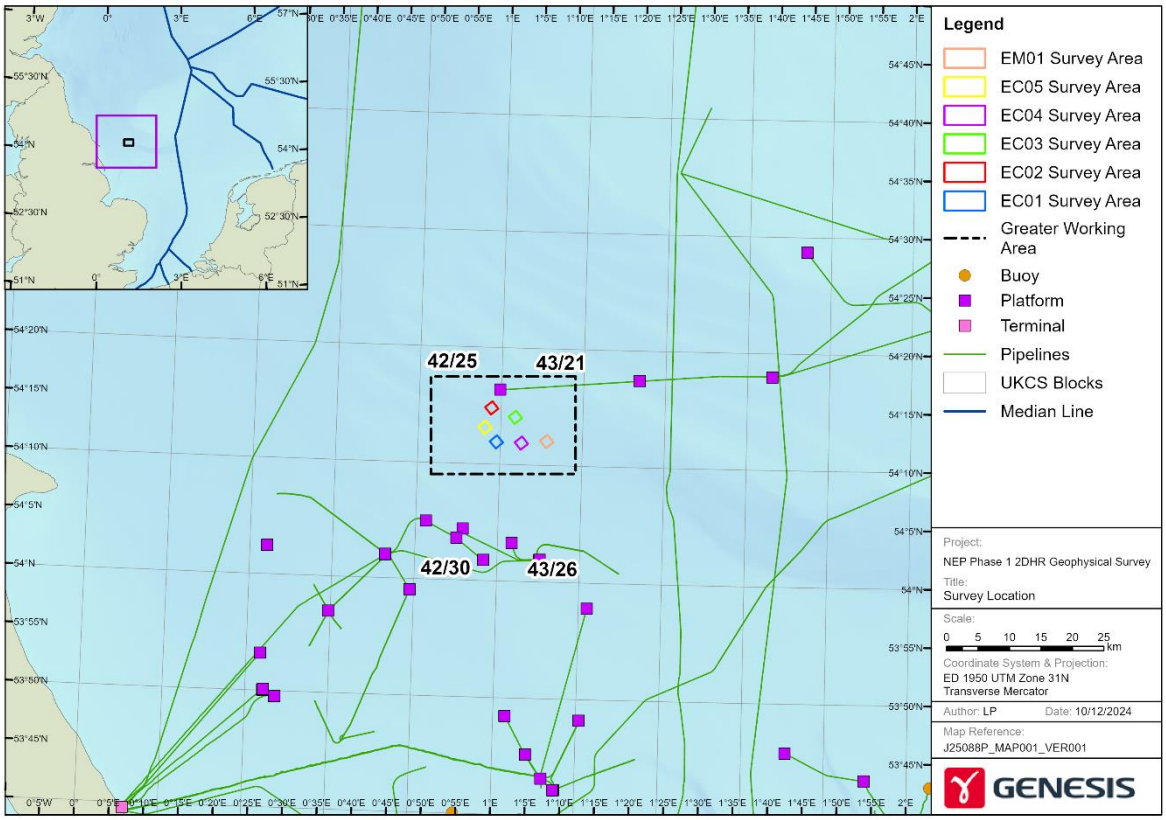

Figure 1: Location of the proposed Seismic Survey and greater working area.

2.4 The survey is scheduled to take place between 15 February and 20 April 2025, with airguns operating for 30 days (bp, 2025a, 2025b).

2.5 The survey vessel, the MV Ocean Reliance, will tow streamers at a speed of approximately 4 knots (~2.06 m/s) (bp, 2025b). The maximum combined airgun volume will be 160 cu. in. The airguns will be firing at intervals of every three seconds. A summary of the proposed survey specifications is presented in Table 1.

2.6 During the proposed surveys, the JNCC (2017a) "*Guidelines for minimising the risk of injury to marine mammals from geophysical surveys*" will be implemented. Therefore, the source will commence with a 'soft start' (where the source power is increased incrementally over a period of at least 20 minutes). The airguns will be switched off at the end of each survey line. The estimated duration of each line turn is approximately 45 minutes (bp, 2025a, 2025b).

Table 1: Survey parameters (Source: bp, 2023a, 2023b).

Survey Parameter	Application
Start date and End date	15th February – 20th April 2025
Total duration of survey (days)	30 (20 within Summer period)
Greater Working Area (km^2)	357
Survey Area (km^2) [1]	73.5
Vessel speed (knots)	4
Estimated duration of line turns (minutes)	45

1 – excludes the Greater Working Area where no airguns will be operated

2.1 The specifications for the seismic array, as presented in the application, are presented in Table 2. The peak Sound Pressure Level (SPL) for the 160 cu. in. airgun array is 250.3 dB re 1 µPa m.

Table 2: Proposed seismic array parameters (Source: bp, 2025a, 2025b).

Array Parameter	Array Option
Total volume (cu. in).	160
Zero-to-peak SPL (dB re 1 µPa m)	245.5
Peak-to-peak SPL (dB re 1 µPa m)	250
Sound exposure level (SEL) (dB re 1 μPa^2 m^2 s)	214
Pulse rate / shot interval (seconds)	3
Towed depth (m)	3

3 DESIGNATED SITES

3.1 The proposed seismic survey is being undertaken in waters within the Southern North Sea SAC and approximately 27.5 km from the Dogger Bank SAC. Other European designated sites lie more than 50 km from the GWA of the proposed survey (Figure 2).

3.2 Based on the information presented within the application, including the results from the noise modelling undertaken in support of the application, the Southern North Sea SAC has been identified as having qualifying species at risk of a likely significant effect from the proposed survey.

3.3 The Dogger Bank SAC does not have any qualifying features that are likely to be impacted by underwater sound which is the only aspect of the proposed survey which is anticipated could cause ecological disturbance at a distance of 27.5 km. The proposed survey will therefore not have a significant impact on the Dogger Bank SAC.

3.4 The Secretary of State is satisfied that there is no potential for a likely significant effect from the proposed survey on any qualifying features of other European sites.

3.5 The qualifying site and species relevant to this HRA are:

- Southern North Sea SAC, designated for harbour porpoise (*Phocoena phocoena*)

3.6 The Southern North Sea SAC is located off the east coast of England and includes key winter and summer habitat for the harbour porpoise. Approximately two-thirds of the site, the northern part, is recognised as important for harbour porpoises during the summer season, whilst the southern part supports persistently higher densities during the winter (JNCC, 2020).

3.7 The timing of the proposed surveys (February - April) may coincides with the start of the period when harbour porpoises are expected to be most abundant in the Southern North Sea SAC summer area.

3.8 The proposed 1 Seismic Survey GWA is located wholly within the Southern North Sea SAC summer area, therefore 100% of the total GWA (357 km^2) overlaps with the Southern North Sea SAC summer area, which is equivalent to 1.32% of the site as a whole (27,028 km^2).

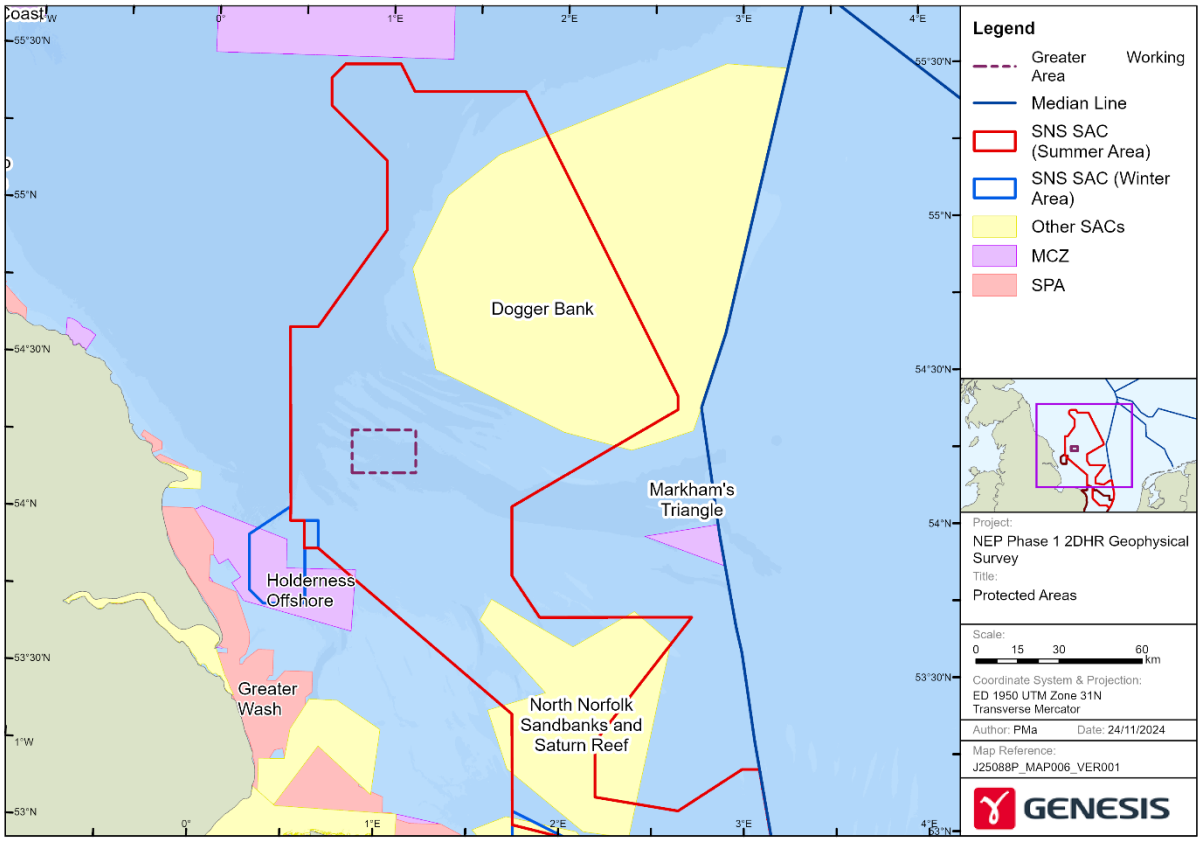

Figure 2: Location of proposed Seismic Survey and relevant designated sites.

Qualifying features

3.9 The HRA considers potential direct and indirect impacts from the proposed survey alone and in-combination with other projects on the harbour porpoise qualifying feature of the Southern North Sea SAC.

Harbour porpoise

3.10 The harbour porpoise is the smallest and most abundant cetacean species in UK waters. They occur widely across shelf waters predominantly either individually or in small groups, but larger aggregations have been reported (Department for Environment Food and Rural Affairs (Defra) 2015), with group sizes varying with season (Clark 2005). Harbour porpoises have a very broad distribution occurring predominantly over the continental shelf. Higher densities occur in areas of up-welling and strong tidal currents and in water depths of predominantly between 20 and 40 m (Clark 2005, Whaley 2004). Their distribution may also be strongly correlated with seabed type, with areas of sandy gravel being preferred and this may be linked to prey availability (Clark 2005).

3.11 Harbour porpoise occur widely across the North Sea. Following the successful completion of the Small Cetacean Abundance in the North Sea (SCANS) survey in 2022, there are now four estimates of abundance for harbour porpoise in the North Sea from SCANS, SCANS-II, SCANS-III and SCANS-IV (Gilles *et al.,* 2023).

3.12 The latest estimated harbour porpoise population within the whole of the SCANS survey area is 409,244 (CV 298,194 – 578,505) (Gilles *et al.,* 2023). Since 1994, the population of harbour porpoises within the SCANS surveyed area has remained relatively stable (Hammond *et al*., 1995, Hammond *et al.,* 2017, Hammond *et al*., 2021). For North Sea harbour porpoise, the simple annual trends estimated from the data are positive but with poor precision and, thus, not significantly different from 'no trend'. Although there is no direct evidence of declines, these results should not be interpreted as providing evidence that there have been no declines, as small annual declines would not be able to be detected (Gilles *et al.,* 2023).

3.13 Data from the four SCANS surveys indicate that that there may have been a southward shift in the distribution of harbour porpoise in the North Sea. In the early 1990's harbour porpoise was widespread but appear to have occurred predominantly around eastern Scotland and the northern North Sea to the southern North Sea (Hammond *et al*. 2013). Since the 1990's harbour porpoise continues to be widespread across the North Sea but densities have increased in the southern and central North Sea. The cause of this apparent change in the distribution of harbour porpoises across the North Sea is unclear but may be related to changes in prey availability (IAMMWG *et al.* 2015). The observed distribution of harbour porpoises from SCANS-IV in summer 2022 was similar to that observed from SCANS-III in summer 2016 (Hammond *et al.,* 2021).

