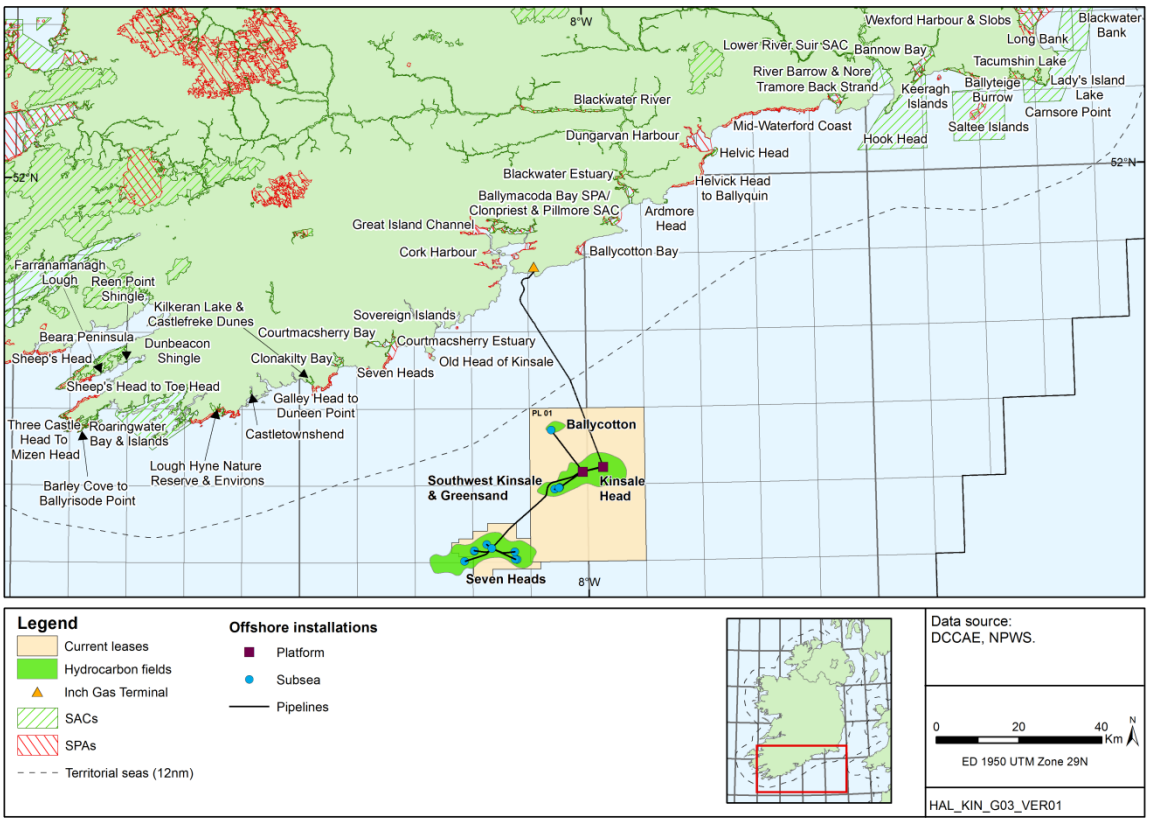
PSE Kinsale Energy Limited

Kinsale Area Decommissioning Project – Pre/Post Rock Placement Surveys



Addendum to Screening for Appropriate Assessment and Article 12 Assessment

January 2022

Rev: 1

Contents

1 INTRODUCTION

1.1 Background and document purpose

PSE Kinsale Energy Limited (Kinsale Energy) is applying for consent to undertake survey activities at sites associated with the Kinsale Head, Ballycotton and Southwest Kinsale fields (Petroleum Lease area no.1), and the Seven Heads field (Seven Heads Petroleum Lease) in the North Celtic Sea Basin. The survey area is located off the coast of Co. Cork, extending from the landfall of the export pipeline at Powerhead to a distance of up to 47km from the nearest coast (Figure 1.1).

Kinsale Energy is progressing with the decommissioning of the Kinsale Area gas fields and facilities (incorporating the Kinsale Head gas fields and facilities and the Seven Heads gas field and facilities), which have come to the end of their productive life; gas production from the wells ceased on 5th July 2020. In keeping with lease obligations, Decommissioning Plans and related Environmental Impact Assessment Report (EIAR) and Appropriate Assessment (AA) screening reports were prepared and were submitted to the Department of Environment, Climate and Communications (formerly the Department of Communications, Climate Action & Environment), and a further application has been submitted to cover the remaining works to be consented as part of the decommissioning programme, the decommissioning of the Kinsale Head and Seven Heads pipelines. Together the decommissioning of the entirety of the Kinsale Area gas fields and facilities is collectively referred to as the Kinsale Area Decommissioning Project (KADP).

Consent applications are now being made for the remaining works required to complete the KADP (Consent Application no. 3 for Kinsale Head Petroleum Lease (OPL 1) and Consent Application no. 2 for Seven Heads).

At the time of previous Consent Applications for Kinsale Head and Seven Heads, Section 5 of the Dumping at Sea Act 1996 did not yet apply to “offshore installations” and there were ongoing studies by third parties that might have identified a future re-use of one or more of the offshore pipelines. Accordingly, previous Consent Applications did not address the offshore pipelines and umbilicals. As all studies on potential reuse of the pipelines and umbilicals have now concluded and no further use has been identified for any of the offshore pipelines or umbilicals, these are now the subject of this consent application.

Kinsale Head Consent Application no. 3 includes for the following facilities:

- To leave in situ all infield pipelines and umbilicals associated with the Kinsale Head gas fields
- To leave in situ the 24” export pipeline (offshore and onshore section) and to fill the onshore section with grout
- To use engineering materials to protect the pipelines and umbilicals in situ

Seven Heads Consent Application no. 2 includes the following:

- To leave in situ all infield pipelines and umbilicals associated with the Seven Heads gas field
- To leave in situ 18” Seven Heads export pipeline and umbilical
- To use engineering materials to protect the pipelines and umbilicals in situ

The consent applications (Section 7.2 thereof) also include the undertaking of survey activities at sites associated with the Kinsale Head, Ballycotton and Southwest Kinsale fields and the Seven Heads field. In order to accurately record the status of the pipelines and confirm the completion of the pipeline decommissioning activities, pre- and post-rock placement surveys

are proposed as part of the Decommissioning Plans. In anticipation of the need to undertake such surveys, and now that greater definition is available on their scope and the types of equipment likely to be used than covered in the EIAR for KADP, the application for consent is accompanied by this addendum to the Screening for AA Report, an addendum to the EIAR and a Pre-survey Fisheries Assessment Report.

The surveys will include the use of equipment (e.g. multi-beam echosounder, sidescan sonar) to characterise the pipeline/umbilicals and the immediately adjacent seabed (more detail is provided in Section 2). The survey campaign will be carried out in phases, between Q2 and Q4 in 2022. However, these works may slip to between Q2 and Q3 2023 due to the potential for delays.

1.2 Legislative background and AA process

The EU Habitats Directive (92/43/EEC) requires that Member States contribute to the creation of a coherent ecological network of sites through the identification and designation of Special Areas of Conservation (SAC) relating to those habitats and species listed in Annex I and Annex II of the Directive respectively. The EU Birds Directive (2009/147/EC) requires the protection of bird species listed in Annex I of that Directive, and regularly occurring migratory species, including the use of conservation measures through the designation of Special Protection Areas (SPAs). SACs and SPAs are collectively part of the Natura 2000 network. The relevant conservation agencies responsible for site selection designate sites on the basis of the presence of relevant qualifying habitats and species, and conservation objectives are set to maintain or, where relevant, restore, the features to a favourable conservation status. The requirements of the *EC Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora* (the "Habitats and Species Directive")*;* and *EC Council Directive 2009/147/EC* (the "Bird Directive") have been implemented through the *European Communities (Birds and Natural Habitats) Regulations 2011* (as amended)*.*

Article 6(3) of the Habitats Directive indicates that, "*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4*[1]*, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public*."

The Competent Authority (in this case the GeoScience Regulation Office of the Petroleum Affairs Division of the Department of Communications, Climate Action & Environment) must therefore undertake an AA where likely significant effects are identified for qualifying interests of a relevant site from activities not directly connected with the management of the site. This requirement and the process by which such a consideration is made, is outlined in the *European Communities (Birds and Natural Habitats) Regulations 2011*, and in guidance at a European (European Commission 2021a) and national (DoEHLG 2010) level. The key stages of the AA process are listed below and shown in Figure 1.2.

Stage 1: Screening for appropriate assessment. To assess, in view of best scientific knowledge, and in view of relevant site conservation objectives, if the project, individually or

[1] Article 6(4) relates to plans or projects which must be undertaken despite identification of an assessment determining a negative effect on a given site due to imperative reasons of overriding public interest (IROPI), including those of a social or economic nature. Suitable compensatory measures are required to maintain the coherence of the network should such a case be made.

in-combination with another plan or project, is likely to have a significant effect on any Natura 2000 site.

Stage 2: Appropriate Assessment. Required if it cannot be excluded, on the basis of objective information, that the project, individually or in-combination with other plans or projects, will not have a significant effect on a Natura 2000 site. Where there are adverse impacts, an assessment of the potential mitigation of those impacts will be made. The appropriate assessment must include a final determination by the competent authority as to whether or not a proposed development would adversely affect the integrity of a Natura 2000 site. In order to reach a final determination, the consenting authority must undertake examination, analysis and evaluation, followed by findings, conclusions and a final determination. The appropriate assessment must contain complete, precise and definitive findings and conclusions, and may not have lacunae or gaps.

Stage 3: Assessment of alternative solutions. This process examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site.

Stage 4: Assessment where no alternative solutions exist and where adverse impacts remain. An assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed.

As the project is not directly connected with the management of a Natura 2000 site, a screening exercise (Stage 1) has been undertaken to consider the potential for likely significant effects to arise in relation to Natura 2000 sites from activities associated with the proposed survey scope as defined in Section 2, including in-combination with other plans or programmes. The approach taken to screening has been to:

- Define the location and nature of the proposed activities, together with their potential to result in likely significant effects on European sites
- Identify all relevant European sites and their qualifying interests with the potential to be affected by the proposed survey activities
- Screen the relevant sites for the likelihood of significant effects that could result from the activities, based on the nature and scale of potential effects, including in-combination with other marine activities
- Conclude whether likely significant effects have been identified

1.2.1 Annex IV Species Screening Assessment

In addition to the requirement to consider the potential for effects on Natura 2000 Sites under Article 6 of the Habitats Directive (above), the Directive and transposing legislation, the *European Communities (Birds and Natural Habitats) Regulations 2011* (as amended), requires consideration of the potential effects on species listed under Annex IV of the Directive (termed Annex IV species). Under Article 12, Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas. The potential for interaction with Annex IV species and related effects are considered in Section 6 of this document.