3.14 There are three Management Units (MU's) identified for harbour porpoise in the north-east Atlantic, of which, the Southern North Sea SAC lies within the North Sea MU. The harbour porpoise population within the North Sea MU was originally estimated to be 227,298 (176,360 – 292,948) (IAMMWG, 2015). This estimated population of harbour porpoise is recognised to have been derived from data collected in 2005 and 2016 during a single month and that the harbour porpoise population within the SAC will vary across seasons and years. The population estimated from the Joint Cetacean Protocol (JCP), where abundance and distribution data from multiple sources collected over a period of time have been integrated was 333,808 individuals (JNCC, 2017a; JNCC, 2017b). The most recent population estimate for the North Sea MU is 346,601 individuals and this figure has been used for this assessment (IAMMWG, 2022).

3.15 The Southern North Sea SAC is an area of importance for harbour porpoise, supporting an estimated 7.5% of the UK North Sea MU population (JNCC, 2023).

3.16 Harbour porpoise densities vary seasonally and across the Southern North Sea SAC (Evans and Teilmann, 2009). Site-specific surveys undertaken by wind farm developers have shown considerable variation in the spatial and temporal distribution of harbour porpoises across years (e.g. Forewind 2013, SMart Wind 2017). Typically, peak abundance has been reported to occur between May and July at sites across the Dogger Bank area and between September and April at sites further south (e.g. Forewind 2014, SMart Wind 2015, EAOWL 2015). Lowest reported abundance across nearly all wind farm surveyed areas occurs between November and February,

although the poorer survey conditions that occur predominantly during the winter months may be a contributing factor in the lower number of harbour porpoise recorded during this period.

3.17 Based on data in the JCP database highest densities in the central and northern area of the SAC occur during the summer period with modelled harbour porpoise densities greater than 3.0 per km^2 occurring widely. During the winter period the distribution of harbour porpoise in the southern North Sea changes, with reduced densities over the central and northern area but an increase in densities in nearshore waters and the southern part of the SAC (Heinänen and Skov 2015).

3.18 Surveys undertaken across the southern North Sea, including areas within and encompassing the SAC, have reported lower densities of harbour porpoise than that estimated from JCP data. Densities reported from SCANS-IV surveys are 0.6027 animals per km^2 in SCANS block NS-C and 0.3096 animals per km^2 in SCANS block NS-B (Gilles *et al.,* 2023).

3.19 Data obtained from surveys undertaken at offshore wind farms located within or adjacent to the SAC indicate densities vary across the site and across seasons. Mean densities reported from surveys undertaken by offshore wind farm developers range from 0.11 ind./km^2 at Triton Knoll offshore wind farm including a 1 km buffer to 2.87 ind./km^2 within the Hornsea subzone 3 wind farm area plus a 4 km buffer (TKOWFL 2011, SMart Wind 2017).

3.20 Tagging studies undertaken in Denmark indicate that harbour porpoises are highly mobile and range widely in the North Sea, with individuals tagged in the Skagerrak travelling up to 100 km per day, with a mean distance of 24.5 km per day (Sveegaard, 2011). Individuals tagged in Danish waters were recorded off the east coasts of England and Scotland (Sveegaard, 2011).

3.21 Harbour porpoise swimming speeds vary with the highest recorded swimming speeds being 4.3 m/s (Otani *et al.,* 2000). Mean recorded speeds are typically around 1 m/s (Otani *et al.,* 2000, Kastelein *et al.,* 2018). When disturbed by noise harbour porpoise can increase swimming speeds with increasing sound levels. Studies using playback experiments of pile-driving sounds have reported increases in swimming speed from an average of 1.2 m/s to 2.0 m/s at sound levels of 154 dB re 1 µPa that were sustained for at least 30 minutes (Kastelein *et al*., 2018).

3.22 Although harbour porpoises may dive to depths of up to 226 m and remain submerged for up to five minutes, they more frequently undertake relatively shallow dives of a short duration, with a mean depth of 14 m and duration of 44 seconds (Santos and Pierce 2003; Otani *et al*., 1998, 2000). Studies undertaken on 14 tagged harbour porpoise in Danish and adjacent waters reported that on average harbour porpoise spend 55% of the time in the upper 2 m of the surface waters. The most frequent dive depths were between 14 m and 32 m, with the maximum depth dived of 132 m. The number of dives per hour increased from an average of 29 dives hr^{-1} between April and August to 43 dives hr^{-1} in October and November when it was presumed that higher levels of

foraging activity occurred to compensate for the higher energy requirements required during the cooler winter period (Teilmann *et al*., 2007).

3.23 Harbour porpoise use echolocation to detect and track individual prey and are opportunistic feeders, foraging close to the seabed or near the sea surface, preying on a wide range of fish species including, herring (*Clupea harengus*), whiting (*Merlandius merlangus*), Gadoids spp. sprats (*Sprattus sprattus*), gobi (*Pomatoschistus minutus*) and sandeels (*Ammodytes* spp.), and their prey will vary during and between seasons (DeRuiter 2008; Santos and Pierce 2003; IAMMWG *et al.,* 2015). The prey of harbour porpoise may change over time with a reported long-term shift in prey from clupeid species to sandeels and gadoid species (IAMMWG *et al*., 2015), indicating that harbour porpoise may be opportunistic feeders capable of feeding on a variety of species.

3.24 Studies undertaken in Denmark indicate that their local distribution may be correlated with prey availability (Sveegaard, 2011). Due to the relatively high metabolic rate of harbour porpoise and the relatively small size of their predominant prey it has been suggested that harbour porpoise require a reliable source of food and frequent food consumption in order to maintain their body weight, with increased consumption in cooler environments (Kastelein *et al*., 1997; Wisniewska *et al*., 2016; 2018).

3.25 Harbour porpoise have a maximum life expectancy of 24 years, with an average life expectancy of around 12 years in UK waters (Lockyer 2003; Learmouth *et al.,* 2014). Females become sexually mature at between three and five years old (Lockyer 2003; Learmouth *et al*., 2014). Breeding is thought to occur primarily during the summer months between May and September, particularly in August, with calving 10 months later. Calves are nursed for eight to ten months but may remain with the mother until a new calf is born (Defra 2015, Lockyer 2003, Weir *et al*. 2007).

3.26 The range at which marine mammals, including harbour porpoise, may be able to detect sound arising from offshore activities depends on the hearing ability of the species and the frequency of the sound. Other factors that can affect the potential impact include ambient background noise, which can vary depending on water depth, seabed topography and sediment type. Natural conditions such as weather and sea state and existing sources of human produced sound can also reduce the auditory range.

3.27 Porpoises are generally considered to be 'high frequency' or 'very high frequency' specialists with a relatively poor ability to detect lower frequency sounds (Southall *et al.* 2007, 2019). Studies undertaken on captive harbour porpoises indicate that porpoises have a functional hearing range of between 250 Hz and 180 kHz with their best hearing between 16 to 140 kHz and their maximum sensitivity between 100 and 140 kHz. It is within the frequency range of 130 to 140 kHz that harbour porpoise echolocates (Miller and Wahlberg 2013).

3.28 Their ability to detect sound below 16 kHz or above 140 kHz falls sharply (Kastelein *et al.* 2012, 2015, Southall *et al*. 2007). Harbour porpoise are therefore most sensitive to sound sources between 16 to 140 kHz and, although potentially audible, they are unlikely to be sensitive to sound either above or below those frequencies.

3.29 Harbour porpoise use echolocation to communicate and detect prey. Reported sound levels produced range from between 166 to 194 re: 1 µPa (rms SPL) and between 178 and 205 dB re. 1 µPa (peak – peak SPL), with a mean level of 191 dB re. 1 µPa (peak – peak SPL) and within the peak frequency range of 110 to 150 kHz (Villadsgaard, *et al*. 2007, Miller and Wahlberg 2013, MMO 2015).

Prey species

3.30 Fish are not qualifying species for the Southern North Sea SAC, however, potential impacts on fish that are prey for harbour porpoise could affect the integrity of the site by reducing their prey base (JNCC and NE 2019).

3.31 Sandeels are one of the main prey items for harbour porpoise and are also an important prey species for predatory fish such as whiting, cod and haddock, some of which may also be prey for harbour porpoise (Greenstreet *et al*., 2006).

3.32 Sandeels are one of the most abundant fish in the North Sea occurring widely over suitable sandy substrates where, once the larvae have settled, they remain in the area (Heath *et al.,* 2011). Although widespread, sandeel distribution is highly substrate specific as they depend on seabed habitat comprising a high proportion of medium and coarse sands (particle size 0.25 - <2 mm) with low silt content (Holland *et al*., 2005).

3.33 Between September and April sandeels remain largely buried in the seabed except when spawning during December and January (Greenstreet *et al.,* 2006, Van der Kooij *et al*., 2008).

3.34 Within the Southern North Sea SAC sandeels occur across the site with their main spawning area over the Dogger Bank and have a wider nursery area across most of the SAC (Judd *et al.* 2011).

3.35 Harbour porpoise prey on a variety of fish species that could be impacted by the proposed survey including gobies, sandeel spp., whiting, herring and sprat (JNCC and NE, 2019).

3.36 Fish hearing is based on detecting particle motion directly stimulating the inner ear. However, those with swim bladders are also able to detect pressure waves and can detect a wider range of frequencies and sounds of lower intensity than fishes without swim bladders (Popper, 2003). Fish with swim bladders that possess a coupling mechanism between the swim bladder and the auditory system, e.g. herring and sprats, are recognised to be hearing specialists. Fish that have swim bladders but lack a mechanised coupling mechanism or do not have swim bladders, e.g. sandeel spp. are considered hearing generalists and have a relatively lower sensitivity to sound than fish that have swim bladders and a coupling mechanism.

3.37 Studies on the behaviour of fish in response to noise, largely using play-back experiments, have reported a range of behavioural responses including avoidance behaviour, changes in swimming speed and direction (e.g. Hawkins 2014, Mueller-Blenkle *et al.,* 2010) and reduced antipredator responses (Everley *et al.,* 2016).

3.38 Sandeels are not considered to have sensitive hearing (Popper *et al.,* 2014). Studies undertaken using airguns indicate that sandeels have distinct but weak reactions to seismic airguns with initial startle responses reducing in frequency with on-going noise, and no increased mortality was detected (Hassel *et al.,* 2004).

3.39 There are limited studies assessing potential impacts on eggs and larvae. Results indicate that there is potential for increase in mortality when larvae are exposed to an airgun sound source with peak sound pressure levels of 220-242 dB re 1 μPa^2 (unknown measure), but only within 5 m of the airgun (Popper *et al*., 2014).

Information Sources

3.40 This HRA draws on a number of information sources relating to the proposed project and the site designation which should be read in conjunction with this report including:

- bp (2025a). Application to carry out a Marine Survey. GS/1853/0 (Version 2). 5th February 2025.
- bp (2025b). NEP Phase 1 Geophysical Survey EAJ, SA/2046. February 2025.
- Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs. (England, Wales & Northern Ireland). JNCC (2020).
- Harbour Porpoise (*Phocoena phocoena*) possible Special Area of Conservation: Southern North Sea. Draft Conservation Objectives and Advice on Activities. JNCC and NE (2019).
- A potential approach to assessing the significance of disturbance against conservation objectives of the harbour porpoise cSACs. Version 3.0. Discussion document JNCC (2017d).
- Noise assessment and management in harbour porpoise SACs. Briefing note: Use of thresholds to assess and manage the effects of noise on site integrity. JNCC (2017e).

3.41 References to technical papers and other documents are given in the text as necessary.

4 POTENTIAL IMPACTS

4.1 The potential impacts arising from the proposed survey are sound from the airguns and the physical presence of the vessel. No other sources of potential impact that could affect qualifying habitats or species have been identified.

Marine Mammals

4.2 There is a substantial volume of literature describing the potential effects of sound on marine mammals, and summarised in e.g. Thomsen *et al.* (2006), Southall *et al.* (2007, 2019), and OSPAR (2009).

4.3 There are four main types of potential effect from noise that are recognised within the marine environment:

- *Fatal effects* caused by significant levels of noise in close proximity to the receptor.
- *Physical injury*, specifically hearing impairment, which can be permanent or temporary. These effects can impact on the ability of marine mammals to communicate, forage or avoid predators.
- *Behavioural effects* such as avoidance, resulting in displacement from suitable feeding or breeding areas, and changes in travelling routes.
- *Secondary impacts* caused by the direct effects of noise on potential prey causing a reduction in prey availability.

4.4 The range at which marine mammals may be able to detect sound arising from offshore activities depends on the hearing ability of the species and the frequency of the sound. Pinnipeds (seals) are potentially more sensitive to low frequency sounds than cetaceans and harbour porpoise may be more sensitive to relatively high frequencies. Other factors which may affect the potential impact of sound on marine mammals includes ambient background noise, which can vary depending on water depth, seabed topography and sediment type. Natural conditions such as weather and sea state and other existing sources of human produced sound, e.g. shipping, can also reduce the auditory range.

Fatal effects

4.5 If source peak pressure levels from the proposed operations are high enough there is the potential for a lethal effect on marine mammals. Studies suggest that potentially lethal effects can occur to marine mammals when the peak pressure level is greater than 246 or 252 dB re. 1 µPa (Parvin *et al.* 2007). Damage to soft organs and tissues can occur when the peak pressure level is greater than 220 dB re. 1 µPa.

Physical injury

4.6 Underwater sound has the potential to cause hearing damage in marine mammals, either temporarily resulting in a shift in hearing threshold (Temporary Threshold Shift, TTS) or

permanently (PTS). The potential for either of these conditions to occur is dependent on the hearing bandwidth of the animal, the duty cycle of the sound source and duration of the exposure (Southall *et al*., 2019, OSPAR 2009).

4.7 There are two primary and different metrics for measuring the effect of sound on marine mammals: sound pressure level (SPL) and sound exposure level (SEL).

4.8 SPL is the result of the pressure variations in the water achieved by the sound waves. Sound travels through the water as vibrations of the fluid particles in a series of pressure waves. The waves comprise a series of alternating compressions (positive pressure variations) and rarefactions (negative pressure fluctuations). In water the sound source strength is defined by its SPL in dB re 1µPa, referenced back to a representative distance of 1 m from an assumed (infinitesimally small) point source. This allows calculation of sound levels in the far-field.

4.9 SEL is used as a measure of the total sound energy of an event or a number of events (e.g. over the course of a day) and is normalised to one second. This allows the total acoustic energy contained in events lasting a different amount of time to be compared on a like for like basis, meaning multiple events can be taken into account.

Behavioural Change

4.10 Potential changes in behaviour may occur depending on the sound source levels and the species' and individuals' sensitivities. Behavioural changes can include changes in swimming direction, diving duration, avoidance of an area and reduced communication.

4.11 Masking effects may also cause changes in the behaviour as the level of sound may impair the detection of echolocation clicks and other sounds that species use to communicate or detect prey, thus causing them to alter their behaviour.

Secondary Effects

4.12 There is potential for impacts on prey species to affect marine mammals, in particular possible impacts of noise on fish species.

5 NOISE MODELLING

5.1 To assess the potential environmental impacts from the proposed survey the applicant has undertaken noise modelling (bp, 2025b).

5.2 The modelling focuses on predicting received sound levels from the seismic source array since this will be the predominant sound source associated with the survey activities. Sound generated by the survey vessel will be significantly lower than that from the source array and are therefore not included in the modelling.

Harbour porpoise

5.3 The modelling predicts that both zero-to-peak SPL and single-pulse SELs will decrease to below the PTS thresholds for all marine mammals within the nominal 500 m mitigation zone that will be employed during the site survey activities. Therefore, the probability of zero-to-peak SPL and single-pulse SEL sound levels produced by the source array causing PTS onset to marine mammals is low.

5.4 In terms of cumulative SEL received by marine mammals due to multiple sound pulses, the modelling results show that for HF marine mammals and Phocid pinnipeds the cumulative SEL sound levels will not exceed the thresholds for PTS when a soft start of the source array is employed and marine mammals swim away from the source at a conservative swim speed of 1.5 m/s. For LF and VHF cetaceans the maximum distance to threshold is 1 metre. The modelling results therefore demonstrate that the soft start will enable time for marine mammals to move away from the source to distances where they will not be exposed to sound levels that may cause PTS.

5.5 Potential disturbances to marine mammals from the proposed site survey have been estimated using three different threshold values: the National Marine Fisheries Services (NMFS) Level B Harassment disturbance threshold to marine mammals (NMFS, 2018), the Tougaard (2016) threshold for disturbance to marine mammals, and the 12 km Effective Deterrence Range (EDR) suggested by JNCC (2020) for assessing possible disturbance to harbour porpoises from seismic surveys. The JNCC (2020) guidance recommends the use of EDRs i.e., the radius of a circular area assumed to be disturbed, for harbour porpoise for a variety of sound sources, including seismic surveys.

5.6 The modelling predicts that sounds levels will decrease to below the threshold values for behavioural disturbance to marine mammals within 4 – 7 km, which is less than the 12 km EDR suggested by JNCC (2020). The 4 km value was obtained by comparison of modelling results with NMFS Level B Harassment disturbance threshold for disturbance to marine mammals, and the 7 km value was obtained by comparison of modelling results with Tougaard (2016) threshold for disturbance to marine mammals.

5.7 Measurements made during a seismic survey in the Moray Firth (Thompson *et al*., 2013) showed displacement of harbour porpoises out to 5 – 10 km from a 470 cu. in seismic array. These observations corroborate the modelling for the NEP Phase 1 Seismic Survey for which a smaller (160 cu. in.) source array was used.

5.8 The 12 km EDR suggested by JNCC was derived based on observations of harbour porpoise displacement from a seismic survey conducted with a 3,147 cu. in source array (JNCC, 2020). This is a significantly larger source array than will be used for the proposed site surveys and would be expected to have generated higher sound levels. The smaller distances to the marine mammal disturbance threshold values estimated by the applicant's modelling are therefore likely to provide a more realistic indication of impact. Nevertheless, the applicant has based it's assessment on the more conservative EDR value.

Fish (prey species)

5.9 The modelling undertaken by the applicant predicts that sound levels will be below Popper *et al*., (2014) threshold values associated with injury to the most sensitive fish beyond a maximum distance of 80 m from the source array. Predicted distances are lower for less sensitive fish species. It is expected that the soft start of the source array will likely disperse any mobile fish away from the sound source to further distances where injury impacts are unlikely to occur. However, fish eggs and larvae that cannot move away from the source array will be more susceptible to injury.

5.10 Behavioural disturbance to fish cannot be quantitively predicted from the propagation modelling since there are no well-established disturbance thresholds for fish. The qualitative criteria established by Popper *et al.,* (2014) suggest that any disturbance to fish species will likely be localised with higher levels of disturbance only occurring in regions near to the source (e.g., within a few hundred metres). At further distances from the source (e.g., beyond one kilometre), the risk of behavioural disturbance to fish is likely to be low. Fish are mobile and would be expected to move away from a sound source that had the potential to cause them harm. If fish are disturbed by sound, evidence suggests they will return to an area once the activity generating the sound has ceased (Slabbekoorn *et al.,* 2010).

6 EFFECTIVE DETERRENT RADIUS / RANGE

6.1 The Effective Deterrent Radius / Range (EDR) is proposed by the Statutory Nature Conservation Bodies (SNCBs) as a means to measure potential impacts on harbour porpoise within the SAC (JNCC, 2017d, 2017e; JNCC, 2020). The EDR is an empirically derived generic distance within which deterrence, i.e. displacement, of harbour porpoise is predicted to occur. The EDR are based on published studies that have monitored the effects on harbour porpoise from various activities and reflects the overall loss of habitat if all animals vacate the area (e.g. Defra 2015). It is an area of displacement as opposed to disturbance, which may be greater.

6.2 The published precautionary EDR are presented in Table 3 (JNCC, 2020). Relevant to the assessment of the proposed seismic survey is the EDR for seismic surveys which is published as being 12 km.

6.3 Other EDR in Table 3 have been used in the assessment of the impact of the seismic survey in combination with other activities taking place within the SAC.

Table 3: Precautionary Effective Deterrent Ranges (EDR) (Source: JNCC, 2020).

Activity	Effective Deterrent Range (km)
Monopile	26
Unexploded Ordnance	26
Pin-pile [1]	15
Monopile with noise abatement	15
Conductor piling	15
Seismic survey	12
High Resolution Geophysical Surveys	5

[1] Pin-piles are '*smaller diameter piles that secure jacket structures'* although no definition as what diameter a pin-pile should be has been provided in published advice (JNCC 2020).

6.4 The SNCBs recognise that future data may require the suitability of the EDR to be reconsidered if it is found to be inappropriate (JNCC 2017e).

7 CONSERVATION OBJECTIVES

7.1 Conservation Objectives constitute a necessary reference for identifying site-based conservation measures and for carrying out HRAs of the implications of plans or projects (JNCC and NE 2019). They outline the desired state for any European site, in terms of the features for which it has been designated. If these features are being managed in a way which maintains their nature conservation value, they are assessed as being in a 'favourable condition'. An adverse effect on the integrity of a site is likely to be one which prevents the site from making the same contribution to favourable conservation status for the relevant feature as it did at the time of its designation (English Nature, 1997).

7.2 The purpose of an Appropriate Assessment is to determine whether a plan or project adversely affects a site's integrity. The critical consideration in relation to site integrity is whether the plan or project affecting a site, either individually or in-combination, affects the site's ability to achieve its conservation objectives and favourable conservation status (JNCC 2015).

Southern North Sea SAC

7.3 The Southern North Sea SAC was designated as a SAC in 2019. The site covers an area of 36,951 km^2 and is designated for harbour porpoise.

7.4 Harbour porpoise are also protected throughout European waters under the provisions of Annex IV and Article 12 of the Habitats Directive. Harbour porpoise in UK waters is considered part of a wider European population and the mobile nature of this species means that the concept of a 'site population' is not thought to be appropriate for this species. Site based conservation measures therefore aim to complement wider ranging measures that are in place for the harbour porpoise (JNCC and NE 2019).

7.5 The Conservation Objectives for harbour porpoise are designed to ensure that human activities do not, in the context of maintaining site integrity:

- kill, or injure harbour porpoise (directly or indirectly),
- prevent their use of significant parts of the site (disturbance / displacement),
- significantly damage relevant habitats, or
- significantly reduce the availability of prey.

Southern North Sea SAC Conservation Objectives:

To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status for Harbour Porpoise in UK waters.
In the context of natural change, this will be achieved by ensuring that:

1. Harbour porpoise is a viable component of the site,
2. There is no significant disturbance of the species, and
3. The condition of supporting habitats and processes, and the availability of prey is maintained.

Source: JNCC and NE 2019

7.6 Harbour porpoises are considered to be a 'viable component' of the site if they are able to survive and live successfully within it. The first Conservation Objective aims to minimise the risk from activities that cause unacceptable levels of impact on harbour porpoise using the site, specifically those that could impact on the Favourable Conservation Status of harbour porpoise (JNCC and NE, 2019).

7.7 The '*integrity of the site*' is not defined in the Conservation Objectives. However, UK Government guidance defines the integrity of a site as ''*the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified*' (Defra 2012). Therefore, the integrity of the site applies to the whole of the site and it is the potential impacts across the whole of the site that are required to be appropriately assessed. Pressures that would affect site integrity include:

- killing or injuring harbour porpoise (directly or indirectly),
- preventing their use of significant parts of the site (disturbance / displacement),
- significantly damaging relevant habitats,
- significantly reducing the availability of prey (JNCC and NE 2019).

7.8 The second Conservation Objective states that there should be '*…no significant disturbance of the species'* and that '*Disturbance is considered significant if it leads to the exclusion of harbour porpoise from a significant portion of the site'* (JNCC and NE 2019).

7.9 *'Supporting habitats and processes'* relate to the seabed and water column along with the harbour porpoise prey.

7.10 JNCC advise that it is not appropriate to use the site population estimates in any assessments of effects of plans or projects (i.e. HRAs), as it is necessary to take into consideration population estimates at the MU level to account for daily and seasonal movements of the animals (JNCC 2017c; JNCC and NE 2019).