Figure 1.1: Location of the Kinsale Area infrastructure to be subject to survey

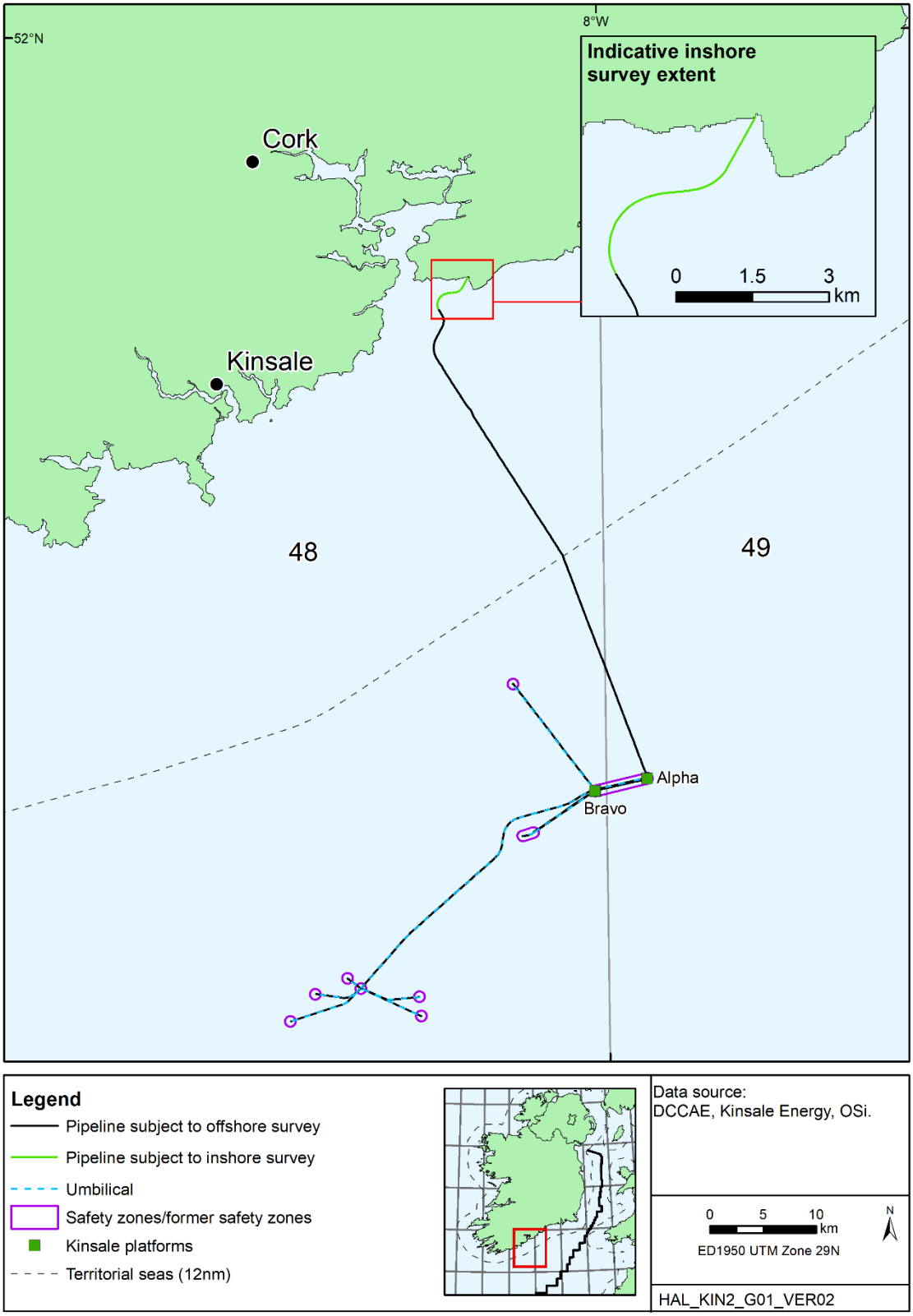
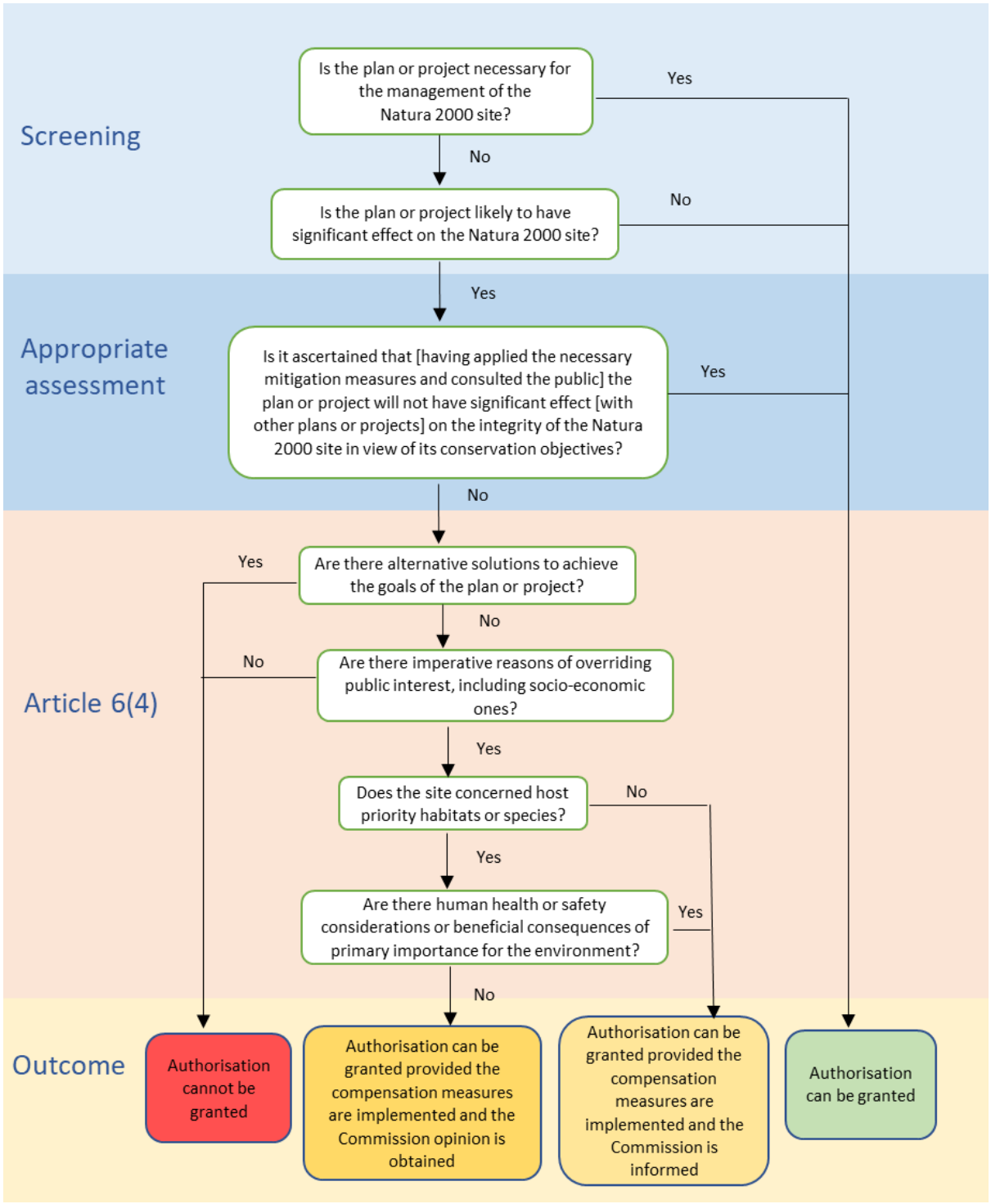


Figure 1.2 – Consideration of a plan or project affecting a Natura 2000 site



Source: European Commission (2021a)

2 PROJECT DESCRIPTION

2.1 Survey Background and Purpose

As noted in Section 1, Kinsale Energy is progressing the decommissioning of the Kinsale area gas fields and facilities. Two applications have been made and approved in relation to the decommissioning of the Kinsale area facilities which were each accompanied by an Environmental Impact Assessment Report and Appropriate Assessment screening. These applications covered; facilities preparation, well plug and abandonment, platform topsides and subsea structure removal (application no. 1); and jacket removal (application no. 2). A third application was submitted in October 2021[2] which covers the remaining works associated with the overall KADP, which are the decommissioning of all Kinsale Head and Seven Heads pipelines and umbilicals by leaving them *in situ*, and the use of engineering materials (rock placement) to protect the pipelines and umbilicals. Decommissioning activity associated with the first two consent applications has already commenced, and has included the removal of pipeline spoolpieces and umbilical jumpers, which connected these to infrastructure subsea. Rock placement is only to be used at locations along the pipeline where freespans occur, a freespan being a section of pipe where seabed sediments have been eroded or scoured to leave a void beneath the pipeline so that it is no longer supported on the seabed, and at pipeline and umbilical ends where the spools/jumpers have been removed.

An inspection survey was undertaken in 2017 to accurately record the position of the pipelines and umbilicals and their status, such as their depth of burial and the presence of freespans, which helped to inform the likely nature of scale of rock placement necessary for pipeline decommissioning which in turn informed the EIAR submitted alongside the applications covering the KADP. In that EIAR, Kinsale Energy committed to undertaking a post-decommissioning survey of the pipelines, umbilicals, wellsites and platform locations, covering a 100m corridor along the pipeline and umbilical routes (50m either side), for debris clearance and to confirm the final position and status of the pipelines and umbilicals so that they can be accurately depicted on navigation charts. While the effects of such surveys were considered in the EIAR for the KADP, greater definition is now available on the nature of the equipment that may be used, which is the subject of this AA screening.

The survey campaign has the following principal objectives:

- To inform the rock placement activities with the most recent set of pipeline inspection data (e.g. freespan location and seabed at pipeline/umbilical ends)
- To confirm the success of the rock placement activity which includes freespan areas and pipeline/umbilical ends
- To provide information on the status of the pipelines for charting purposes post-decommissioning

2.2 Survey Activity and Equipment

The specific equipment to be used as part of the survey is yet to be selected, but the range of equipment which could be deployed is listed in Table 2.1, and all are considered in terms of their potential impact in Sections 4 and 5. The selected equipment will not differ substantially from those listed in Table 2.1 such that the scale or nature of potential effects will not differ from those assessed in this report. All of the survey equipment is non-intrusive and there will be no seabed interaction associated with the survey works.

[2] https://www.gov.ie/en/publication/58f06-decommissioning-of-certain-facilities-within-the-kinsale-area-gas-fields/

Pre-rock placement

The extent of the pipelines and umbilicals to be surveyed are shown in Figure 2.1. The survey will cover 100m along the pipelines and umbilicals and may be undertaken in a single pass of the survey vessel, or two passes may be required depending on final equipment selection (e.g. whether or not a ROV is used to perform the survey). The working area of the vessel will not extend beyond the 100m corridor other than during transit. The survey will be undertaken by two vessels, one of which will conduct the surveys of all offshore infield pipelines and umbilicals, and the export pipeline up to approximately 3km from the shore. A separate inshore vessel will be used to conduct the final portion of the survey due to water depth restrictions.

Survey data will mainly be collected using multibeam echo sounder (MBES) and side scan sonar (SSS), though other equipment including standard vessel echo sounder, and ultra-short baseline acoustic positioning (USBL) either will, or may, be used to assist in the positioning of the vessel and equipment deployed from it (see Table 2.1)

These survey operations are planned to take place between Q2 and Q4 in 2022. However, these works may be undertaken between Q2 and Q3 2023 due to the potential for delays. This part of the survey campaign is expected to be complete in approximately 14 days. In line with Section 4.3.4 iii) of the DAHG (2014) guidance, the nearshore survey operations will only start in daylight hours.

Post-rock placement

Rock will be placed in a controlled manner using a dedicated dynamically positioned fall pipe vessel, with the position of the rock placed over freespans to be surveyed using a fallpipe ROV (FPROV) at the time rock is deposited. The FPROV will collect MBES data over the area of rock placement only, which will be incorporated into the pre-rock placement data to provide a data source for the final position and status of the decommissioned pipelines/umbilicals. The extent of rock placement, and therefore the survey coverage for this aspect of the work, will only be known following completion of the pre-rock placement survey. On the basis of the 2017 survey, it was estimated that a total length of rock cover for all pipeline ends and freespans would be approximately 5,200m, and would take a rock fallpipe vessel approximately 14 days including transits to complete (see EIAR for the KADP). It has been assumed for the purposes of this assessment that the survey undertaken during the rock placement campaign will take 14 days including transits and be conducted in anticipated to be completed by Q4 2022. However, these works may be undertaken between Q2 and Q3 2023 due to the potential for delays.

Table 2.1: Summary of potential survey equipment

Source type	Potential equipment	Operating frequency	Objectives
Main survey equipment			
Side-scan sonar (towed)	Edgetech 4200	400kHz	Record the position of objects within the survey corridor.
Multi-beam echosounder	R2Sonic 2024, Norbit iWBMS / Winghead, Kongsberg EM 2040, Reson 8125	400kHz	Record the seabed topography and pipeline/umbilical location and status (e.g. freespan) to inform rock placement campaign, and also used during rock placement to record the position of the rock berms.

Source type	Potential equipment	Operating frequency	Objectives
Other acoustic equipment used for safe vessel operation, or operation of survey equipment deployed from the vessel			
Vessel echo sounder	Furuno FE-800	50-200kHz	For measuring water depth below the vessel hull.
Acoustic Doppler	Teledyne Workhorse (Monitor / Navigator)	300kHz-1,200kHz	For measuring speed over ground
USBL	Sonardyne Wideband Sub-Mini 6 Plus (WSM6+), Sonardyne Type 8300 Compatt 6, Kongsberg HiPAP	20-40kHz	Required for acoustic positioning if remote vehicle used (towed fish or ROV).
Bathymetric sensor	Tritech SeaKing Bathy 704 with altimeter	500kHz	Depth measurement / bathymetry for ROV
Obstacle avoidance sonar	Kongsberg 1071, Tritech Super SeaKing DST	>300kHz	Possibly used on ROV for obstacle avoidance.
Sound velocity sensor	Valeport MiniSVS	2.5MHz	Used to generate accurate sound velocity profiles to calibrate survey equipment.

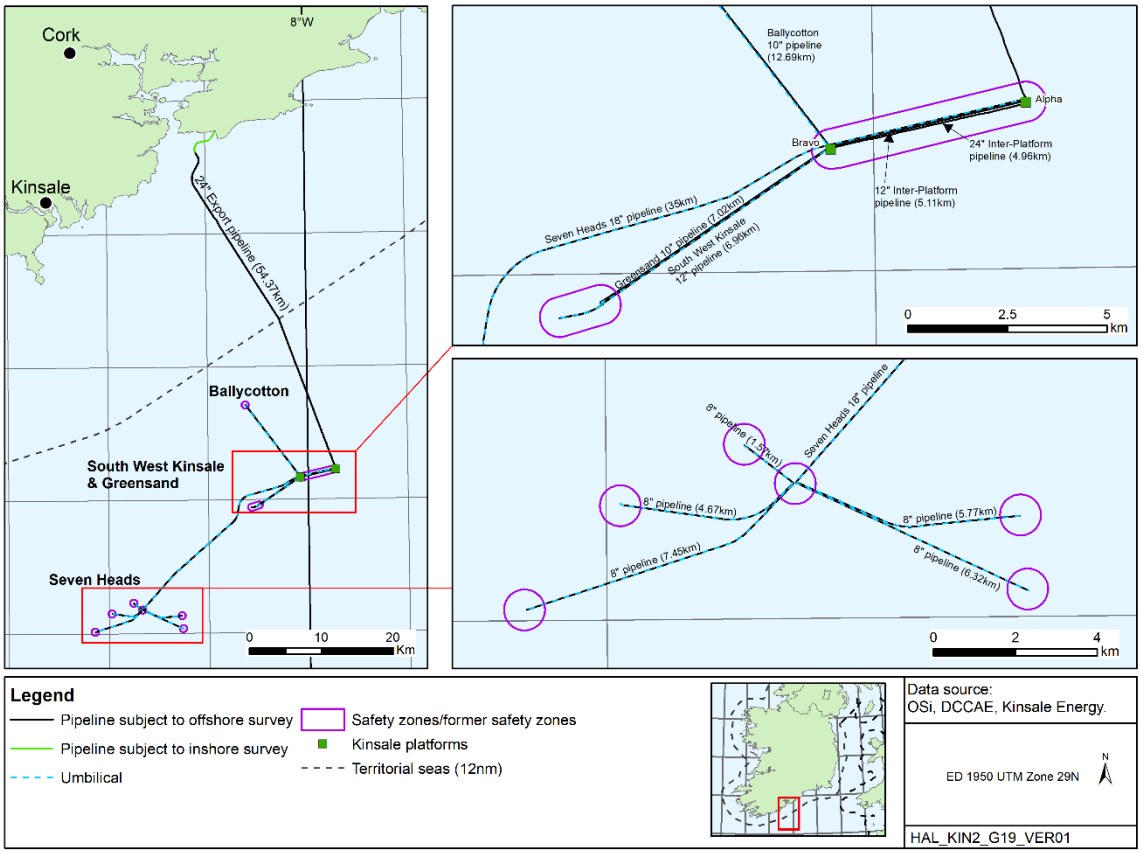
2.3 Vessels

The vessels to complete the survey programme have not yet been selected. For the purposes of this assessment, a representative vessel has been assumed (e.g. RV Celtic Explorer, RV Ocean Researcher or equivalent for the offshore survey, RV Tonn or equivalent for the inshore survey, and the Seahorse for the rock placement vessel). Note that only the effects of the survey components of the rock placement are considered here. The use of the rock-placement vessel (i.e. the effects of its transit, deposition of rock, emissions etc.) has already been subject to assessment in the EIAR for the KADP.

There will be no significant discharges from the survey vessels, and any discharge would be consistent with obligations under MARPOL[3] as implemented in Ireland, which effectively prevent pollution from such sources. In view of the scale and duration of the surveys these are not considered to be significant and are not considered further.

[3] Following the guidance set out in EC (2021a), compliance with MARPOL is a statutory requirement and forms a generic component of the project and is not a specific form of mitigation.

Figure 2.1: Kinsale Area pipelines and umbilicals to be subject to post-decommissioning survey



3 IDENTIFICATION OF RELEVANT NATURA 2000 SITES

3.1 Overview

Relevant Natura 2000 sites were considered for inclusion/exclusion in the screening process with respect to whether an impact pathway could be identified between the features for which they are designated and the proposed survey activities described in Section 2. The identification of potential impacts from the survey and relevant sites is based on:

- the nature and scale of the proposed surveys,
- the sources of potential effect from the survey activities and their likely spatial footprint,
- identification of those qualifying interests of Natura 2000 sites which are sensitive to the sources of potential effect,
- the relative location of relevant Natura 2000 sites and their qualifying interests (including where mobile species may be located beyond site boundaries, e.g. when foraging), to the spatial footprint of effect.

3.2 Site selection process

Guidance from the National Parks and Wildlife Service - *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities* (DoEHLG, 2010) recommends that the identification of any Natura 2000 site which might be affected by any plan or project should be evaluated on a case-by-case basis but that that the appropriate assessment process should include the following Natura 2000 sites:

1. Any Natura 2000 sites within or adjacent to the plan or project area.
2. Any Natura 2000 sites within the likely zone of impact of the plan or project. A distance of 15km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson *et al.* 2006). For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in-combination effects.
3. Natura 2000 sites that are more than 15km from the plan or project area, depending on the likely impacts of the plan or project, and the sensitivities of the ecological receptors, bearing in mind the precautionary principle. In the case of sites with water dependent habitats or species, and a plan or project that could affect water quality or quantity, for example, it may be necessary to consider the full extent of the upstream and/or downstream catchment.

This AA screening has identified Natura 2000 sites which could be affected by the survey based on the nature and scale of the proposed survey programme (Section 2), its sources of potentially significant effect (Section 3.3), an understanding of the nature and scale of such effects (Section 3.4), and the potential for interaction between relevant qualifying interests and these effects (Section 3.5). Combined, these reflect the zone of influence of the project, which varies for each relevant site or site qualifying interest. The sites identified for screening are assessed for the likelihood for significant negative direct, indirect and in-combination effects in Section 4.

3.3 Sources of potential effect

In respect of the proposed survey, the main sources of potential effect relevant to Natura 2000 sites and their qualifying interests arise from:

- physical presence of the survey vessels,
- underwater noise including from the vessel and survey equipment.

The survey programme does not involve any physical interaction with the seabed, and therefore the potential for physical disturbance effects has been discounted. It is therefore not considered that the survey programme could result in a foreseeable interaction with any Annex I habitat, and therefore, such qualifying interests of related sites have not been considered further.

The evidence base for the sources of potential effect are considered in turn below against major groups of receptors for which there is considered to be a potential interaction, which are primarily marine mammals, birds and fish. The evidence is then considered against the potential presence of qualifying interests to allow identification of the relevant Natura 2000 sites.

3.4 Evidence base for the nature and scale of potential effects

3.4.1 Physical presence of the survey vessels

Birds

The Kinsale Area may support important numbers of birds at certain times of the year including overwintering birds and those foraging from coastal SPAs. Therefore, the presence and/or movement of the survey vessels could temporarily disturb birds from relevant SPA sites.

Physical disturbance of seaduck and other waterbird flocks by vessels is possible, particularly in SPAs established for shy species (e.g. common scoter). Such disturbance can result in repeated disruption of bird feeding, loafing and roosting. For example, large flocks of common scoter were observed being put to flight at a distance of 2km from a 35m vessel, though smaller flocks were less sensitive and put to flight at a distance of 1km (Kaiser 2002, also see Schwemmer *et al.* 2011). Larger vessels would be expected to have an even greater disturbance distance (Kaiser *et al.* 2006). Mendel *et al.* (2019) further note behavioural response in red-throated diver within 5km of ships. Divers and sea ducks have been assessed as being the most sensitive species groups to offshore development and associated boat traffic. Whilst displacement effects for divers have been detected at greater distances (e.g. 5-7km, Webb 2016; significant changes noted at 10-16.5km, Mendel *et al.* 2019), this relates to the construction and operation of offshore wind farms which have a much larger spatial and temporal footprint than the proposed survey activities. Fliessbach *et al.* (2019) reported maximum escape distances for individual birds in response to vessels to be 3.2km for common scoter, with other sea ducks, divers, red-breasted merganser and cormorant all ≥1.5km; consequently, these are the species considered to be sensitive to vessel disturbance for the purposes of this assessment. It is noted that flock escape distances for all the aforementioned species were 1.2km or less. Considering the evidence, for divers, sea ducks and other species identified as most sensitive to vessel disturbance, a 4km displacement buffer is considered to be appropriate. Similarly, such species generally forage in coastal waters of ≤20m depth (Fox *et al*. 2003), which limit their potential to interaction with the offshore aspects of the proposed survey which would take place in deeper waters.

Certain seabird species (e.g. gulls, fulmar, kittiwake) are generally considered to be less sensitive to shipping activities (Garthe & Hüppop 2004, Fliessbach *et al.* 2019), with others such as razorbill, cormorant and guillemot regarded to have moderate sensitivity (Fliessbach *et al.* 2019, also see MMO 2018).

Criterion used: Screen in relevant SPAs for waterbird species sensitive to vessel disturbance (e.g. divers and seaducks) which are located within 4km of the proposed inshore survey area where activities take place within shallow coastal waters known to be used by such species. For seabirds, screen in relevant SPAs for which a moderately sensitive qualifying interest (e.g. razorbill, cormorant and guillemot) could theoretically be present in the survey area based on available foraging range data (e.g. Woodward *et al.* 2019).

Marine mammals

The primary source of potential physical effect from vessels in relation to marine mammals is collision. Worldwide, collisions with vessels are a potential source of mortality to marine mammals, primarily cetaceans. Whales are occasionally reported to be struck and killed by ships, especially by fast-moving ferries, but smaller cetacean species and seals can also be impacted by propeller strikes from smaller vessels. In the UK certain areas experience very high densities of commercial and recreational shipping traffic, some of which may also be frequented by large numbers of marine mammals; despite this, relatively few deaths are recorded as results of collisions (Hammond *et al*. 2008). Between 2000 and 2009, only 11 out of 1,100 post-mortems on harbour porpoises and common dolphins identified collision as the cause of death (UKMMAS 2010).

Criterion used: Screen in relevant SACs for marine mammal species where the site boundary overlaps the proposed survey area, and for pinnipeds screen in any site within foraging range (50km for harbour seal and 100km for grey seal, see Section 3.4.1). Cetaceans are not central-place foragers, and attributing any animals to a specific SAC is challenging. For the purposes of this assessment, cetaceans which are qualifying interests of all SACs within the relevant management units as defined by IAMMWG (2021) have been used.

3.4.2 Underwater noise including from the vessel and survey equipment

Studies on the potential effects of underwater noise from marine survey have tended to focus on seismic survey using airgun arrays. While the proposed survey will generate significantly less noise than airgun sources, these studies have relevance to the consideration of potential noise effects on birds, fish and marine mammals and are therefore summarised here.

Birds

Information on the underwater hearing abilities of diving birds and evidence of the effects of underwater anthropogenic noise is very limited. Direct effects from underwater acoustic surveys on diving birds could potentially occur through physical damage, given exposure to sufficiently high amplitudes, or through behavioural disturbance. Deeper-diving species which spend longer periods of time underwater (e.g. auks) may be most at risk of exposure, but all species which routinely submerge in pursuit of prey and benthic feeding opportunities in marine and estuarine habitats may be exposed to anthropogenic noise.
A list of relevant species is provided in Table 3.1.

Tests of hearing in a range of diving species suggest a hearing range of approximately 500Hz to 4kHz, with similar results obtained in air and underwater (Crowell 2014, Crowell e*t al.* 2015, Hansen *et al*. 2017). McCauley (1994) inferred from vocalisation ranges that the threshold of perception for low frequency seismic noise in some species (e.g. penguins, considered as a

possible proxy for auk species) would be high, hence individuals might be adversely affected only in close proximity to the source.

Very high amplitude low frequency underwater noise may result in acute trauma to diving seabirds, with several studies reporting mortality of diving birds in close proximity (i.e. tens of metres) to underwater explosions (Yelverton *et al*. 1973, Cooper 1982, Stemp 1985, Danil & St Leger 2011). However, mortality of seabirds has not been reported during extensive seismic operations in the North Sea and elsewhere.

With the exception of Pichegru *et al*. (2017), which relates to penguins, there are no published reports of changes in abundance or distribution of diving birds concurrent with seismic or other acoustic survey activity. A study investigated seabird abundance in Hudson Strait (Atlantic seaboard of Canada) during seismic surveys over three years (Stemp 1985). Comparing periods of shooting and non-shooting, no significant difference was observed in abundance of thick-billed murre (Brünnich's guillemot), or fulmar or kittiwake.

While seabird responses to approaching vessels are highly variable (e.g. Fliessbach *et al*. 2019), flushing disturbance would be expected to displace most diving seabirds from close proximity to the survey vessels and any towed equipment, thereby limiting their exposure to the highest sound pressures generated. Similarly, any behavioural disturbance of seabirds due to the survey activities is most likely to be temporary displacement associated with the physical presence of the vessel, comparable to that experienced by routine shipping traffic.

These data are limited, but the observed regions of greatest hearing sensitivity for cormorants in water and other diving birds in air are above those low frequencies (i.e. <500Hz) which dominate and propagate most widely from geological survey. While there is some evidence of noise-induced changes in the distribution and behaviour of diving birds in response to impulsive underwater noise, these have been temporary and may be a direct disturbance or reflect a change in prey distribution during that period (possibly as a result of seismic activities).

Table 3.1: Migratory and/or Annex I diving bird species considered potentially vulnerable to underwater noise effects

Divers and grebes	**Diving ducks**
Great northern diver *Gavia immer*	Pochard *Aythya ferina*
Red-throated diver *Gavia stellata*	Tufted duck *Aythya fuligula*
Black-throated diver *Gavia arctica*	Scaup *Aythya marila*
Little grebe *Tachybaptus ruficollis*	Eider *Somateria mollissima*
Great crested grebe *Podiceps cristatus*	Long-tailed duck *Clangula hyemalis*
Slavonian grebe *Podiceps auritus*	Common scoter *Melanitta nigra*
	Velvet scoter *Melanitta fusca*
Seabirds	Goldeneye *Bucephala clangula*
Manx shearwater *Puffinus puffinus*	Red-breasted merganser *Mergus serrator*
Gannet *Morus bassanus*	Goosander *Mergus merganser*
Cormorant *Phalacrocorax carbo carbo*	
Shag *Phalacrocorax aristotelis*	
Guillemot *Uria aalge*	
Razorbill *Alca torda*	
Puffin *Fratercula arctica*	

Note: Includes species which are known to engage in pursuit diving or benthic feeding in marine, coastal and estuarine waters at least during part of the year.