7.11 There are no formal thresholds at which impacts on site integrity are considered to be adverse. However, a threshold of 1.7% of the relevant harbour porpoise population above which a population decline is inevitable has been agreed with Parties to the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), with an intermediate precautionary objective of reducing the impact to less than 1% of the population (Defra 2003; ASCOBANS, 2015). This threshold relates to impacts from fisheries by-catch on harbour porpoise where the impact on the harbour porpoise is permanent, i.e. up to 1.7% of the population may be caught as by-catch before a population decline is inevitable. An equivalent level of impact from disturbance, which is temporary and non-lethal, on a population will have a lower level of impact on the population compared to that from a fisheries by-catch.

7.12 The lack of agreed population thresholds either at the MU level or site level, below which evidence demonstrates there would not be an adverse effect, does not prevent objective judgements to be made on site integrity.

7.13 Thresholds to assess and manage the effects of noise on site integrity have been proposed by the JNCC and NE (JNCC 2017d, 2017e; JNCC and NE 2019; JNCC 2020). The proposed approach is not based on a population level impact but is instead based on a temporal and spatial level where a proportion of the area within the SAC may be affected over a period of time.

7.14 The JNCC and NE advice is that *'noise disturbance within the site should not exclude harbour porpoise from more than 20% of the site on any given day. Over a season, the advice is that an average loss of access to more than 10% of the SAC should be considered significant, recognising that within the SAC the abundance of harbour porpoise per unit habitat is generally higher than the equivalent sized habitat in the rest of the relevant Management Unit. Management of temporary habitat 'loss' to below defined area/time thresholds is therefore designed to ensure that it continues to contribute in the best possible way to the maintenance of the species at Favourable Conservation Status (FCS).'* (JNCC, 2020).

7.15 The potential extent of noise causing disturbance that would meet these proposed thresholds and therefore impact on the integrity of the site is presented in Table 4. The results indicate that should the impact occur wholly inside the SAC that, within the 'summer' area a sound source alone or in-combination causing disturbance for one day over an area of 5,406 km^2 would risk impacting site integrity. This is equivalent to a circular radius of noise out to 41.5 km. To exceed the threshold for the 'winter' area, noise in any one day should not extend over an area of more than 2,539 km^2: equivalent to a circular radius of 28.4 km.

7.16 Over the course of a season the total extent of potential disturbance on average per day should, in the 'summer' area, not extend over an area of more than 3,695 km^2; equivalent to a radius of noise of 29.3 km and in the 'winter' area should not extend over an area of more than 1,270 km^2, equivalent to a radius of 20.1 km.

Table 4: Estimated extent sound levels capable of causing displacement disturbance occur in order to impact on site integrity.

Site	Area (km^2)	1 day threshold		Seasonal threshold	
		20% of area (km^2)	Distance to threshold (km)	10% of area (km^2)	Distance to threshold (km)
Southern North Sea SAC	36,951	7,390	48.5	3,695	34.3
'summer' area April - September	27,028	5,406	41.5	2,701	29.3
'winter' area October - March	12,696	2,539	28.4	1,270	20.1

The 'Distance to threshold' presumes sound propagation is circular in shape, i.e. the distance is the equivalent to a radius of circular noise.

7.17 Unlike the daily threshold, the area of the SAC that can be affected over the course of a season is an average over the season. The seasonal average is calculated by summing the proportion of the site impacted (for the relevant season) over the number of days the impact will occur and then averaging across the total number of days within that season, i.e. 183 days in the summer period and 182 days in the winter period. This provides a seasonal average spatial effect.

7.18 This assessment is based on both the potential impact on the North Sea MU population using both the ASCOBANS thresholds and the proposed SNCB threshold approach.

7.19 In order to undertake any meaningful assessment using the threshold approach, accurate information on the timing, duration and extent of activities being undertaken is required. Where this information is lacking or where speculative 'worst-case' scenarios are used there is little or no confidence that the results will bear any resemblance to the true extent of impact within the SAC on any single day or across the course of a season.

7.20 The HRA has been carried out in light of best scientific knowledge with reference to the Conservation Objectives of the SAC and the potential impacts on the integrity of the site (EC, 2018).

8 IN-COMBINATION IMPACTS

8.1 Under the Habitats Regulations, it is necessary to consider the in-combination effects of plans or projects on European Sites. These refer to effects, which may or may not interact with each other, but which could affect the same receptor or interest feature (i.e. a habitat or species for which a European site is designated).

8.2 The in-combination assessment includes plans or projects that are:

- Under construction,
- Permitted application(s), but not yet implemented,
- Submitted application(s), not yet determined,
- Projects identified in the relevant Development Plan (and emerging Development Plans),
- Sites identified in other policy documents, as development reasonably likely to come forward.

8.3 In recognition of there being different regulatory regimes, administered by different competent authorities, for the permitting of offshore activities which could affect the Southern North Sea SAC via the propagation of noise, a SAC Noise Management Regulators Working Group has been established to facilitate the sharing of information between all parties with an interest in these activities.

8.4 The SAC Noise Management Regulators Working Group has developed an activity tracker which provides information on current and future possible operations in the Southern North Sea SAC area (Gov, 2025). This tracker has been used to identify other activities that may be taking place in the SAC at the same time as the proposed survey. The activities identified to potentially overlap with the timing of the proposed survey (February – April) are summarised in the following subsections.

Renewable energy activity

8.5 A source of potentially significant in-combination underwater noise impact is from pile driving activity occurring during the construction of offshore renewable developments, particularly offshore wind farms.

8.6 There are 24 UK offshore wind farms that are either operating or have had applications submitted for consent, and that lie wholly within the Southern North Sea SAC or are within 26 km of the boundary (Figure 3). This is identified by the JNCC as an area that harbour porpoises may be displaced from by noise arising from pile-driving activities (JNCC, 2017d; JNCC, 2020). A further six wind farms are currently in pre-application phase (Table 5).

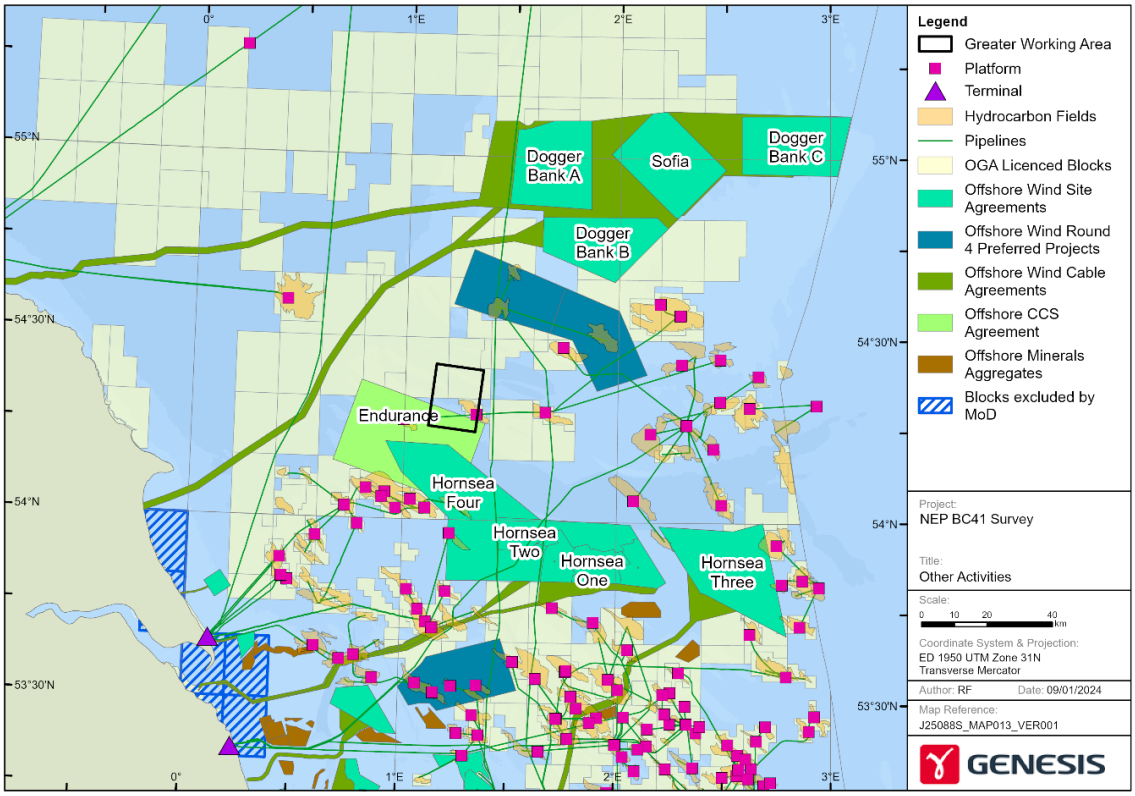

Figure 3: Offshore wind farms and oil and gas activities in the region of the proposed NEP Phase 1 Seismic Survey GWA.

8.7 During the period of the proposed survey the following wind farm related activities could be undertaken that could cause an in-combination impact:

- Sofia Offshore Wind Farm monipiling could take place between 1st January 2025 and 1st June 2025.
- Sofia OWF UXO Survey could take place between 2nd June 2023 and 31st May 2028.
- East Anglia Three Monopiling (Unabated) could take place between 1st April 2025 and 7th April 2025.
- East Anglia Three Monopiling (abated) could take place between 8th April 2025 and 30th April 2025.
- East Anglia Three Pin Piling could take place between 3rd July 2025 and 23rd July 2025.
- Hornsea Three Low Order UXO Clearance could take place between 4th April to 19th April 2025 and 21st August 2025 to 19th September 2025.
- Hornsea Three High Order UXO Clearance could take place between 1st April to 3rd April 2025 and 1st August 2025 to 20th August 2025.

- Dogger Bank C Monopiling (Unabated) could take place between 1st September 2025 and 4th September 2025.
- Dogger Bank B Monopiling (Unabated) could take place between 1st April 2025 and 1st April 2025.

8.8 All other wind farms are either operating, consented but not started offshore construction or have submitted applications and are awaiting determination. No other activities associated with offshore wind farms have been identified as having potential for causing an in-combination impact.

Table 5: Offshore wind farms located within 26 km of the SNS SAC.

Wind farm	Status
Round 1	
Scroby Sands	Operating
Round 2/2.5	
Dudgeon	Operating
Galloper	Operating
Greater Gabbard	Operating
Gunfleet Sands II	Operating
Humber Gateway	Operating
Thanet	Operating
Triton Knoll	Operating
Westermost Rough	Operating
Round 3	
Dogger Bank A	Offshore construction started
Dogger Bank B	Onshore construction started
Dogger Bank C	Onshore construction started
Sofia	Consented
East Anglia One	Operating
East Anglia One North	Consented
East Anglia Two	Consented
East Anglia Three	Consented
Hornsea Project One	Operating
Hornsea Project Two	Offshore construction started
Hornsea Project Three	Consented
Hornsea Project Four	Application submitted
Norfolk Vanguard	Consented
Norfolk Boreas	Consented
'Round 3+'	
Dogger Bank D	Pre-application
Extension Projects	
Dudgeon and Sheringham Shoal Extensions	Application submitted
Five Estuaries	Pre-application
North Falls	Pre-application
Round 4	
Dogger Bank South: West	Pre-application
Dogger Bank South: East	Pre-application
Outer Dowsing	Pre-application

Aggregate extraction and dredging activity

8.9 Existing localised aggregate dredging occurs primarily in the southern half of the SAC, along the east coast of England. In 2019 there were 29 aggregate production areas and five Exploration and Option areas covering an area of 579.2 km^2. Five of the aggregate areas occur in the 'summer' area of the SAC covering 77.7 km^2 and the rest occur in the 'winter' area of the SAC and cover an area 533.8 km^2, with some sites occurring in both the 'winter' and 'summer' areas.

8.10 Studies have indicated that harbour porpoise may be displaced by dredging operations within 600 m of the activities (Diederichs *et al.*, 2010). Noise modelling previously undertaken for

aggregate assessments have predicted the potential for avoidance at ranges of 500 m from suction dredging (Parvin *et al*., 2008 (referenced in Hanson Aggregates Marine Ltd 2013)).