Marine mammals

Information on the potential effects of other geophysical surveys (e.g. sub-bottom profilers) is limited, with empirical studies of animal responses to such surveys lacking. The most recent UK Offshore Energy SEA (DECC 2016) concluded that, given the characteristics of the noise sources produced, effects are considered to be negligible but with a high level of uncertainty. Recent investigation of the source levels of a variety of high-resolution geophysical survey (HRGS) sources (Crocker & Fratantonio 2016, Crocker *et al*. 2019), combined with preliminary results of emitted sound fields, have provided evidence to support the conclusion of very low risk of significant effects from non-airgun HRGS sources, with received levels dropping to below that which might be expected to cause behavioural disturbance within a few hundred metres of the source (Halvorsen & Heaney 2018).

Evidence of the effects of seismic surveys on odontocetes and pinnipeds is limited but of note are studies in the Moray Firth observing responses to a 10 day 2D seismic survey (Thompson *et al.* 2013). The 2D seismic survey took place in September 2011 and exposed a 200km^2 area to noise throughout that period; peak-to-peak source levels generated by the 470 cubic inch airgun array were estimated to be 242-253 dB re 1 µPa at 1m and are therefore representative of the volume of a typical array used in VSP, and larger than that used in rig-site survey. Within 5-10km from the source, received peak-to-peak SPLs were estimated to be between 165 and 172 dB re 1 µPa, with SELs for a single pulse between 145 and 151 dB re 1 µPa^{2}s. A relative decrease in the density of harbour porpoises within 10km of the survey vessel and a relative increase in numbers at distances greater than 10km was reported; however, these effects were short-lived, with porpoise returning to affected areas within 19 hours after cessation of activities.

Overall, it was concluded that while short-term disturbance was induced, the survey did not lead to long-term or broad-scale displacement (Thompson *et al*. 2013). Further acoustic analyses revealed that for those animals which stayed in proximity to the survey, there was a 15% reduction in buzzing activity associated with foraging or social activity; however, a high level of natural variability in the detection of buzzes was noted prior to survey (Pirotta *et al*. 2014). Passive acoustic monitoring provided evidence of short-term behavioural responses also for bottlenose dolphins, but no measurable effect on the number of dolphins using the Moray Forth SAC could be revealed (Thompson *et al*. 2013).

More recently, the effects of a large 3D seismic survey in the Danish sector of the North Sea on harbour porpoise echolocation activity were examined (Sarnocińska *et al*. 2020). The source was a 3,570in^3 airgun array and the survey lasted 103 days, with seismic activity occurring on all but 17 days, covering an area of 1,121km^2. Acoustic loggers were deployed inside and adjacent to the seismic survey area, before, during and after the survey over a total duration of 9 months. Three different measures of porpoise activity showed a dose-response effect, with the lowest activity closest to the source vessel, and activity increasing up to a range of 8-12km, beyond which baseline acoustic activity was attained and no general displacement could be detected compared to reference stations at 15km from the seismic activity. The lowest porpoise acoustic activity was recorded at SELs for a single pulse of 155dB re 1 µPa^{2}s - a similar level to that estimated by Thompson *et al*. (2013) at distances where harbour porpoise detections were reduced.

Noise from the presence and movement of vessels could also potentially disturb marine mammals foraging within or close to sites for which they are a qualifying feature. Reported responses include avoidance, interrupted foraging behaviour, changes in swimming speed, direction and surfacing patterns, and alteration of the intensity and frequency of calls (review in Erbe *et al*. 2019). Chronic exposure has also been linked to an increase in stress-related hormones (Rolland *et al.* 2012). Harbour porpoises, white-sided dolphins and minke whales

have been shown to respond to survey vessels by moving away from them, while white-beaked dolphins have shown attraction (Palka & Hammond 2001). A study on captive harbour porpoises in a semi-natural net-pen complex in a Danish canal, recorded their behaviour while simultaneously measuring underwater noise of vessels passing the enclosure; reaction to noise was defined to occur when a highly stereotyped 'porpoising' behaviour was observed. Porpoising occurred in response to almost 30% of vessel passages; the most likely behavioural trigger were medium- to high- frequency components (0.25-63kHz octave bands) of vessel noise, while low- frequency components of vessel noise and additional pulses from echo-sounders could not explain the results (Dyndo *et al*. 2015). A tagging study of a small number of free-ranging porpoises in Danish coastal waters estimated that porpoises encountered vessel noise 17-89% of the time (from evaluation of the wideband sound and movement tag recordings). Occasional high-noise levels (coinciding with a fast ferry) were associated with vigorous fluking, bottom diving, interrupted foraging and even cessation of echolocation, leading to significantly fewer prey capture attempts at received levels greater than 96dB re 1 mPa (16 kHz third-octave, Wisniewska *et al.* 2018).

More evidence is available on bottlenose dolphins, especially for coastal populations. Shore-based monitoring of the effects of boat activity on the behaviour of bottlenose dolphins off the US South Carolina coast, indicated that slow moving, large vessels, like ships or ferries, appeared to cause little to no obvious response in bottlenose dolphin groups (Mattson *et al*. 2005). Pirotta *et al*. (2015) used passive acoustic techniques to quantify how boat disturbance affected bottlenose dolphin foraging activity in the inner Moray Firth. The presence of moving motorised boats appeared to affect bottlenose dolphin buzzing activity (foraging vocalisations), with boat passages corresponding to a reduction by almost half in the probability of recording a buzz. The boat effect was limited to the time where a boat was physically present in the sampled area and visual observations indicated that the effect increased for increasing numbers of boats in the area (Pirotta *et al.* 2013). Dolphins appeared to temporarily interrupt their activity when disturbed, staying in the area and quickly resuming foraging as the boat moved away.

Fish

Studies of fish mortality or behavioural response to noise have tended to focus on geological seismic survey using airgun arrays, and while the proposed survey will generate significantly less noise than these, these studies have relevance to the consideration of potential noise effects on fish and are therefore summarised here.

Fish exhibit large variation in their response to sound, largely due to the great diversity in anatomical features, hearing physiology and behaviour; all species respond to particle motion, but several have adaptations that make them sensitive also to the pressure component of sound. Most species can detect sounds from <50Hz to a few hundred Hz, with some extending this range to approximately 500Hz (e.g. cod, saithe), and those with specialisations to be sensitive to sound pressure being able to detect sounds up to several kHz (e.g. herring) (review in Hawkins & Popper 2017). There is no evidence of mortality or potential mortal injury to fish from ship noise (Popper *et al*. 2014). Slabbekoorn *et al*. (2019) note that there are few good case-studies in the peer-reviewed literature that report on the impact of a seismic survey on the behavioural response of free-ranging fish or the direct impact on local fisheries. Existing studies do not yield completely coherent results but suggest that fish could stop foraging and move down in the water column. Such temporary displacement and/or altered feeding behaviour are likely to be responsible for the reduced catches reported in some circumstances.

Potential effects on migratory diadromous fish is an area of significant interest for which empirical evidence is still limited, especially as salmonids and eels are sensitive to particle

motion (not sound pressure) (Gill & Bartlett 2010). Atlantic salmon *Salmo salar* have been shown through physiological studies to respond to low frequency sounds (below 380Hz), with best hearing at 160Hz (threshold 95 dB re 1 µPa). Harding *et al.* (2016) note a lower sensitivity at 100Hz than previously reported (Hawkins & Johnstone 1978), and greater sensitivity at frequencies of >200Hz, with evidence of some response at 400-800Hz. However, the authors qualify their results with differences in methodological approach, and the use of fish maintained in tanks receiving low frequency ambient sound within the greatest range of sensitivity (<300Hz) for some time in advance of the experiments taking place. The ability of salmon to respond to sound pressure is regarded as relatively poor with a narrow frequency span, a limited ability to discriminate between sounds, and a low overall sensitivity relative to other fish species (Hawkins & Johnstone 1978, Harding *et al.* 2016). A recent study of the hearing ability of sea lamprey (*Petromyzon marinus*) reported that, consistent with fish lacking a swim bladder, sea lamprey showed a limited sensitivity to sound, with juveniles detecting tones of 50-300Hz, but not higher frequencies (Mickle *et al*. 2019). Injury threshold criteria have been suggested by Popper *et al.* (2014), with the criteria for mortality and potential injury for species lacking a swim bladder being $L_{p,pk}$ >213 dB re 1 µPa and for all other groups, $L_{p,pk}$ >207 dB re 1 µPa. Teague & Clough (2011) indicate that shad may be able to detect ultrasound at frequencies of up to 180kHz, with a preliminary exposure trial of twaite shad eliciting significant reactions at sound frequencies of between 30 and 60kHz.

Criterion used: Screen in any SAC and SPA with qualifying interests which are noise sensitive (marine mammals, migratory fish, diving birds) either where the site boundary is within 15km of the survey area or where foraging ranges may bring such qualifying interests to within this distance. For cetaceans, screen in any SAC within the relevant management unit (after IAMMWG 2021) where the survey is proposed to take place.

3.5 Relevant sites

Natura 2000 sites (Special Areas of Conservation, SACs and Special Protection Areas, SPAs) have been identified on the basis that they could have a potential interaction with the survey activities, using the criteria outlined in Section 3.4. These are presented in Figures 3.1 and 3.2.

No Natura 2000 sites are located within the survey area, and few are within those distances noted in the criteria set out in Section 3.4. The identification of sites has therefore concentrated on the potential for relevant mobile species (seabirds, marine mammals and fish) which are qualifying interests of Natura 2000 sites, to interact with the survey area and its wider footprint of effect.

An overview of the current understanding of the foraging ranges of relevant species is given below. While these may indicate a theoretical interaction between a site feature and the survey area, there is an important distinction to be made between a potential interaction with site features and the potential for likely significant effects (i.e. those which could undermine a site's conservation objectives), which are considered further in Section 4.

3.5.1 SACs

Marine mammals

Relevant SACs in Ireland for which an interaction is considered possible include those for harbour porpoise, grey seal and harbour seal.

The harbour porpoise is the most abundant and widespread species occurring around the Irish coast, commonly seen in shallow coastal waters in the summer, although surveys suggest highest densities along the south coast occur in autumn (Marine Institute 2013). They move further offshore in the spring; although the details of this migration are uncertain, it may be linked to calving (DCENR, 2015). Harbour porpoise are generally less often encountered in the Celtic Sea than in the Irish Sea, although it may be that this is a result of lower survey effort and higher sea states off the south coast (Wall *et al*. 2013). In both the Celtic Sea Herring Assessment Survey (CSHAS) and selected Irish Whale and Dolphin Group (IWDG) casual sightings data, harbour porpoise are the second most frequently sighted toothed cetacean, seen both close to shore and in offshore waters. A comparison of the results of the broad-scale SCANS and SCANS-II surveys (SCANS-II 2008) indicate there has been a general shift to the southwest and an increase in the harbour porpoise population in the region over the period between the surveys. Two strata surveyed for marine mammals as part of the ObSERVE programme are relevant to the survey area, which took place across summer and winter 2015 and 2016. These are Stratum 4, and Stratum 8 which was only surveyed in summer and winter 2016, and covered 9,506km^2 of coastal waters off the south and south-west coasts. For the area relevant to the proposed survey, predicted distribution maps from the ObSERVE programme suggest the presence of higher densities of harbour porpoise in summer than in winter (relative to other surveyed areas for each species).

SACs for harbour porpoise represent areas supporting persistently higher densities of animals relative to elsewhere in their range (e.g. Heinänen & Skov 2015). Harbour porpoise are a highly mobile, wide-ranging species; while some individuals using designated SACs will exhibit a degree of site fidelity, they are not central place foragers like seals or breeding seabirds and will travel and forage over a large area. While harbour porpoise using more distant SACs are less likely to occur in the Kinsale Area, their broad-scale movements are poorly understood, and so a precautionary approach has been taken to screen in any SACs occurring within the same management unit as the Kinsale Area. The Kinsale Area lies within the large Celtic and Irish Seas harbour porpoise management unit, which encompasses the majority of coastal waters of Ireland, in addition to those of Wales, south-west and north-west England and south-west Scotland (IAMMWG 2015).

While bottlenose dolphins are also known to occur in the wider Kinsale Area (e.g. Rogan *et al*. 2018), there are no SACs where this species is a qualifying feature within the relevant management unit of Offshore Channel, Celtic Sea & South West England.

Grey seals occupy haul-outs along the Irish coast, to which they return to rest, breed and rear young. Breeding in Ireland generally takes place between September and December (Cronin *et al*. 2011). Grey seals favour exposed rocky shores, sand-bars or sea caves, with easy access to deep water for breeding and the largest colonies are found on exposed islands off the west and southwest coasts. The closest major colony to the survey area is at Roaringwater Bay, 75km away. They are a designated feature of the Roaringwater Bay and Islands SAC, where a permanent population of up to 150 individuals is estimated (NWPS website). The total grey seal population of Ireland has been estimated at between 5,500 and 7,000 individuals (Ó Cadhla *et al*. 2008) and Duck & Morris (2013) estimated that 9% were present along the Co. Cork coast. Grey seal densities at sea are highest in coastal waters, particularly close to colonies and haul-outs, but individuals may undertake foraging excursions up to 100km offshore (Jones *et al*. 2015). Distances travelled by seals tagged on Great Blasket Island in Co. Kerry by Cronin *et al*. (2011) were variable. It was found that larger seals spent longer foraging at sea but travelled shorter distances, while smaller seals were found to travel as far as the Western Isles of Scotland, utilising haul-out sites along the way. The seals were found to spend more time at sea during the summer.

Marine usage maps for the UK and Ireland based on extensive tagging data suggest a very low occurrence of grey seals in the Kinsale Area, with animals present in waters around the south coast of Ireland focused off southwest Cork and southeast Wexford (Jones *et al*. 2015). Grey seals were observed in five of the 11 annual CSHAS from 2008-2018, comprising 14 sightings of single seals, most of which were close to the coast (e.g. O'Donnell *et al.* 2018).

Harbour seals are generally found in more sheltered areas, again predominantly along the west coast. Females pup in June or July, and the annual moult takes place in July and August, so harbour seals tend to be at or near haul-outs through the summer (Cronin *et al*. 2008, Rakka & Minto 2015).

Harbour seals rarely forage far from their haul-out, with surveys in southwest Ireland suggesting they generally stay within 20km of their haul-out (Cronin *et al*. 2008), although longer distances do occur (e.g. Jones *et al.* 2015 noted that only 3% of tagged harbour seals foraged further than 50km) and foraging behaviour seems to vary with geographical location. The Irish population of harbour seal was estimated at 3,000-4,150 individuals (DCENR 2015) and Duck & Morris (2013) estimated 13% of the total population were present along the County Cork coast.

Marine usage maps for the UK and Ireland based on extensive tagging data suggest a very low occurrence of harbour seals in the Kinsale Area, with animals present in waters around the south coast of Ireland focused off southwest Cork and Kerry (Jones *et al*. 2015). No confirmed harbour seal sightings occurred off the south coast of Ireland in any of the 11 annual CSHAS.

The above evidence of at-sea distribution of seals suggests that the survey area is not within the normal foraging range of either species; however, taking a precautionary approach, and considering that data are subject to uncertainty, sites for grey and harbour seal were screened in for further consideration on the basis of whether they are within 100km and 50km of the survey area respectively.

Fish

Of those fish listed under Annex II of the EC Habitats Directive, those relevant to potential sources of effect identified for the survey are Atlantic salmon, sea lamprey, river lamprey and twaite shad, as these are migratory and spend part of their life cycle at sea. These are likely to have a widespread and transient presence offshore, and therefore any sites located along the Cork, Waterford and Wexford coasts where the aforementioned species are a qualifying interest have been screened in for further assessment. Sites with the freshwater pearl mussel listed as a qualifying interest were also included, as Atlantic salmon forms a critical part of their lifecycle.

Table 3.2: SACs identified for further consideration

Site code	Site name	Relevant qualifying interests
IE0000101	Roaringwater Bay and Islands SAC	Harbour porpoise
		Grey seal
IE0002172	Blasket Islands SAC	Harbour porpoise
IE0003000	Rockabill to Dalkey Island SAC	Harbour porpoise
IE0002171	Bandon River SAC	Freshwater pearl mussel
IE0002170	Blackwater River (Cork/Waterford) SAC	Freshwater pearl mussel
		Atlantic salmon

Site code	Site name	Relevant qualifying interests
		Sea lamprey
		River lamprey
		Twaite shad
IE0002162	River Barrow and River Nore SAC	Freshwater pearl mussel
		Atlantic salmon
		Sea lamprey
		River lamprey
		Twaite shad
IE0002137	Lower River Suir SAC	Freshwater pearl mussel
		Atlantic salmon
		Sea lamprey
		River lamprey
		Twaite shad
IE0000781	Slaney River Valley SAC	Freshwater pearl mussel
		Atlantic salmon
		Sea lamprey
		River lamprey
		Twaite shad
UK0030396	Bristol Channel Approaches / Dynesfeydd Môr Hafren	Harbour porpoise
UK0030398	North Anglesey Marine / Gogledd Môn Forol	Harbour porpoise
UK0030397	West Wales Marine / Gorllewin Cymru Forol	Harbour porpoise
UK0030399	North Channel	Harbour porpoise

3.5.2 SPAs

Waterbirds

Physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from the survey vessels at which flushing of birds could take place (~4km) is less than the minimum distance from the proposed survey (at least 5.5km, Cork Harbour SPA). The coastal nature of the foraging activities of waterbirds further limits the potential for interaction between such qualifying interests and the offshore aspects of the survey, however, there is the potential for interaction with certain wintering features associated with Cork Harbour SPA (e.g. cormorant, red-breasted), though this could be avoided depending on survey timing (i.e. if it were outside of the wintering period).

Seabirds

Information on the foraging movements of a number of seabird species has increased in recent years, mainly due to advances in satellite and other tracking technologies (e.g. Langston *et al*. 2013, Wakefield *et al*. 2015, 2017, Thaxter *et al*. 2014, 2018, Cleasby *et al*. 2015, 2020, Bogdanova *et al*. 2017, Carter *et al*. 2016, Edwards *et al*. 2016, Votier *et al*. 2017). There is generally limited information on foraging areas used by species from particular colonies and to help address this, Thaxter *et al*. (2012) reported on representative breeding season foraging ranges for a range of species, which were recently updated by Woodward *et al.* (2019).

Table 3.3 provides indicative foraging ranges (mean and mean maximum) travelled for a range of seabird species from a breeding colony to a foraging area, which have been used to identify

relevant sites on the basis that related qualifying interests could interact with the proposed survey area. The mean maximum foraging range value has been used here to show possible connectivity to breeding colony SPAs, but bird density will not be continuous throughout this range. Other ways of representing foraging ranges (e.g. the mean, or percentage foraging area derived from kernel analyses) may therefore provide more useful information, where available. Whilst applying mean maximum foraging radius would encompass the majority of a population's home-range area, the overall size of the predicted foraging areas around the colony would potentially make it too large to be a useful management tool, without further refinement using habitat and bathymetric data (Soanes *et al.* 2016). Similarly, the assumption that seabirds are uniformly distributed out to some threshold distance from their colonies, such as their putative maximum foraging range, is unrealistic. Seabird density declines with distance from the colony with density-dependent competition, coastal morphology and habitat preferences (Wakefield *et al*. 2017), for example oceanographic features at which seabirds preferentially forage including shelf-edge fronts, upwelling and tidal-mixing fronts, offshore banks and internal waves, regions of stratification, and topographically complex coastal areas subject to strong tidal flow (Cox *et al.* 2018), resulting in highly non-uniform distributions. While Critchley *et al*. (2018) used a distance-weighted foraging radius approach to project distributions at sea for a wide range of seabird species during the breeding season, the authors recognised the limitations of not considering environmental variables that contribute to such non-uniform distributions noted above.

The selection of all sites within the mean maximum foraging range of the survey area is a useful but simplistic approach to identifying relevant sites. The approach taken here has been to review the initial selection of sites on this basis, and exclude those for which an interaction would be unrealistic, which primarily relates to sites for which fulmar has been identified as a qualifying interest in sites to the far north and west of Ireland. Fulmar are a highly pelagic seabird, and are highly unlikely to move large distances over land which could bring them to within the survey area. The potential mean maximum foraging range for this species has therefore been applied across the marine area, including where birds could move around headlands.

Table 3.3: Indicative breeding season foraging ranges

Species	Mean maximum[1] (km)	Mean[2] (km)	Confidence[3]
Eider	21.5	3.2 ± 4.2	Poor
Red-throated diver	9	4.5	Low
Fulmar	542.3±657.9	134.6 ± 90.1	Good
Manx shearwater	1346.8±1018.7	136.1 ± 88.7	Moderate
Leach's storm petrel	n/a	657	Moderate
Gannet	315.2±194.2	120.4 ± 50	Highest
Cormorant	25.6 ± 8.3	7.1 ± 3.8	Moderate
Shag	13.2 ± 10.5	9.2 ± 4.9	Highest
Arctic skua	n/a	2 ± 0.7	Poor
Great skua	443.3 ± 487.9	67 ± 31.5	Uncertain
Black-headed gull	18.5	7	Uncertain
Common gull	50	n/a	Poor
Mediterranean gull	20	11.5	Uncertain
Herring gull	58.8 ± 26.8	14.9 ± 7.5	Good
Lesser black-backed gull	127 ± 109	43.3 ± 18.4	Highest
Kittiwake	156.1 ± 144.5	54.7 ± 50.4	Good
Sandwich tern	34.3 ± 23.2	9 ± 9.2	Moderate

Species	Mean maximum[1] (km)	Mean[2] (km)	Confidence[3]
Roseate tern	12.6 ± 10.6	4.1 ± 2.6	Moderate
Common tern	18.0 ± 8.9	6.4 ± 4.5	Good
Arctic tern	25.7 ± 14.8	6.1 ± 4.4	Good
Little tern	5	3.5	Moderate
Guillemot	73.2 ± 80.5 (55.5 ± 39.7)[4]	33.1 ± 36.5 (23.9 ± 21.1)[4]	Highest
Razorbill	88.7 ± 75.9 (73.8 ± 48.4)[4]	61.3 ± 33.4 (31.2 ± 17.3)[4]	Good
Puffin	137.1 ± 128.3 (119.6 ± 131.2)[4]	62.4 ± 34.4 (48.1 ± 28.3)[4]	Good

Source: Woodward et al. (2019). Notes: 1. The maximum range reported in each study averaged across studies. 2. The mean foraging range reported for each colony averaged across all colonies. For tracking studies, this was typically the mean foraging range from all central place foraging trips assessed at the colony. 3. Confidence levels were assigned as follows: highest (based on >5 direct studies with low variation between sites); good highest (based on >5 direct studies with wider variation between sites); moderate (between 2-5 direct studies); low (indirect measures or only one direct tracking study); uncertain (survey-based estimates); poor (few survey estimates or speculative data available). 4. May be affected by unusually high foraging ranges from Fair Isle due to reduced prey availability in study year. Ranges excluding Fair Isle data also provided.

The mean maximum foraging range for Manx shearwater is large (1,346.8 ± 1,018.7km), which when applied as a means to identify sites for consideration in the screening results in a broad range of sites being selected as far south as northern Spain (Figure 3.3). While the putative mean maximum foraging range of this species could theoretically result in individuals from very distant sites coming within the survey area, evidence suggests substantial variation in trip distance and range. For example, trips may vary by life stage (Fayet *et al.* 2015), and be substantially less during the chick-rearing period compared to the incubation period (Dean *et al.* 2015; however, note regular far-ranging activity presented in Wischnewski *et al.* 2019). Tracks (Wischnewski *et al.* 2019, Fayet *et al.* 2015) and density distributions (Dean *et al.* 2012, 2015, Fayat *et al.* 2015) suggest that for UK and Irish colonies studied, longer trips were to offshore waters of the North Atlantic, with higher levels of activity closer to colonies (note the ten-fold difference in mean (136.1±88.7km) and mean maximum (1,346.8 ±,1,018.7km) foraging range).

On the basis of this evidence, it is considered that the sites for Manx shearwater that are most relevant to this screening assessment are Saltee Islands SPA, Puffin Island SPA, Skelligs SPA, Blasket Island SPA, Lambay Island SPA, Deenish Island and Scariff Island SPA, Skomer, Skokholm and the Seas off Pembrokeshire SPA, Aberdaron Coast and Bardsey Island SPA, Copeland Islands SPA, and the Irish Sea SPA (and by association those SPAs related to this offshore aggregation which may include sites in Ireland, Northern Ireland, Scotland, Wales and England[4], some of which are already listed).