8.11 This assessment focuses on noise sources which have the greatest potential to disturb harbour porpoise over a large area, these are specifically impulsive noise sources generally in the range of 10Hz to 10 kHz. As a precaution and to test the assumption that aggregate dredging does not represent a significant contribution to the cumulative the cumulative disturbance level a rudimentary assessment has been undertaken, which assumes there is a level of behavioural displacement out to 600 m meaning there is potential for an area of 1.13 km^2 to be affected at each active dredging location. There are currently three aggregate production areas in the 'summer' area and 26 in the 'winter' area. Although the level of dredging activity within each of the active licence areas is unknown, as a worst-case scenario, with dredging occurring within each dredging area, harbour porpoise may be displaced from an area of 3.39 km^2 in the 'summer' area and 29.38 km^2 in the 'winter' area. Therefore, a very small proportion (0.01% of the summer area and 0.2% of the summer area) of the SAC may be impacted by noise arising from dredging activities meaning dredging related noise will not be considered further within this assessment.

Oil and gas activity

8.12 There is a long history of oil and gas activities within the boundaries of the Southern North Sea SAC. Since 1965, when the first well was spudded (first drilled), there has been extensive oil and gas development with a total of 117 installations installed within the SAC. The vast majority (94%) of all the installations within the boundary of SAC are located in the 'summer' area of the site. Those in the vicinity of the proposed seismic survey are shown in Figure 3 (OGA NDR 2020).

8.13 Seismic surveys have regularly been undertaken within the SAC over the last 50 years, with a total of 23 2D or 3D seismic surveys carried out within the SAC over a ten year period up to 2017. The majority of surveys during this period took place in the northern half of the SAC, where the most recent oil and gas activity has occurred.

8.14 OPRED are aware of the following planned oil and gas related seismic activity within the SAC during the period when the proposed survey will be undertaken:

- NEP Phase 1 Seismic Survey (bp), which could take place between 15th February and 20th April 2025.
- NEP Expansion Seismic Acquisition 2025 which could take place between 1st April and 1st October 2025.
- NEP EPCI 3 Survey which could take place between 25th March and 30th June 2025
- NEP EPCI 1 Survey which could take place between 14th May and 3rd July 2025.

NEP Phase 1 Survey

8.15 In December 2024, bp submitted an application (GS/1853/0) to carry out a seismic survey between 15th February and 20th April 2025.

8.16 For the NEP Expansion Seismic Survey, bp are planning to acquire high resolution data across six distinct areas and along two tie-in lines using a seismic source array comprising four 40 cubic inch (cu. in.) airguns (maximum combined airgun volume of 160 cu. in.), a parametric SBP, a MBES and a SSS device.

8.17 The survey is scheduled to take approximately 30 days to complete and will cover an area of approximately 73.5 km^2. The area of the GWA will be approximately 357 km^2. The proposed survey is located in Quadrants 42 and 43.

Shipping

8.18 Impacts from shipping on harbour porpoise within the SAC have been identified as arising from shipping noise and collision impacts.

8.19 Shipping noise is the predominant anthropogenic source of noise within the marine environment and is reported to have a negative effect on harbour porpoise within the SAC when vessel traffic exceeds 80 vessels per day (JNCC and NE, 2019).

8.20 Shipping has been on-going in the SNS for many hundreds of years and the area is important for shipping, with relatively high numbers of vessels occurring within it. Based on vessel track lines, in 2015 a total of 269,018 vessels track lines were recorded transiting across the SAC: an average of 737 vessels per day (MMO 2017a).

8.21 The level of vessel activity across the 'summer' and 'winter' areas of the SAC differs. There is relatively widespread vessel activity in low densities across the 'summer' area, with 76% of the quadrants having less than seven vessels per week and 17% having less than one vessel per week. Compared with the 'winter' area of the SAC where 14% of the quadrants had, on average, less than seven vessels per week and only 1% had less than one vessel per week. In contrast 11% of the 'winter' area had more than 70 vessels per week compared with none in the 'summer' area. The areas with relatively higher levels of shipping (>24 vessels per day), occur over 4% of the 'winter' area. Therefore, the 'winter' area has relatively localised, higher density, areas of vessel traffic compared with the 'summer' area that has widespread but low-density vessel traffic.

8.22 The North Sea Transition Authority (NSTA) has compiled a list of shipping densities in UKCS blocks, categorising shipping density to be either: negligible; very low; low; moderate; high; or very high (NSTA, 2016). Shipping densities are 'moderate' in the region of the proposed NEP Phase 1 Seismic Survey GWA.

8.23 Vessel density maps have been created for European waters and some neighbouring areas for the European Marine Observation Data network (EMODnet, 2019) and are updated every year,

currently including data from 2017 - 2022. The maps are based on Automatic Identification System (AIS) data showing shipping density in 1 x 1 km squares, expressed as hours per square kilometre (km^2) per month. Figure 4 shows the shipping density in the region of the proposed GWA in terms of the number of hours vessels spent in each 1 km x 1 km block per month in the year 2022 (EMODnet, 2019).

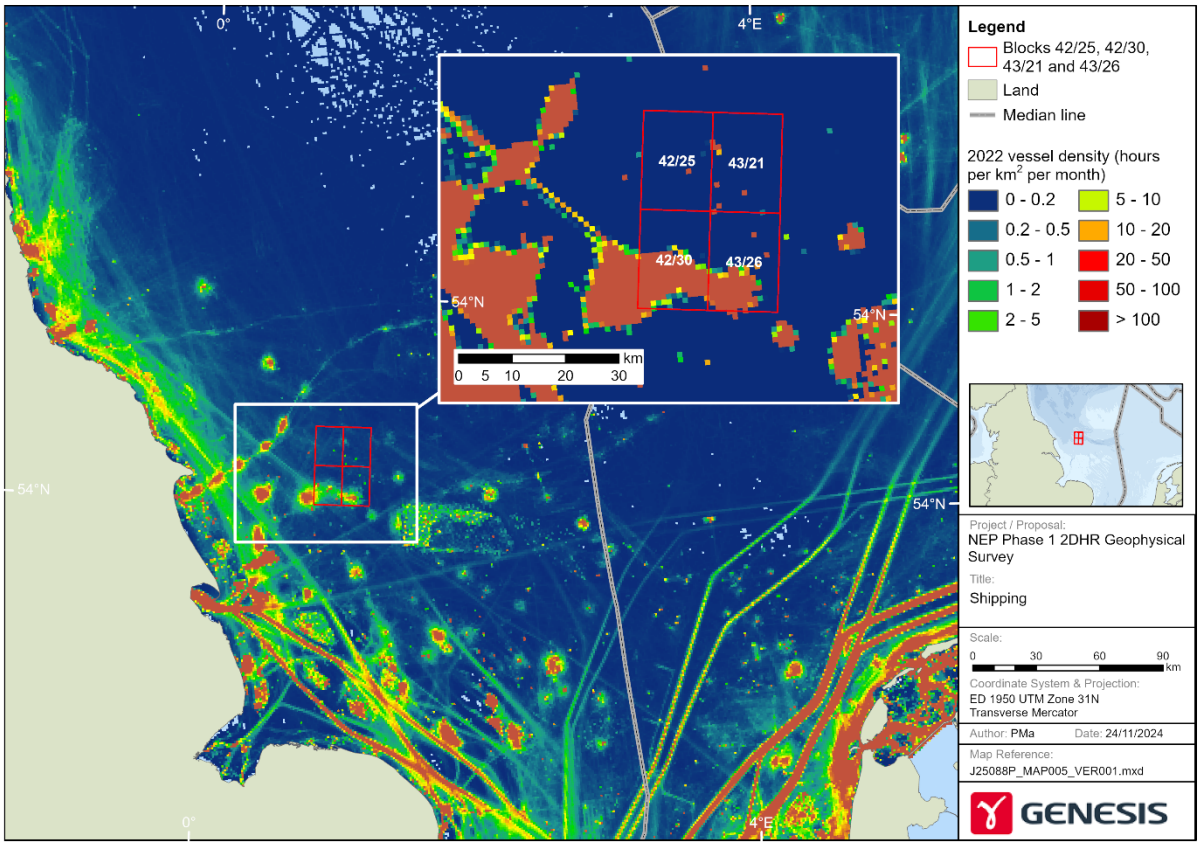

Figure 4: Shipping density in the region of the survey (EMODnet, 2023).

Fishing activity

8.24 Fishing occurs widely across the SNS and has been on-going in the area for many hundreds of years.

8.25 The majority of current fish landings are obtained from areas adjacent to the SAC but there is widespread fishing activity in the southern half and north-eastern edge of the SAC and relatively moderate to high levels of fishing activity along the western edge of the central part of the SAC (MMO 2017b). Note however, this does not include the activities of non-UK registered vessels that will occur within the site or vessels greater than 15 m in length.

8.26 The proposed NEP Phase 1 Seismic Survey GWA overlaps with International Council for the Exploration of the Sea (ICES) rectangle 37F1. Fishing effort in ICES rectangle 37F1 was small

compared to the UK average over all ICES rectangles (2018-2022), indicating that it is not a particularly important area to the fishing community.

8.27 There is a risk of an impact from bycatch associated with the fishing industry to harbour porpoise across the North Sea. There is a also a medium risk of an impact from removal of prey (JNCC and NE 2019).

8.28 The bycatch of harbour porpoise in fishing gear is reported in SNCB conservation advice to be one of the most significant anthropogenic pressures impacting on the harbour porpoise population (JNCC and NE 2019). It is estimated that between 1,235 and 1,990 harbour porpoise die each year in the North Sea due to bycatch, predominantly in gill nets (ICES 2016, Mitchell *et al*. 2018, OSPAR 2017). This is approximately 0.6% of the North Sea MU population.

8.29 Noise modelling predicts that the proposed seismic survey will not cause any direct mortality to any harbour porpoise and therefore there will be no in-combination impact regarding porpoise mortality between fishing and the survey.

In-combination conclusion

8.30 Following consideration of all known developments that could cause a likely significant effect, OPRED considers that there are plans or projects likely to cause an in-combination likely significant effect. The activities likely to cause an in-combination impact considered within this HRA are:

- Sofia Offshore Wind Farm monopiling could take place between 1st January 2025 and 1st June 2025.
- Sofia OWF UXO Survey could take place between 2nd June 2023 and 31st May 2028.
- East Anglia Three Monopiling (Unabated) could take place between 1st April 2025 and 7th April 2025.
- East Anglia Three Monopiling (abated) could take place between 8th April 2025 and 30th April 2025.
- East Anglia Three Pin Piling could take place between 3rd July 2025 and 23rd July 2025.
- Hornsea Three Low Order UXO Clearance could take place between 4th April to 19th April 2025 and 21st August 2025 to 19th September 2025.
- Hornsea Three High Order UXO Clearance could take place between 1st April to 3rd April 2025 and 1st August 2025 to 20th August 2025.
- Dogger Bank C Monopiling (Unabated) could take place between 1st September 2025 and 4th September 2025.

- Dogger Bank B Monopiling (Unabated) could take place between 1st April 2025 and 1st April 2025.
- NEP Phase 1 Seismic Survey (bp), which could take place between 15th February and 20th April 2025.
- NEP Expansion Seismic Acquisition 2025 which could take place between 1st April and 1st October 2025.
- NEP EPCI 3 Survey which could take place between 25th March and 30th June 2025
- NEP EPCI 1 Survey which could take place between 14th May and 3rd July 2025.

8.31 On-going routine activities such as shipping, that could contribute to impacts on qualifying species, will also be being undertaken for the duration of the proposed surveys.

9 LIKELY SIGNIFICANT EFFECTS TEST

9.1 Regulation 5 of the 2001 Regulations requires the Competent Authority to consider whether a development will have a likely significant effect on a European site, either alone or in combination with other plans or projects. A likely significant effect is, in this context, any effect that may be reasonably predicted as a consequence of a plan or project that may affect the Conservation Objectives of the features for which the site was designated but excluding trivial or inconsequential effects. An Appropriate Assessment is required if a plan or project is likely to have a significant effect on a European site, either alone or in combination with other plans or projects. A judgement of likely significant effect in no way pre-supposes a judgement of adverse effect on site integrity.

9.2 There are no recognised criteria as to what can be considered to be trivial or inconsequential impacts. Where predicted impacts are relatively very small compared to either the population of the MU or the area of the site or the duration of the impact, it was determined that the impact would not cause a likely significant effect.

9.3 This section addresses this first step of the HRA, for which OPRED has considered the potential impacts of the survey both alone and in combination with other plans and projects on each of the interest features of the relevant European sites to determine whether or not there will be a likely significant effect.

Harbour porpoise

9.4 Harbour porpoise are a qualifying species for the Southern North Sea SAC.

9.5 Within the Southern North Sea SAC harbour porpoise are known to occur throughout the site, with particular concentrations in the northern ‘summer’ area over which the proposed seismic survey overlaps.

9.6 Noise modelling undertaken by the applicant indicates that there is potential for auditory injury to occur within 500 m of the sound source and disturbance or displacement effects to occur within 4 – 7 km of the airguns, which is less than the 12 km EDR suggested by JNCC (2020). Using this EDR, results indicate the potential for behavioural disturbance extends over a maximum area of roughly 873 km^2. Using the modelling results and comparing to the NMFS Level B Harassment and Tougaard (2016) threshold values it is predicted the potential for behavioural disturbance extends between 165 km2 and 372 km2.

9.7 Based on the predicted extent of potential impacts, it is concluded that there is potential for a likely significant effect on harbour porpoise from the proposed seismic survey within the Southern North Sea SAC; the potential impacts on harbour porpoise are therefore considered further in the Appropriate Assessment.

Fish (prey species)

9.8 There is potential for noise to impact on the prey species of harbour porpoise from or within designated sites.

9.9 Fish hearing is based on detecting particle motion directly stimulating the inner ear. However, those with swim bladders are also able to detect pressure waves and can detect a wider range of frequencies and sounds of lower intensity than fishes without swim bladders (Popper, 2003). Fish with swim bladders include prey species for harbour porpoise, such as herring, are recognised to be hearing specialists. Those without, e.g. sandeels, are considered to have a relatively low sensitivity to noise. Most fish with swim bladders are able to detect sound within the 100 Hz to 2 kHz range, those without swim bladders are unlikely to detect sound above 400 Hz (Popper *et al*., 2014).

9.10 Noise modelling undertaken by the applicant indicates that sound levels will be below Popper *et al.,* (2014) threshold values associated with injury to the most sensitive fish beyond a maximum distance of 80 m from the source array. Predicted distances are lower for less sensitive fish species. The area of impact within which physical injury could occur is therefore relatively very small.

9.11 However, the area within which disturbance could occur may be substantially greater. Behavioural disturbance to fish cannot be quantitively predicted from the propagation modelling since there are no well-established disturbance thresholds for fish. The qualitative criteria established by Popper *et al.,* (2014) suggest that any disturbance to fish species will likely be localised with higher levels of disturbance only occurring in regions near to the source (e.g., within a few hundred metres). At further distances from the source (e.g., beyond one kilometre), the risk of behavioural disturbance to fish is likely to be low.

9.12 Modelling undertaken for piling operations at the Hornsea Two offshore wind farm within the SAC indicate a general behavioural response may occur out 25 km for 'hearing specialists' (DONG 2015). Although the sound profile from piling is different from that of a seismic survey it does indicate the potential extent of disturbance to fish beyond the area of physical injury.

Likely significant effects test - conclusions

9.13 Based on the information presented within the application relating to the proposed activities and a summary understanding of relevant available literature, it is concluded that it is not possible to exclude a likely significant effect on the following designated site and qualifying species:

- Southern North Sea SAC - Harbour porpoise.

9.14 For all other designated sites and associated qualifying habitats or species it is concluded that there will not be a likely significant effect from the proposed seismic survey either alone or in-combination with other plans or projects.

10 APPROPRIATE ASSESSMENT

10.1 An Appropriate Assessment is triggered when the competent authority, in this case the Secretary of State, determines that a plan or project is likely to have a significant effect on a site. Guidance issued by the European Commission states that the purpose of an Appropriate Assessment is to determine whether adverse effects on the integrity of the site can be ruled out as a result of the plan or project, either alone or in-combination with other plans and projects, in view of the site's conservation objectives (EC, 2018).

10.2 A likely significant effect on the harbour porpoise feature of the Southern North Sea SAC could not be ruled out with respect to impacts from noise generated from activities from the project alone and in-combination.

10.3 A dual approach based on outputs from noise modelling and supported by the use of the 12 km EDR suggested by JNCC (2020) has been used for harbour porpoise in order to determine whether an adverse effect on the integrity of the Southern North Sea SAC will occur.

Southern North Sea SAC (Harbour porpoise)

Physical Injury

10.4 Noise modelling undertaken indicates that there is not potential for auditory injury to occur within 160 m of the sound source.

10.5 The peak harbour porpoise density across the SAC is estimated to be >3 per km^2 (Heinänen and Skov, 2015). Based on this peak density and the worst-case scenario of PTS occurring out to 160 m of the survey, a single harbour porpoise could potentially be affected at the start of the seismic survey.

10.6 The North Sea MU harbour porpoise population is 346,601 individuals (IAMMWG, 2022) and therefore in a worst-case scenario of one harbour porpoise being impacted this would be <0.0003% of the MU population.

10.7 The estimated area of potential impact from PTS is within 500 m of the airgun array and therefore within the radius which, if marine mammals are detected during a pre-shooting search, the commencement of the firing of the airguns must be delayed by a minimum of 20 minutes, as per the JNCC guidance (JNCC 2017a). Harbour porpoise will avoid the area of potential injury and move away from the seismic survey vessel as it approaches. Consequently, there is a very low risk of physical injury to any harbour porpoise.

10.8 There is a low risk of harbour porpoise being physically impacted by the proposed seismic survey. In the extremely unlikely event, the onset of PTS does occur, it would only affect a very small proportion of the relevant population.

Disturbance

10.9 As described in Section 5, the area over which noise from the survey source array may cause temporary displacement of harbour porpoise has been determined by the applicant on the basis of three different approaches. Two of these are derived from modelling of the noise propagation to determine the distance at which the noise levels decrease to below a threshold for disturbance. Using the NMFS Level B Harassment disturbance threshold for disturbance to marine mammals a radius of 4 km was established and using the Tougaard (2016) threshold for disturbance to marine mammals a radius of 7 km was established. The third approach adopted the 12 km EDR suggested by JNCC (2020) for assessing possible disturbance to harbour porpoises from seismic surveys.

10.10 The range of values derived from the applicant's noise modelling is broadly aligned with observations made by Thompson *et al* (2013) of displacement behaviour of harbour porpoise in the Moray Firth during a seismic survey. The survey used a 470 cu. in. source array (compared to a 160 cu. in. array proposed for the NEP Phase 1 Seismic Survey) and observed a decrease in the relative densities of harbour porpoise within 10 km of the source array, with an increase in densities at greater distances.

10.11 The 12 km EDR suggested by JNCC was influenced by information relating to seismic surveys with a source array of 3,147 cu. in. which may account for the larger radius than that derived from the applicant's noise modelling.

10.12 The applicant has presented estimates of disturbance for all three approaches considered, the most conservative being that which utilises the EDR suggested by JNCC. A summary of the estimates of numbers of harbour porpoise that could be disturbed in aggregate over the total survey are shown in Table 6.

10.13 The total aggregated area over which there is potential for disturbance at some point during the proposed seismic survey has been derived as 873 km^2 from the GWA with an extension of 12 km in all directions.

10.14 Based on the North Sea MU harbour porpoise estimated density range (Gilles *et al*, 2023) and population (IAMMWG, 2022) and using disturbance areas derived from the 12 km EDR, the estimated number of harbour porpoise that could potentially be disturbed or exhibit behavioural responses over the NEP Phase 1 Seismic Survey area overall is 405 – 1,185 animals, which is equivalent to 0.117 - 0.342 % of the North Sea MU harbour porpoise population being disturbed.

Table 6: Potential number of harbour porpoise disturbed in aggregate over the full Phase 1 survey area as estimated by three approaches.

Estimation Basis	Radius of Potential Displacement (km)	Area of Potential Displacement (km^2)	Animal Density (animals/km^2)	Number of Animals Disturbed	Percentage of MU Population Disturbed (%)
Modelled results with NMFS (2018) threshold	7	165	0.464 - 1.358	76 - 224	0.022 – 0.065
Modelled results with Tougaard (2016) threshold	12	372		172 - 505	0.05 – 0.015
JNCC (2020) EDR	16	873		405 – 1,185	0.117 - 0.342

10.15 A summary of the estimates of numbers of harbour porpoise that could be disturbed at any one instant during the survey are shown in Table 7.

10.16 The maximum area within which disturbance could occur at any one instant is 873 km^2 based on a 12 km EDR.

Table 7: Potential number of harbour porpoise disturbed at any single point in time during the Phase 1 survey as estimated by three approaches.

Estimation Basis	Radius of Potential Displacement (km)	Area of Potential Displacement (km^2)	Number of Animals Disturbed	Percentage of MU Population Disturbed (%)	
Modelled results with NMFS (2018) threshold	4	50	23 – 68	0.007 – 0.02	
Modelled results with Tougaard (2016) threshold	7	154	92 - 206	0.027 – 0.059	
JNCC (2020) EDR	12	452	270 - 606	0.078 – 0.175	

10.17 As the seismic survey vessel transits along a survey line, the area of disturbance will progress. The application states that the seismic survey will be travelling at 4 knots (7.41 km/h) (bp, 2025a, 2025b). As the vessel undertakes a survey, disturbance at any one point will last for a little over 3 hours as a maximum. Once the vessel has left the area, sound levels will reduce to background levels. The disturbance effects are therefore transient and once the vessel has moved away from an area there is, in effect, no disturbance on those porpoises previously impacted.

10.18 Any marine mammals disturbed from the area by the proposed site survey will likely return after cessation of activities (Sarnocińska *et al.,* 2020; Thompson *et al.,* 2013).

10.19 It was observed by Thompson *et al.,* (2013) that harbour porpoises displaced during a seismic survey returned to the survey area within one day after the survey finished.

10.20 Similar studies based on impacts associated with sound from piling have indicated that marine mammals return to the area within relatively short periods of time, usually within three days once the activity causing the displacement has ceased (Brandt *et al*., 2016, 2017, 2018; Carstensen *et al.,* 2006).

10.21 It has been demonstrated that even long-term disturbance from a limited area over several months is unlikely to have a significant long-term impact on marine mammal populations levels (Nabe-Nielsen *et al.,* 2018; Nabe-Nielsen, 2020).

10.22 The proposed surveys are expected to be completed within a total of 30 days. It is expected that any marine mammals that temporarily move away from the area will return after the surveys have been completed. Therefore, any displacement effects caused by seismic surveys are predicted to be temporary, with harbour porpoises returning to the area impacted within 24 hours of the survey vessel moving on.

Threshold Approach

10.23 The JNCC have advised that the assessment for harbour porpoise within the SAC should be undertaken by the proposed threshold approach whereby disturbance should not exceed 20% of the SAC 'summer' or 'winter' areas over the course of one day and on average 10% of an area over the course of a single season (see Section 7).

10.24 To calculate the extent of noise within the SAC using the threshold approach, the extent of disturbance from a moving sound source over the course of 24 hrs and the season is required.

Daily Threshold

10.25 The area of disturbance created by the survey vessel over the course of a day is dependent on the planned arrangement of survey transect lines and time spent turning from one line to the next.

10.26 A survey transit plan was not included in the applicant's assessment and, in the absence of better information, the assessment Survey area EC01 is considered representative of the likely impact per planned survey. It is stated that the six surveys will not be undertaken in parallel.

10.27 The maximum daily disturbance area calculated in this way was 526 km^2 for the EC01 phase of the Phase 1 survey using 12 km EDR. This equates to approximately 1.946% of the SAC summer area.

10.28 The maximum daily disturbance for the Phase 1 site survey calculated using the applicant's noise modelling results was 372 km^2, or 1.38% of the SAC summer area.

10.29 It should be noted that at the time of writing the survey is planned to take place outwith the summer period however there may be delays to the project. The maximum days within the summer period for the SNS SAC will be 20 days.

10.30 It is concluded that the daily threshold will not be exceeded by the proposed seismic survey on its own.

Seasonal Threshold

10.31 The survey is planned to be undertaken over a period of 30 days in the field between 15th February 2025 with completion no later than 20th April 2025 2024 (bp, 2025a; 2025b). Up to 20 days may therefore occur during the summer period.

10.32 The seasonal average disturbance level has been calculated for the site survey area. The daily disturbance area for the Survey area EC01 site survey has been multiplied by the number of days duration of the site survey within the summer period (20) and divided by the number of days (185) of the summer season. The results are expressed as a % of the SAC summer area in Table 8.