[4] https://data.jncc.gov.uk/data/0032da71-db02-44b5-b4e1-022d77ef7ee3/irish-sea-front-sas-departmental-brief.pdf

Table 3.4: SPAs identified for further consideration

Site code	Site name	Relevant qualifying interests	Diving species potentially sensitive to underwater noise?
IE0004002	Saltee Islands SPA	Northern fulmar	N
		Lesser black-backed gull	N
		Manx shearwater	Y
		Northern gannet	Y
		Atlantic puffin	Y
		Black-legged kittiwake	N
IE0004003	Puffin Island SPA	Northern fulmar	N
		Manx shearwater	Y
		Storm petrel	N
IE0004005	Cliffs of Moher SPA	Northern fulmar	N
IE0004007	Skelligs SPA	Northern fulmar	N
		Manx shearwater	Y
		Northern gannet	Y
		Storm petrel	N
IE0004008	Blasket Islands SPA	Northern fulmar	N
		Manx shearwater	Y
		Storm petrel	N
IE0004021	Old Head of Kinsale SPA	Northern fulmar	N
		Herring gull	N
		Black-legged kittiwake	N
		Common guillemot	Y
		Razorbill	Y
IE0004219	Courtmacsherry Bay SPA	Common gull	N
IE0004022	Ballycotton Bay SPA	Lesser black-backed gull	N
		Razorbill	Y
IE0004023	Ballymacoda Bay SPA	Black-legged kittiwake	N
IE0004028	Blackwater Estuary SPA	Herring gull	N
		Herring gull	N
IE0004030	Cork Harbour SPA	Lesser black-backed gull	N
		Common gull	N
IE0004032	Dungarvan Harbour SPA	Lesser black-backed gull	N
IE0004066	The Bull and The Cow Rocks SPA	Northern fulmar	N
		Northern gannet	Y
		Storm petrel	N
		Black-legged kittiwake	N
IE0004069	Lambay Island SPA	Northern fulmar	N
		Manx shearwater	Y
IE0004092	Tacumshin Lake SPA	Lesser black-backed gull	N
IE0004095	Kilcolman Bog SPA	Lesser black-backed gull	N
IE0004113	Howth Head Coast SPA	Northern fulmar	N
IE0004114	Illaunonearaun SPA	Northern fulmar	N
IE0004119	Loop Head SPA	Northern fulmar	N

Site code	Site name	Relevant qualifying interests	Diving species potentially sensitive to underwater noise?
IE0004117	Ireland's Eye SPA	Northern fulmar	N
		Northern gannet	Y
IE0004122	Skerries Islands SPA	Northern fulmar	N
IE0004125	Magharee Islands SPA	Northern fulmar	N
		Storm petrel	N
IE0004127	Wicklow Head SPA	Northern fulmar	N
IE0004153	Dingle Peninsula SPA	Northern fulmar	N
IE0004154	Iveragh Peninsula SPA	Northern fulmar	N
		Black-legged kittiwake	N
IE0004155	Beara Peninsula SPA	Northern fulmar	N
IE0004156	Sheep's Head to Toe Head SPA	Northern fulmar	N
IE0004175	Deenish Island and Scariff Island SPA	Northern fulmar	N
		Manx shearwater	Y
		Lesser black-backed gull	N
		Storm petrel	N
IE0004189	Kerry Head SPA	Northern fulmar	N
IE0004190	Galley Head to Duneen Point SPA	Northern fulmar	N
		Herring gull	N
IE0004191	Seven Heads SPA	Herring gull	N
IE0004192	Helvick Head to Ballyquin SPA	Northern fulmar	N
		Common guillemot	Y
		Razorbill	Y
		Black-legged kittiwake	N
		Herring gull	N
UK9014051	Skomer, Skokholm and the Seas off Pembrokeshire	Lesser black-backed gull	N
		Manx shearwater	Y
		Storm petrel	N
UK9014041	Grassholm SPA	Northern gannet	Y
UK9020328	Irish Sea Front	Manx shearwater	N
UK9013121	Aberdaron Coast and Bardsey Island	Manx shearwater	N

Figure 3.1: SPAs identified for further assessment

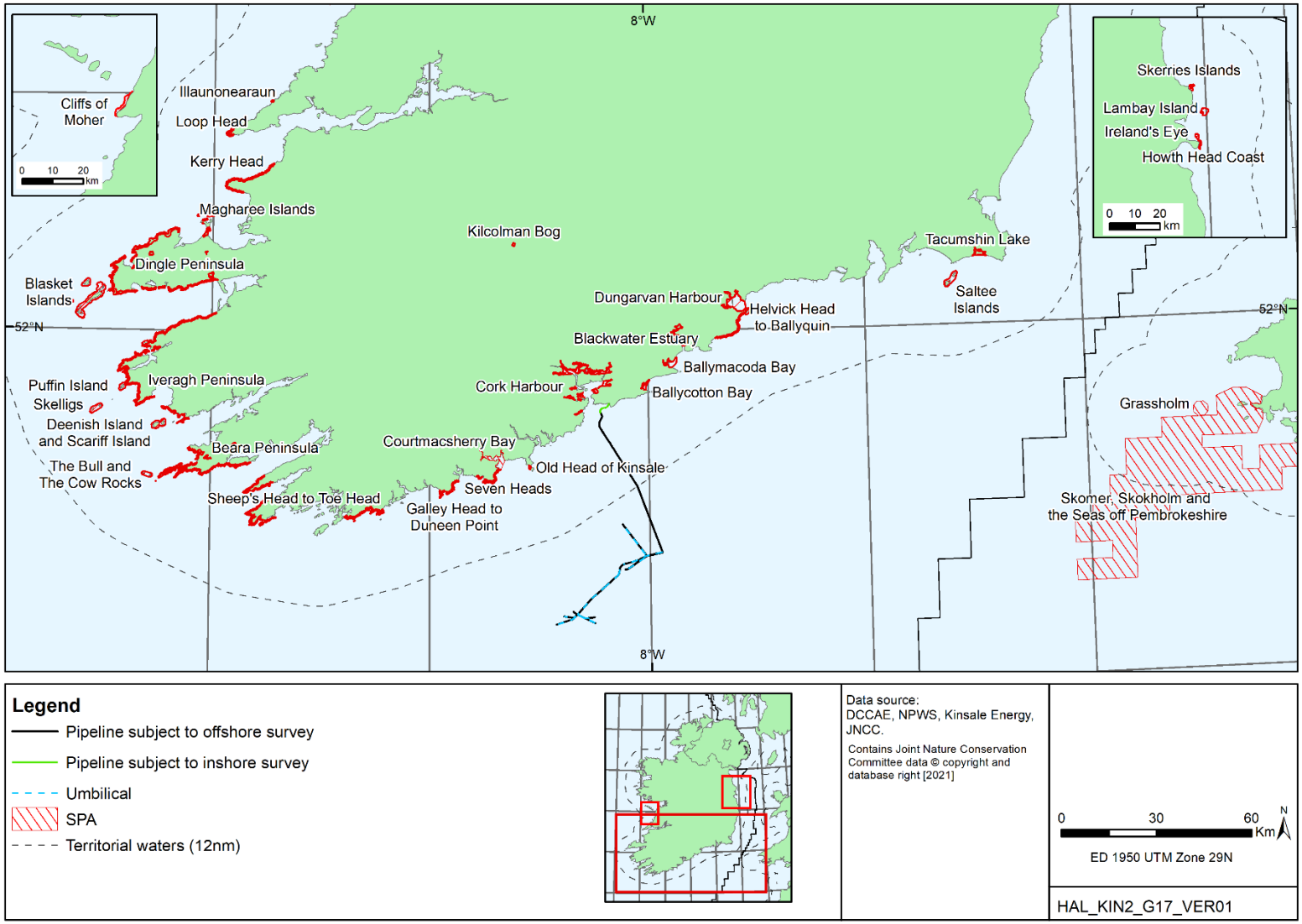


Figure 3.2: SACs identified for further assessment

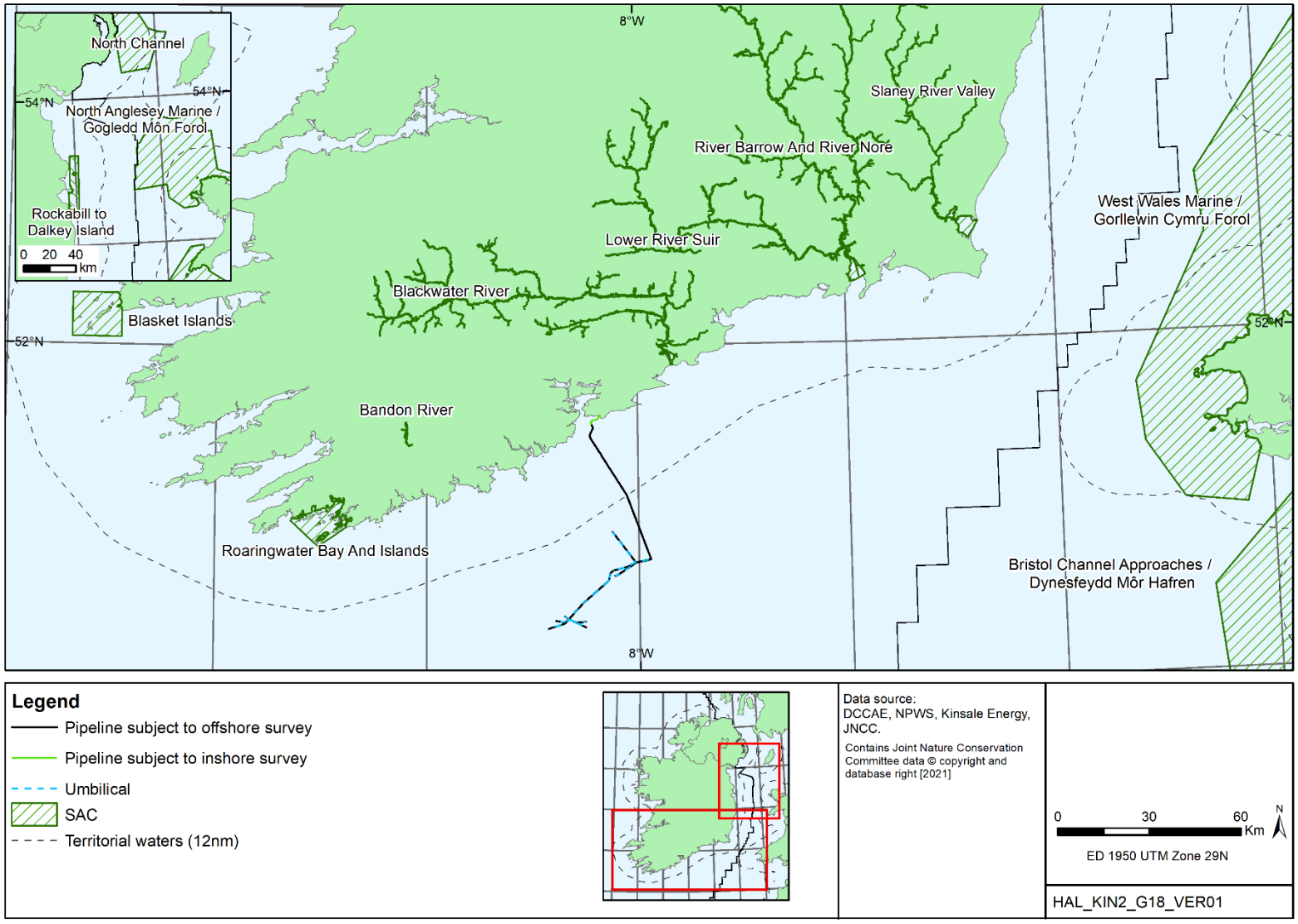
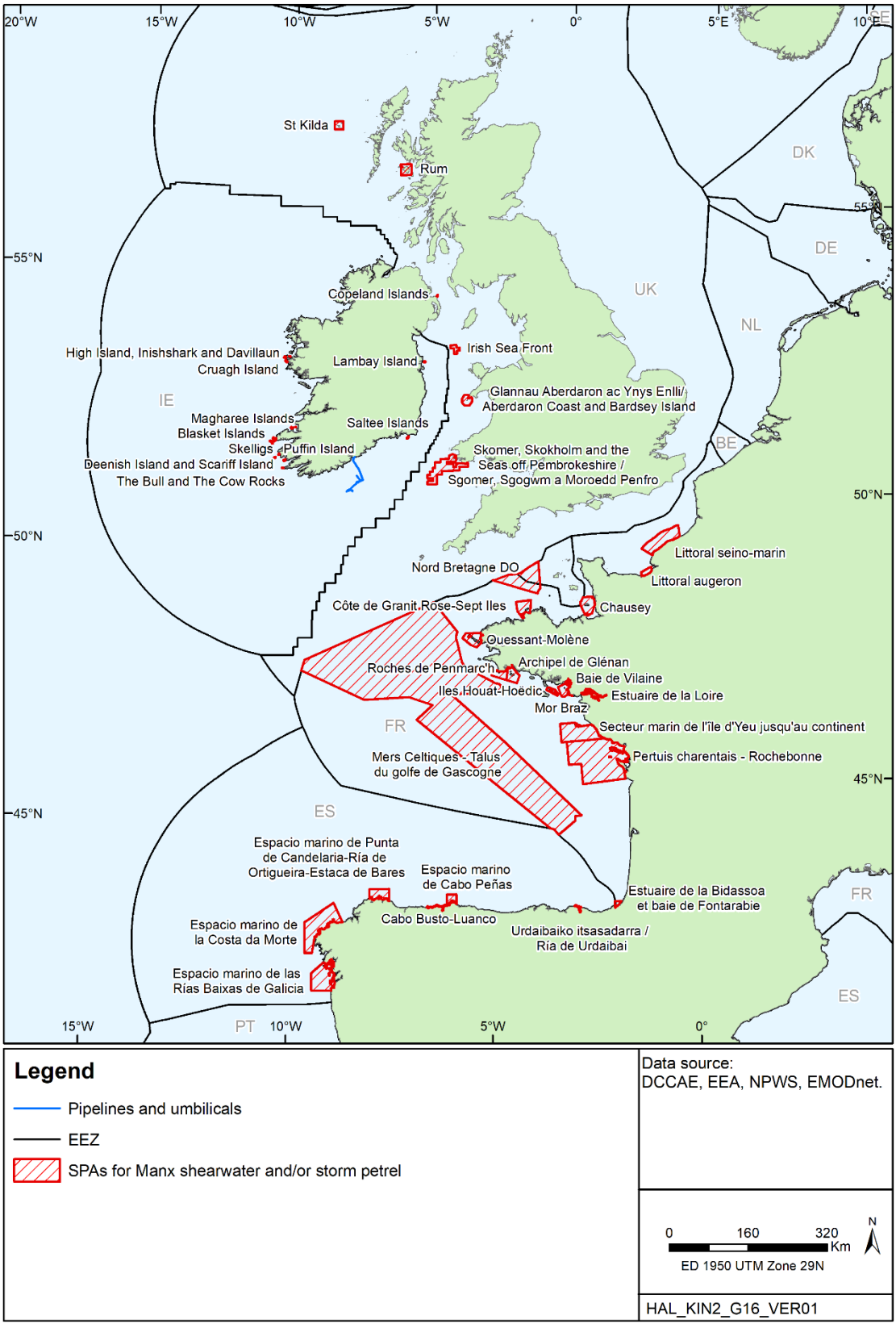


Figure 3.3: Sites identified using Manx shearwater mean maximum foraging range



4 SCREENING FOR LIKELY SIGNIFICANT EFFECTS

The sources of potentially significant effect from proposed survey activities considered relevant to the screening (i.e. where there is a recognised pathway for interaction with features subject to protection under the Birds and Habitats Directives) are the production of underwater noise and the physical presence/disturbance by vessels. Section 4.1 links the sources of potentially significant effect to individual sites and their relevant qualifying features. The potential for likely significant effects on the qualifying interests of the sites identified is considered in Section 4.2. Appendix 1 provides, for all sites listed in Table 4.1, tabulations of the site information (relevant qualifying interests, qualifying interests with a foreseeable interaction with the survey area, summary Conservation Objectives), the closest distance to the survey and a consideration of site interest features against potential sources of likely significant effect.