10.33 The worst case average seasonal disturbance from the full survey is calculated as approximately 0.2% of the Southern North Sea SAC summer area using the JNCC (2020) 12 km EDR.

10.34 It is concluded that the seasonal threshold will not be exceeded by the proposed seismic survey on its own.

Table 8: Estimated extent of seasonal disturbance on harbour porpoise from proposed Phase 1 Seismic Survey within the SAC.

Survey	Maximum Daily Disturbance to the SNS SAC 'Summer Area'		Duration of Impact (days)	Average Seasonal Disturbance to the SNS SAC (%)	
	km²	%			
Comparison of modelled sound levels with NMFS Level B Harassment threshold					
Phase 1 site survey	165*	0.61%	20	0.066%	
Comparison of modelled sound levels with Tougaard (2016) disturbance threshold					
Phase 1 site survey	372*	1.38%	20	0.15%	
JNCC (2020) 12 km EDR					
Phase 1 site survey	526	1.946	20	0.2%	

* Calculated using the full survey area rather than EC01 as has been done for the 12 km EDR.

Conclusion of impacts from the proposed survey alone

10.35 Results from noise modelling indicate that no more than one harbour porpoise are at risk of physical injury from noise arising from the airguns. With proposed mitigation discussed in Section 12 there is a very low risk of any harbour porpoise being injured.

10.36 There is a risk of harbour porpoise being displaced or disturbed by the proposed seismic survey. Noise modelling indicates that between 405 and 1,185 harbour porpoise may be disturbed at some point over the course of the survey; this is 0.117 - 0.342 % of the North Sea Management Unit population and therefore below the predicted level of disturbance that could cause a population level effect.

10.37 At any one moment the area of disturbance could affect 270 – 606 individuals. The disturbance will be of short duration as the vessel transits through the Survey Area. Once the vessel has passed, any changes in behaviour due to disturbance will cease quickly after the vessel has moved away and any porpoises that may have been displaced are predicted to return to the area within 24 hrs.

10.38 The results from the threshold approach indicate that the highest single daily area of disturbance would cover up to 1.95% of the Southern North Sea SAC summer area and that the total average seasonal disturbance due to the full survey is estimated to be 0.21% of the Southern North Sea SAC summer area using the JNCC (2020) 12 km EDR methodology. The daily (20%) and seasonal (10%) thresholds are not exceeded.

10.39 The proposed survey will have a temporary and localised impact on the supporting prey species, e.g. fish. Once the proposed survey has moved away or ceased there will be no effect on the distribution, abundance and population dynamics of the species.

10.40 Based on the best available information and supported by results from noise modelling and the threshold approach, OPRED is satisfied that the proposed survey alone will not have an adverse effect upon the integrity of the Southern North Sea SAC with respect to harbour porpoise.

11 IN-COMBINATION ASSESSMENT

11.1 A number of other activities may be ongoing in the Southern North Sea SAC during the time scheduled for the proposed NEP Phase 1 seismic survey (15th February through to 20th April 2025).

11.2 There is potential for in-combination impacts to arise due to noise from other known or planned activities and the proposed seismic survey.

11.3 Potential cumulative impacts from the proposed survey activities in combination with other activities in the Southern North Sea SAC have been estimated following the JNCC (2020) guidance.

11.4 Projects identified as having potential to cause an in-combination impact are listed below and illustrated in Figure 5

- Sofia Offshore Wind Farm monopiling.
- Sofia OWF UXO Survey.
- East Anglia Three monopiling (Unabated).
- East Anglia Three monopiling (abated).
- East Anglia Three Pin Piling.
- Hornsea Three Low Order UXO Clearance.
- Hornsea Three High Order UXO Clearance.
- Dogger Bank C monopiling (Unabated).
- Dogger Bank B monopiling (Unabated).
- NEP Phase 1 Seismic Survey.
- NEP Expansion Seismic Acquisition 2025.
- NEP EPCI 3 Survey.
- NEP EPCI 1 Survey.

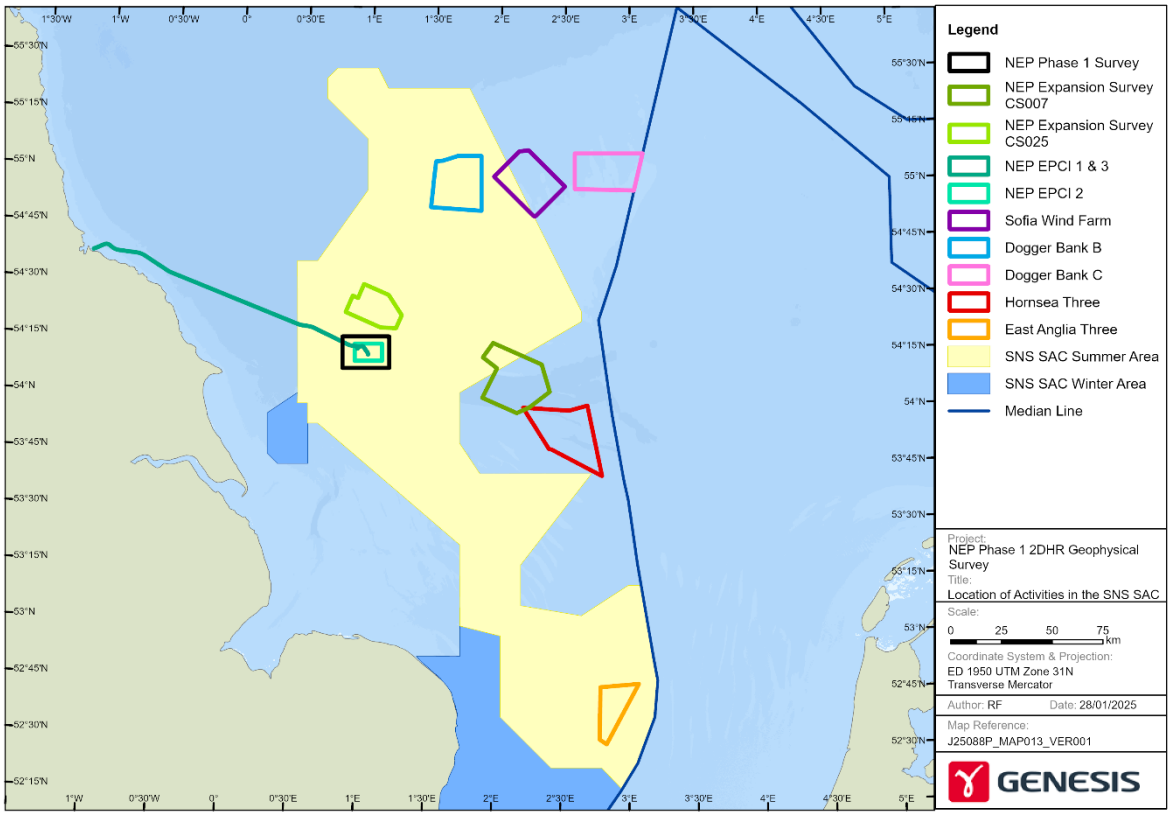

Figure 5: Other activities in the SNS SAC.

Sofia Offshore Wind Farm piling

11.5 Disturbance impact areas from the piling operations at Sofia Wind Farm are provided by the wind farm operator via the Southern North Sea SAC activity tracker (Gov, 2025). The potential in-combination impact of piling at Sofia Wind farm has been estimated based on a scenario of two monopiles being installed at the same time (this is the current construction plan for the windfarm). The impact of piling at Sofia Wind Farm has been estimated using a 26 km EDR (JNCC, 2020).

11.6 Piling will be required across the footprint of the wind farm. To inform the potential for in-combination impact the locations of the piling have been selected such that the maximum possible disturbance to the Southern North Sea SAC has been estimated using the impact disturbance areas provided in the Southern North Sea SAC tracker.

Sofia Offshore Wind Farm Unexploded Ordnance ("UXO") Survey

11.7 The impact areas of Sofia UXO Survey has also been provided in the Southern North Sea SAC activity tracker (JNCC, 2020).

Dogger Bank B and C piling

11.8 Disturbance impact areas from the piling operations at Dogger Bank B Wind Farm are provided in the Southern North Sea SAC activity tracker (Gov, 2025). The impact of piling at Dogger Bank B and Chas been estimated using a 26 km EDR (JNCC, 2020).

11.9 For informing the in-combination assessment of piling at Dogger Bank B, the locations of piling have been selected such that the maximum possible disturbance to the Southern North Sea SAC has been estimated using the impact disturbance areas provided in the Southern North Sea SAC tracker.

East Anglia THREE Pin Piling and Monopiling

11.10 Daily disturbance areas for activities at East Anglia Three have been supplied by bp from information provided at SNS SAC Working Group meetings (BP, 2025).

Hornsea UXO Clearance

11.11 Daily disturbance areas for activities at Hornsea Three have been supplied by bp from information provided at SNS SAC Working Group meetings.

NEP Expansion Seismic Surveys

11.12 Disturbance impact areas for the NEP Expansion Seismic Surveys have been presented in the permit application for said surveys. The daily maximum disturbance area is conservatively estimated as being the total survey GWA extended by the 12 km EDR in all directions. This assumes that the whole survey will be achieved on a single day, whereas it is expected to require 51 days. The average seasonal impacted area is likewise based on the daily maximum disturbance area being impacted for 51 days.

11.13 For the Expansion Acquisition surveys, the disturbance areas have been calculated separately for the two survey areas CS025 and CS007. Since the exact line plan of the survey was not known at the time of writing, the calculations assume that the number seismic lines covered by the survey vessel in one day is proportional to the total duration of the survey. For example, for survey CS025, which will take approximately 18 days, it has been assumed that the survey vessel will operate over 11 seismic lines in a racetrack pattern in a single day.

NEP Phase 1

11.14 Disturbance impact areas for the NEP Phase 1 Survey has been presented in the permit application for said survey. The daily maximum disturbance area is conservatively estimated as being the total survey GWA extended by the 12 km EDR in all directions. This assumes that the whole survey will be achieved on a single day, whereas it is expected to require 20 days. The average seasonal impacted area is likewise based on the daily maximum disturbance area being impacted for 20 days.

NEP EPCI 1, 2 & 3

11.15 Disturbance impact areas from the bp NEP EPCI 1, 2 & 3 surveys have been estimated using a 5 km EDR for geophysical surveys (JNCC, 2020). The calculations for EPCI 1 & 3 assume that the survey area covered by the survey vessel in one day is proportional to the total duration of the survey. To calculate the maximum daily impact, the survey area covered has been located such that it is wholly within the SNS SAC. The calculations for EPCI 2 assume that one of the six

individual survey areas that make up the EPCI 2 survey is covered by the survey vessel in one day.

Summary of disturbance areas for individual in-combination activities

11.16 The maximum daily disturbances and average seasonal disturbances derived for each of the individual activities in isolation are provided in Table 9. The maximum daily disturbance areas are also shown in Figure 6.

11.17 It can be seen from Figure 6 that the impacted areas of certain activities overlap spatially. Consequently, the maximum daily area of disturbance from all activities in combination cannot be determined by adding all the individual areas together. The total maximum feasible daily area of disturbance during the Phase 1 Seismic Survey has been calculated as 31.786 % of the SAC summer area.

11.18 This is greater than the 20% threshold established for the assessment method being used and it is concluded that there is potential for an adverse effect on the integrity of the Southern North Sea SAC from the proposed Phase 1 Seismic Survey in combination with other projects.

11.19 It is not possible to precisely calculate what the average seasonal disturbance figure will be as there are several variables which could alter this figure in practice.

11.20 Within this assessment an average seasonal disturbance figure has been calculated using the worst-case assumptions used to underpin the daily disturbance assessment. However, this approach does present issues because in an effort to ensure that the worst-case daily disturbance scenario has been considered and managed appropriately it has been assumed that the maximum spatial disturbance could occur on any day within the operational period.

11.21 Whilst this provides resilience to the management of daily disturbance levels, such an approach leads to an impossibly large seasonal contribution for the some activities. Nevertheless the maximum average seasonal disturbance from all activities (listed in Table 9) is approximately 8.4%.

11.22 Further uncertainty is caused by the fact that the disturbance footprint for many activities overlaps i.e. under the scenario outlined in Table 9 whereby all the activities occur at their maximum possible disturbance for each day of operation, the disturbance EDR for many of the activities will overlap. The approach outlined by the JNCC only allows for an area of sea to be disturbed once in a 24 hr period, therefore if two operations disturb the same area of sea it is not appropriate to account for the full area of each activity in the seasonal calculation, as this would result in double counting some areas of disturbance.

11.23 In conclusion there is some uncertainty regarding what the average seasonal disturbance will be. However there is confidence that this figure will be below 10% because even using the worst case scenarios for seasonal disturbance shown in Table 9 the average would be 8.4% and in practice this will be lower. To provide extra security the seasonal average disturbance figure will

be calculated and monitored as part of the live cross-sector sim-ops coordination process designed to ensure operations remain within the recommended disturbance thresholds.

Table 9: Estimated disturbance to harbour porpoises within the SNS SAC from various activities in isolation using JNCC (2020) EDRs.

Activity	Maximum Daily Disturbance to the SNS SAC		Duration of Impact (days)	Average Seasonal Disturbance to the SNS SAC (%)
	km²	%		
NEP EPCI 2 SBP Survey	152	0.562	23	0.071
Sofia OWF Survey	133	0.493	N/A	N/A
Sofia OWF Monopiling(Unabated)	1,661	6.147	25	0.840
East Anglia Three Monopiling (Unabated)	2,122	7.850	7	0.300
East Anglia Three Monopiling (Abated)	1,19	5.620	176	5.405
East Anglia Three Pin Piling	705	2.610	21	0.300
Hornsea Three April Low Order UXO Clearance (1 per day)	78	0.290	8	0.013
Hornsea Three April Low Order UXO Clearance (2 per day)	157	0.580	8	0.025
Hornsea Three April High Order UXO Clearance (1 per day)	708	2.620	3	0.043
Hornsea Three August Low Order UXO Clearance (1 per day)	9	0.035	25	0.005
Hornsea Three August Low Order UXO Clearance (2 per day)	11	0.039	5	0.001
Hornsea Three August High Order UXO Clearance (1 per day)	132	0.490	20	0.054
Dogger Bank B Monopiling (Unabated)	2,865	10.600	1	0.058
Dogger Bank C Monopiling (Unabated)	6	0.024	4	0.001
NEP Phase 1 Seismic Survey	526	1.946	20	0.213
NEP Expansion Seismic Survey CS025	1,473	5.450	18	0.536
NEP Expansion Seismic Survey CS007	744	2.753	33	0.496
NEP EPCI 1 Survey	121	0.448	10	0.024
NEP EPCI 3 Survey	121	0.448	19	0.046

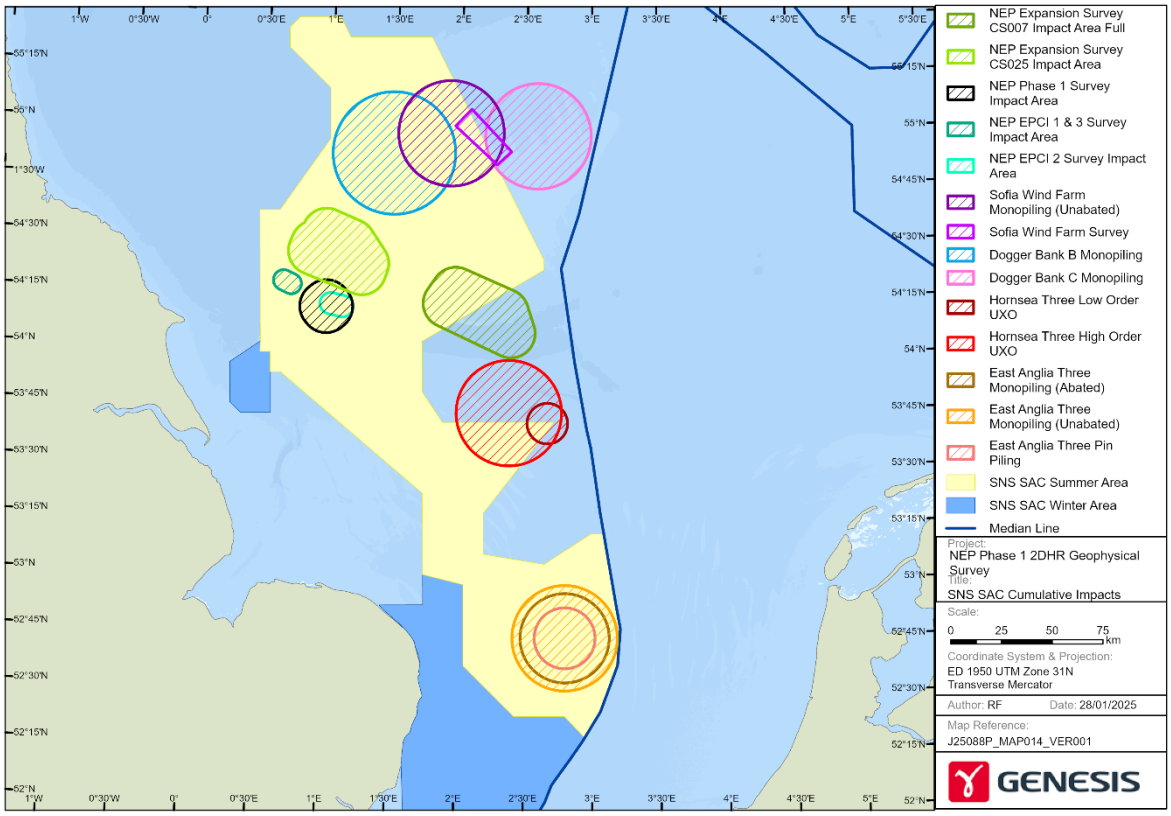

Figure 6: Estimated EDR disturbance areas for activities in the SNS SAC.

Potentially Acceptable In-combination Scenarios

11.24 It is noted that the maximum in-combination daily area of disturbance would exceed the 20% threshold for the SAC summer area even without the NEP Phase 1 Seismic Survey.

11.25 In order to enable activities to be undertaken in a way which does not cause an adverse effect on the integrity of the Southern North Sea SAC, OPRED and the MMO have introduced requirements which mean that operators are obliged to demonstrate that they only undertake their permitted activities in such a way that the daily threshold will not be exceeded.

11.26 The threshold verification will be achieved through inter-operator liaison which will plan activities such that the major sources of impulsive noise do not take place at the same time causing an exceedance of the thresholds, for example UXO high order clearance may take place on days when other high impulsive noise source activities, such as piling, are not occurring or are being undertaken out with the SAC.

11.27 This co-ordination will take place via a cross sector, industry led, simultaneous operations (sim ops) working group where all operators producing impulsive noise within the SAC will meet regularly. The record of daily activity and cumulative disturbance will be displayed on a live, shared document visible to industry and regulators.

11.28 The in-combination total daily area of disturbance for some potential combination scenarios are presented in Table 10. The values presented were calculated by the applicant taking into account potential spatial overlap of individual disturbance zones.

Table 10: Examples of estimated maximum total daily disturbance for in-combination scenarios.

Scenario	Maximum Total Daily Disturbance to the SNS SAC	
	km²	%
All activities combined	11,724	43
NEP Phase 1 Survey + East Anglia Monopiling + Sofia OWF Monopiling + NEP Expansion Seismic Survey CS007	4,835	17.9
NEP Phase 1 Survey + Doggerbank B Piling + NEP Expansion Seismic Survey CS025	4,864	18
NEP Phase 1 Survey + NEP EPCI 2 SBP Survey Sofia OWF Survey + East Anglia Three Pin Piling Hornsea Three April High Order UXO Clearance (1 per day) + Dogger Bank B Monopiling (Unabated) + NEP EPCI 1 Survey + NEP EPCI 3 Survey	5,331	19.7

11.29 It is noted that the areas used in Table 10 are worst case estimates and that lower values would be expected in practice, for example piling at locations in the eastern footprint of the Sofia Windfarm would have little impact on the SAC, or if UXO clearance did not require high order detonation.

11.30 The example scenarios shown in Table 10 are not exhaustive but demonstrate that with due planning, it would be feasible to undertake the NEP Phase 1 Seismic Survey without causing an adverse effect on the integrity of the SAC.

11.31 In its application the applicant has committed to the inter operator co-ordination outlined in the paragraphs above, to achieve this they have stated they will liaise with operators of other activities prior to survey operations commencing to:

- Agree activity combinations that exceed the SAC sound budget.

- Identify operational mitigations (schedule of activity etc.).
- If it is not possible to avoid schedule overlap, then agree time sharing principles in writing to ensure that the Southern North Sea SAC sound budget is not exceeded.

11.32 The applicant has also committed to maintaining communication in-field to ensure adherence to mitigation and time share plans.

12 MITIGATION

12.1 The following section presents a summary of the planned mitigation submitted by the Applicant that will reduce the risk of an adverse effect occurring.

12.2 The applicant has committed to following the JNCC guidelines for *minimising the risk of injury to marine mammals from geophysical surveys* (JNCC 2017a; bp, 2024a, 2024b). This will include:

- JNCC accredited MMOs will be used to conduct watches for marine mammals during daylight and periods of good visibility.
- The MMOs will detect marine mammals within a 500 m mitigation zone that will be established around the source. If any marine mammals are observed within the 500 m mitigation zone, then the start of the source array will be delayed for at least 20 minutes following last sighting.
- MMOs will carry out a 30-minute pre-data acquisition survey of the mitigation zone and, if any marine mammals are detected, the soft start of the source array will be delayed until their passage, or the transit of the vessel, results in the marine mammals being out with the 500 m mitigation zone.
- A soft start activation of the source array will be employed, whereby the power of the source will be incrementally increased over a period of at least 20 minutes. This will allow any marine mammals and fish to move away from the source and reduce the likelihood of being exposed to sound levels that could potentially cause injury.
- If the source array has been inactive for a period of 10 minutes, the MMOs will perform a visual inspection of the 500 m mitigation zone. If a marine mammal is detected within the 500 m mitigation zone, the commencement of the source array will be delayed for at least 20 minutes following the last sighting.
- Passive Acoustic Monitoring (PAM) will be operated at night and during periods of low visibility.

12.3 In addition to the JNCC (2017) guidelines, the applicant has committed to implementing mitigation measures and ‘lessons learned’ from experience of previous surveys conducted in the area:

- Completion of bp/contractor joint risk assessment.
- Collaboration with the survey contractor to brief the crew prior to mobilisation and raise awareness of the risk to marine mammals during the activity and re-emphasize commitments to relevant mitigation measures and permit conditions.
- Assurance that adequately trained/competent monitoring personnel (MMO and PAM specialists) are onboard the survey vessel, and that appropriate PAM equipment is mobilised in a functioning and well-maintained state.
- Regular planned calls and daily reports between the survey contractor and bp during the survey.

13 CONCLUSIONS

13.1 The Secretary of State has carefully considered all of the information available in order to undertake a Habitats Regulations Assessment. The proposed NEP Phase 1 Seismic Survey has the potential to cause a Likely Significant Effect alone and in-combination with other plans or projects on the qualifying species of the Southern North Sea SAC

13.2 OPRED has undertaken an Appropriate Assessment on behalf of The Secretary of State in respect of the site's Conservation Objectives to determine whether the project, either alone or in-combination with other plans or projects, will result in an adverse effect on integrity.

13.3 A robust assessment has been undertaken using all of the information available.

13.4 Having considered all of the information available to them the it has been concluded that the proposed NEP Phase 1 Seismic Survey alone will not have an adverse effect on the integrity of the Southern North Sea SAC.

13.5 However the Secretary of State cannot rule out that the proposed NEP Phase 1 Seismic Survey in-combination with other plans or projects could have an adverse impact on the integrity of the Southern North Sea SAC with respect to potential impacts on harbour porpoise, unless the scheduling of the seismic survey and all other permitted sources of impulsive noise are undertaken within the SAC on any given day between 1st April and 20th April of 2025 , does not in aggregate cause disturbance to harbour porpoise over an area of the SAC equalling 5,406 km^2 or more. Further to this, mitigations will be in place such as MMOs on the vessel, PAM and appropriate soft start procedures which will reduce impact on the qualifying feature of the Southern North Sea SAC, Harbour porpoise.

13.6 The Secretary of State therefore concludes that the NEP Phase 1 Seismic Survey may be permitted if operators adhere to measures which provide the above assurance.

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