4.1 Consideration of potential sources of effect

Table 4.1 shows the individual sites and their relevant qualifying features linked to the sources of potentially significant effect from the proposed survey activities. Those sites identified are then considered in Section 4.2.

Table 4.1: Sites identified for further consideration

Site code	Site name	Relevant qualifying interests	Physical presence	Underwater noise
SACs				
IE0000101	Roaringwater Bay and Islands SAC	Harbour porpoise	✓	✓
		Grey seal	✓	✓
IE0002172	Blasket Islands SAC	Harbour porpoise	✓	✓
IE0003000	Rockabill to Dalkey Island SAC	Harbour porpoise	✓	✓
IE0002171	Bandon River SAC	Freshwater pearl mussel	✓	✓
IE0002170	Blackwater River (Cork/Waterford) SAC	Freshwater pearl mussel	✓	✓
		Atlantic salmon	✓	✓
		Sea lamprey	✓	✓
		River lamprey	✓	✓
		Twaite shad	✓	✓
IE0002162	River Barrow and River Nore SAC	Freshwater pearl mussel	✓	✓
		Atlantic salmon	✓	✓
		Sea lamprey	✓	✓
		River lamprey	✓	✓
		Twaite shad	✓	✓
IE0002137	Lower River Suir SAC	Freshwater pearl mussel	✓	✓
		Atlantic salmon	✓	✓
		Sea lamprey	✓	✓
		River lamprey	✓	✓
		Twaite shad	✓	✓

Site code	Site name	Relevant qualifying interests	Physical presence	Underwater noise
IE0000781	Slaney River Valley SAC	Freshwater pearl mussel	✓	✓
		Atlantic salmon	✓	✓
		Sea lamprey	✓	✓
		River lamprey	✓	✓
		Twaite shad	✓	✓
UK0030396	Bristol Channel Approaches SAC	Harbour porpoise	✓	✓
UK0030398	North Anglesey Marine SAC	Harbour porpoise	✓	✓
UK0030397	West Wales Marine SAC	Harbour porpoise	✓	✓
UK0030399	North Channel SAC	Harbour porpoise	✓	✓
SPAs				
IE0004002	Saltee Islands SPA	Northern fulmar	✓	×
		Lesser black-backed gull	✓	×
		Manx shearwater	✓	✓
		Northern gannet	✓	✓
		Atlantic puffin	✓	✓
		Black-legged kittiwake	✓	×
IE0004003	Puffin Island SPA	Northern fulmar	✓	×
		Manx shearwater	✓	✓
		Storm petrel	✓	×
IE0004005	Cliffs of Moher SPA	Northern fulmar	✓	×
IE0004007	Skelligs SPA	Northern fulmar	✓	×
		Manx shearwater	✓	✓
		Northern gannet	✓	✓
		Storm petrel	✓	×
IE0004008	Blasket Islands SPA	Northern fulmar	✓	×
		Manx shearwater	✓	✓
		Storm petrel	✓	×
IE0004021	Old Head of Kinsale SPA	Northern fulmar	✓	×
		Herring gull	✓	×
		Black-legged kittiwake	✓	×
		Common guillemot	✓	×
		Razorbill	✓	✓
IE0004022	Ballycotton Bay SPA	Lesser black-backed gull	✓	×
		Common gull	✓	×
IE0004023	Ballymacoda Bay SPA	Lesser black-backed gull	✓	×
		Common gull	✓	×
IE0004028	Blackwater Estuary SPA	Lesser black-backed gull	✓	×
		Common gull	✓	×
IE0004219	Courtmacsherry Bay SPA	Common gull	✓	×

Site code	Site name	Relevant qualifying interests	Physical presence	Underwater noise
IE0004030	Cork Harbour SPA	Lesser black-backed gull	✓	×
		Common gull	✓	×
IE0004032	Dungarvan Harbour SPA	Lesser black-backed gull	✓	×
IE0004066	The Bull and The Cow Rocks SPA	Northern fulmar	✓	×
		Northern gannet	✓	×
		Storm petrel	✓	×
		Black-legged kittiwake	✓	×
IE0004069	Lambay Island SPA	Northern fulmar	✓	×
		Manx shearwater	✓	✓
IE0004092	Tacumshin Lake SPA	Lesser black-backed gull	✓	×
		Lesser black-backed gull	✓	×
IE0004095	Kilcolman Bog SPA	Lesser black-backed gull	✓	×
IE0004113	Howth Head Coast SPA	Northern fulmar	✓	×
IE0004114	Illaunonearaun SPA	Northern fulmar	✓	×
IE0004119	Loop Head SPA	Northern fulmar	✓	×
IE0004117	Ireland's Eye SPA	Northern fulmar	✓	×
		Northern gannet	✓	✓
IE0004122	Skerries Islands SPA	Northern fulmar	✓	×
IE0004125	Magharee Islands SPA	Northern fulmar	✓	×
		Storm petrel	✓	×
IE0004127	Wicklow Head SPA	Northern fulmar	✓	×
IE0004153	Dingle Peninsula SPA	Northern fulmar	✓	×
IE0004154	Iveragh Peninsula SPA	Northern fulmar	✓	×
		Black-legged kittiwake	✓	×
IE0004155	Beara Peninsula SPA	Northern fulmar	✓	×
IE0004156	Sheep's Head to Toe Head SPA	Northern fulmar	✓	×
IE0004175	Deenish Island and Scariff Island SPA	Northern fulmar	✓	×
		Manx shearwater	✓	✓
		Lesser black-backed gull	✓	×
		Storm petrel	✓	×
IE0004189	Kerry Head SPA	Northern fulmar	✓	×
IE0004190	Galley Head to Duneen Point SPA	Northern fulmar	✓	×
		Herring gull	✓	×
IE0004191	Seven Heads SPA	Herring gull	✓	×
IE0004192	Helvick Head to Ballyquin SPA	Northern fulmar	✓	×
		Common guillemot	✓	✓
		Razorbill	✓	✓
		Black-legged kittiwake	✓	×
		Herring gull	✓	×

Site code	Site name	Relevant qualifying interests	Physical presence	Underwater noise
UK9014051	Skomer, Skokholm and the Seas off Pembrokeshire SPA	Lesser black-backed gull	✓	×
		Manx shearwater	✓	✓
		Storm petrel	✓	×
UK9014041	Grassholm SPA	Northern gannet	✓	✓
UK9013121	Aberdaron Coast and Bardsey Island	Manx shearwater	✓	✓
UK9020291	Copeland Islands	Manx shearwater	✓	✓
UK9020328	Irish Sea Front	Manx shearwater	✓	✓

4.2 Screening for likely significant effects

On the basis of the evidence presented in Sections 3 and 4 and the information given in Appendix 1, the potential for likely significant effects on the qualifying interests of the relevant sites (Table 4.1) is assessed below.

4.2.1 Physical presence of the survey vessels

Birds

The physical presence of the survey vessels may potentially cause displacement and/or other behavioural responses in birds. Most species from relevant SPAs within foraging range of the survey area have been judged to have a low to moderate sensitivity to disturbance by shipping traffic; these include northern gannet, fulmar, common guillemot, kittiwake, Manx shearwater and gulls (Garthe & Hüppop 2004, MMO 2008, Fliessbach *et al.* 2019). While rafting birds which are qualifying interests of sites may move in response to vessels in transit, such effects would be of low magnitude, short duration and transient, and will represent negligible additional disturbance over other vessel traffic including that of fishing, cargo and tanker traffic. For example, a shipping study based on Automatic Identification System (AIS) data completed for IOSEA4 (DCENR 2011) indicated that generally up to 300-750 vessels per year were present in waters off the south coast of Ireland and in the vicinity of the survey area (see other data sources including MMO 2014 and subsequent data updates, and EMODnet 2019[5]).

Physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from the survey at which flushing of birds could take place (~4km) is less than the minimum distance from the proposed survey (at least 5.5km, Cork Harbour SPA). The coastal nature of the foraging activities of waterbirds further limits the potential for interaction between such birds and the offshore aspects of the survey, however, there is the potential for interaction with certain wintering features associated with Cork Harbour SPA (cormorant, red-breasted merganser), though this could be avoided depending on survey timing (i.e. by not undertaking work in the wintering period). The presence of the inshore survey vessel will be temporary (about 7 days) and incremental to the relatively low density of shipping in the area, which is generally recreational or for inshore fisheries.

[5] https://www.emodnet-humanactivities.eu/search-results.php?dataname=Vessel+Density+ and https://www.emodnet-humanactivities.eu/search-results.php?dataname=Route+density+%28source%3A+EMSA%29

In view of the available evidence on the potential for the survey activities to generate disturbance to qualifying bird interests of relevant sites for which a potential interaction was identified, significant effects are not considered to be likely.

Fish and Marine Mammals

The physical presence of the vessel may influence the distribution and movements of sensitive species in the water column, specifically protected migratory fish (Atlantic salmon, sea lamprey, river lamprey, twaite shad) and marine mammals (harbour porpoise and grey seal). As hearing specialists, any displacement of marine mammals is most likely associated with acoustic disturbance, which is discussed below in Section 4.2.2. There may also be responses from marine mammals and fish to the general physical presence of vessels (Sparling *et al.* 2015), along with the risk of collisions from vessels in transit. However, the physical presence of the vessels around areas of existing activity, and their temporary presence, are anticipated to cause no more than temporary and localised low-level behavioural responses similar to those from wider vessel traffic in the area (as noted above), such that significant effects are not predicted.

4.2.2 Underwater noise

Noise sources and propagation

As outlined in Section 2, the planned survey will use high-resolution geophysical survey (HRSG) sources to obtain information on the pipelines, umbilicals and surrounding seabed around all of the Kinsale Head, Seven Heads, Ballycotton and South-West Kinsale/Greensands field areas. All acoustic sources are electromechanical and use a piezoelectric transducer(s) to transmit a computer-generated frequency-amplitude modulated signal of pre-determined pulse length and frequency. No low frequency survey equipment will be used (the lowest frequency source which may be used is the USBL, which operates at 20-40kHz); no airgun, sparker (electrostatic discharge) or boomer (accelerated water mass) will be used.

Calibrated measurements of the acoustic characteristics of electromechanical sources used in HRGS have, until recently, been lacking, with assessments reliant upon manufacturer specifications. However, a recent study commissioned by the US Bureau of Ocean Energy Management (BOEM) provided calibrated measurements of source characteristics under controlled test tank conditions for a variety of equipment used in HRGSs (Crocker & Fratantonio 2016, Crocker *et al*. 2019). Table 4.2 summarises indicative source characteristics of the survey equipment (and comparable equipment) which will potentially be used in the planned survey, drawing on results of Crocker & Fratantonio (2016) supplemented by manufacturer specifications where required. In addition to those sources described in Table 5.1, there may be the use of an USBL system to monitor the position of towed equipment. The USBL system consists of a multi-element transducer mounted on the hull of the vessel and a transponder attached to the towed equipment (e.g. side-scan sonar). The hull-mounted transducer emits an acoustic pulse that is detected by the transponder, which replies with its own acoustic pulse, and its position is subsequently determined from the range and angle of the pulse as received by the transducer. USBL equipment is widely used by offshore commercial and research vessels where positional accuracy of towed survey equipment is critical. The emitted pulses will be short pulse width ‘pings’, approximately in the range of 20-40kHz and with a source level of up to ~200dB re 1µPa @1m (peak).

Table 4.2: Potential acoustic survey equipment and indicative source characteristics

Potential equipment	Indicative source characteristics	
	Nominal operating frequency	**Source level**
Side-scan sonar e.g. Edgetech 4200 (3)	400kHz	210 dB re 1µPa @1m (peak) (1)
Multi-beam echosounder e.g. Kongsberg EM 2040 (4)	400kHz	223 dB re 1µPa @1m (peak) (2)
e.g. Tritech SeaKing Bathy 704 with altimeter	500kHz (bathymetry only, altimeter is passive)	

Notes: (1) Calibrated measurements for Edgetech 4200 tested at 400kHz reported in Crocker & Fratantonio (2016). (2) Manufacturer-specified source level not available for the Kongsberg EM710, so values (calibrated measurements) are taken for the comparable Reson Seabat T20P MBES operated at a frequency of 400kHz reported in Crocker & Fratantonio (2016).

The propagation of sound in the marine environment is complex and has been the subject of considerable research (e.g. Wang *et al*. 2014). Once a sound is emitted, its characteristics will be altered with distance from source. Changes will affect the amplitude of the signal and its frequency content and, in the case of impulsive sounds, the injurious elements will be reduced through propagation (i.e. pulse duration increases and rise-time decreases with distance). The main process that reduces the amplitude of the sound wave as it propagates is geometrical spreading; while a host of other processes come into play (e.g. reflection, refraction, scattering, reverberation and absorption), many of which are dependent on environmental conditions. The effect of frequency-dependent absorption loss is small on lower frequency sources (e.g. <0.3dB/km at 4kHz), which contributes to seismic survey noise being detectable by hydrophones hundreds of km from the source, but acts to rapidly attenuate higher frequency sources (e.g. 36dB/km at 100kHz) (Francois & Garrison 1982).

The propagation of noise from seismic surveys have received a lot of attention and while different survey designs and environmental conditions may warrant survey specific modelling and/or measurements for assess impacts, general expectations of broadband received levels from airguns can be made. In terms of peak sound pressure levels, while the nominal source levels for a large airgun array (250-260dB 1 µPa @1m, peak-to-peak) are never reached, levels >230dB re 1 µPa can be expected in close proximity (metres); levels are commonly reported to have decreased below 200dB re 1 µPa at a range of 100-1000m, and below 160 re 1 µPa at a range of 10-11km (e.g. Breitzke *et al*. 2008).

The emitted sound fields from HRGS sources such as side-scan sonar and echosounders are of much lower amplitude and extent compared to seismic surveys using airguns due to their lower source levels, higher central operating frequencies and greater directionality (narrower beam widths) (e.g. Boebel et al*.* 2005*,* Genesis 2011). However, very few empirical field data are available to quantify these expectations. The most relevant work to date is part of the study funded by the US BOEM: following the calibrated measurements of Crocker & Fratantonio (2016), measurements were made in shallow (≤ 100m depth) open-water environments to investigate the propagation of sound from various HRGS sources (Halvorsen & Heaney 2018). Unfortunately, problems were encountered during the open-water testing resulting in a lack of calibration in the reported sound source levels (Labak 2019). The accompanying advice note (Labak 2019) emphasises that these uncalibrated data should not be used to provide source level measurements, and consequently the reported isopleths (summarising sound propagation) should not replace project-specific sound source verifications. A further project to calibrate these measures and provide an expanded assessment of propagation commenced in 2019.

Despite these caveats, it is worth noting some general patterns observed in Halvorsen & Heaney (2018). In all test environments, broadband received levels from all echosounder and side-scan sonar devices tested were rapidly attenuated with distance from source, with particularly pronounced fall-off for directional sources when the receiver was outside of the source's main beam. The greatest propagation was generally observed at the deepest test site (100m water depth) from sources generating low frequencies (<10kHz); by contrast, at 100m water depth, some of the highest frequency sources (>50kHz) experienced such attenuation that they were only weakly detectable or undetected by recording equipment. In all open-water test environments, broadband received levels did not exceed 160dB re 1µPa (rms)[6] beyond 200m from any echosounder or side-scan sonar device tested. While recognising that these results require refining, preliminary evidence suggests that these electromechanical HRGS sources generate a very limited sound field in the marine environment, and of a much lower magnitude than those generated by seismic airgun sources. While independently-measured sound fields are not available for USBL, their nominal source levels and central operating frequencies are such that emitted sounds fields are likely to be very small and of limited/no audibility above that of the concurrently operating survey equipment and vessel.

In generic terms, underwater noise emitted by small leisure craft and vessels <50m tends to have a source level of 160-175 dB re 1µPa@1m, and with greater sound energy in relatively higher frequency (above 1kHz) when compared to large ships; support and supply vessels (50-100m) are expected to have source levels in the range 165-180dB re 1µPa@1m range and with most energy in lower frequencies (OSPAR 2009). For the purpose of this noise assessment, the offshore survey vessels are assumed to be of 50-100m in length, though the inshore survey vessel will be significantly smaller (perhaps <10m). Veirs *et al*. (2016) estimated sound characteristics for a wider variety of ships (from pleasure craft to container ships) in transit across the Haro Strait (west coast of North America). Median received levels of ship noise within the study area were measured to be most elevated above ambient noise at the lower frequencies (20-30dB from 100-1000Hz), and to a lesser extent also at higher frequencies (5-13dB from 10-40kHz).

Cavitational noise commonly arises at speeds between 8 and 12 knots and grows in amplitude with increasing speed; its frequency spectrum is broad with dominant frequencies above a few hundred Hz. In addition to vessels in transit, cavitational noise is important when vessels are operating under high load conditions (high thrust) and when dynamic positioning (DP) systems are in use. For example, the use of thrusters for DP has been reported to result in increased sound generation of ~10dB compared to the same vessel in transit: measurements at 600m range to an offshore supply vessel of 79m length recorded broadband SPL (18-3,000Hz) of 148.0dB re 1µPa (root-mean-squared, rms) when in DP mode, compared to 135.5dB re 1µPa rms when in transit at a speed of 10 knots (Rutenko & Ushchipovskii 2015).

Acoustic modelling in support of oil & gas operations have shown that across a variety of vessels, activities and localities, exposure to sound pressure level (SPL) above >180 dB re 1 µPa rms is highly unlikely; SPL >160 dB re 1 µPa rms are encountered only within the immediate vicinity of the activity (<50m) while SPL >120 dB re 1 µPa rms are encountered up to a few kilometres (Neptune LNG 2016, Fairweather 2016, Owl Ridge Natural Resource Consultants 2016).

[6] The 160dB re 1µPa (rms) isopleth represents the acoustic exposure criterion for behavioural disruption from impulsive noise as described by NMFS (2016), although this criterion is not universally adopted in policy or guidance elsewhere (such as the UK).

Marine mammals

Marine mammals, for which sound is fundamental across a wide range of critical natural functions, show high sensitivity to underwater sound. Generally, the severity of effects tends to increase with increasing exposure to noise with both sound intensity and duration of exposure being important. A distinction can be drawn between effects associated with physical (including auditory) injury and effects associated with behavioural disturbance. With respect to injury, risk from an activity can be assessed using threshold criteria of sound levels, with the most recent criteria presented in Southall *et al.* (2019). Auditory capabilities, and in particular the range of frequencies over which sensitivity is greatest, varies between species and criteria are assigned to functional hearing groups with accompanying injury criteria. Table 4.3 provides details of the relevant marine mammals (i.e. those which are qualifying interests of relevant sites) listed by functional hearing group, their estimated hearing range and recommended injury criteria, defined as the sound level at which a permanent threshold shift (PTS; permanent hearing damage) is estimated to occur.

Table 4.3: Marine mammal auditory injury criteria to pulsed sounds by functional hearing group

Functional hearing group (species relevant to the Kinsale area)	**Estimated hearing range** (region of greatest sensitivity) [frequency of peak sensitivity]	**Proposed injury (PTS onset) threshold criteria to impulsive noise** (dB re 1µPa, peak, unweighted)
Very high frequency cetaceans Harbour porpoise (*Phocoena phocoena)*	275Hz to 160kHz (12kHz to 140kHz) [105kHz]	202
Phocid seals in water Grey seal (*Halichoerus grypus*) Harbour seal (*Phoca vitulina*)	50Hz to 86kHz (1.9kHz to 30kHz) [13kHz]	218

Source: Southall et al. (2019). Notes: The region of greatest sensitivity represents parameters f1 and f2, which are the bounds of the flat, central portion of the frequency-weighting curve region; the frequency of peak sensitivity represents parameter f0.

Of the species likely to occur in the survey area, the harbour porpoise has the lowest threshold criteria for the onset of PTS at 202dB re 1µPa. Given the source characteristics and evidence of propagation presented above, the potential sources in the planned Kinsale survey will either not generate source levels of this amplitude, or will not result in received sound levels exceeding this threshold beyond more than a few metres from the source and/or not overlap frequencies of greatest sensitivity. For all other species/functional hearing groups, the risk is lower still. Therefore, **the risk of injury to marine mammals which are qualifying interests of relevant SACs (Section 4.1.1) is considered to be negligible, and significant effects are not considered to be likely**.

With respect to behavioural disturbance of marine mammals, it has proved much more difficult to establish broadly applicable threshold criteria based on exposure alone. This is due, in part, to the challenges encountered in studies of wide-ranging species with complex behaviour, but is largely because many behavioural responses are context-specific (e.g. Gomez *et al*. 2016*,* Harding *et al*. 2019). Field observations during industrial activities are fundamental sources of information for assessment. Research on potential effects of seismic airguns has focused particularly on baleen whales, because of the low-frequency overlap in noise sources and their hearing abilities; the potential for avoidance reactions and for changes in vocalisation has been demonstrated across several species and a variety of distances (see review in DECC 2016).

For harbour porpoise, there is empirical evidence to support a temporary effective deterrence radius around seismic survey of approximately 10km, with Thompson *et al.* (2013) using passive acoustic monitoring (PAM) to observe a reduction in harbour porpoise density within 5-10km of a 470in^3 airgun array in the Moray Firth, with animals returning 19 hours after exposure ceased. More recently, Sarnocińska *et al.* (2020) also used PAM to observed a dose-response effect among porpoise activity and 3D seismic survey in the Danish North Sea using a 3,570in^3 airgun array. The lowest porpoise activity was recorded closest to the source vessel increasing up to a range of 8-12km, beyond which baseline acoustic activity was observed. No long-term or large-scale displacements were observed throughout the survey.

Consistent with the findings of Thompson *et al*. (2013), the most recent UK Offshore Energy SEA (OESEA3, DECC 2016) concludes that a conservative assessment of the potential for marine mammal disturbance from seismic surveys will assume that firing of airguns will affect individuals within 10km of the source, resulting in changes in distribution and a reduction of foraging activity, but the effect is short-lived. The applicability of this value of 10km to other marine mammals is justified by harbour porpoise showing greater sensitivity to hearing damage and apparently stronger responses to anthropogenic noise than other species commonly occurring in UK shelf waters. A 10km Effective Deterrence Radius (EDR) has also been suggested by UK Statutory Nature Conservation Bodies as an appropriate approach to assessing disturbance due to seismic surveys.

In comparison to the work on seismic airguns, potential effects from other acoustic surveys such as sub-bottom profilers (SBPs) or echosounders on marine mammals, or any other marine fauna, have received much less attention. High frequency sources with central operating frequencies at the upper end of marine mammal hearing ranges or above (e.g. echosounders, side-scan sonar) have been shown to emit energy at lower frequencies audible to most marine mammals (e.g. Risch *et al*. 2017), although at reduced amplitudes and with a small emitted sound field which is unlikely to cause behavioural effects (Cotter *et al*. 2019). Evidence of responses to echosounders is variable and limited, with the strongest evidence of negative effects relating to deep-diving odontocetes and with echosounder use which is not representative of most survey applications in shelf waters (e.g. Cholewiak *et al*. 2017). Consideration of the higher frequency signals, typically lower source levels and higher directionality of these and other HRGS sources has resulted in the assumption that these would not propagate far enough for marine species to be negatively affected by received levels (Halvorsen & Heaney 2018). However, a precautionary approach has been adopted where it is acknowledged that such sources are within the hearing range of marine mammals and therefore could, in a few cases, cause localised short-term impacts on behaviour or temporary displacement of a small number of individuals (Boebel *et al*. 2005). The aforementioned results of recent BOEM studies into source characteristics and preliminary evidence of propagation appear to support this assertion.

Underwater noise from the survey vessels could potentially cause behavioural disturbance of marine mammals present in the area. Reported responses include avoidance, changes in swimming speed, direction and surfacing patterns, alteration of the intensity and frequency of calls (review Erbe *et al*. 2019). Harbour porpoises and minke whales have been shown to respond to survey vessels by moving away from them, while some other species, such as common dolphins, have shown attraction (Palka & Hammond 2001).

While there is potential for some behavioural disturbance of cetaceans in response to survey vessel noise, the area of potential disturbance will be highly localised (i.e. within a few hundred metres radius), in an open sea habitat (i.e. with movement of animals not restricted by geographic features such as a shoreline), transient and of short overall duration. The increase in underwater noise from the survey vessel activities, relative to existing levels in the wider area from other shipping and fisheries, is expected to be negligible.

The waters off the south coast of Ireland support a high diversity of cetaceans, which include harbour porpoise, during the period April-September. However, considering the acoustic characteristics of the potential sources and their propagation, the relevant evidence of effects on marine mammals from vessel noise, seismic survey and the proportionally lower potential for effects of the specific sources being used, in addition to the small spatial footprint and short duration of the planned surveys, **the risk of behavioural disturbance to any species of marine mammal which is a qualifying interest of a relevant SAC (Section 4.1.1) is considered to be extremely low, and significant effects are not considered to be likely.**

The risk of negative effects on marine mammals is considered to be sufficiently low that no mitigation measures are necessary. The planned survey does not include seismic sources (such as airguns, sparkers or boomers) and the location of the offshore survey area is such that it is not necessary to adhere to the DAHG Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (DAHG 2014). This is reflective of the low risk to marine life posed by the potential equipment and the survey environment not being of high sensitivity. As the inshore survey extent, which will use a different vessel to the offshore survey, could be categorised as taking place within a bay or within 1,500m of the entrance of an enclosed bays, the measures outlined in DAHG (2014) will be followed.

Fish

Fish exhibit large variation in their response to sound, largely due to the great diversity in anatomical features, hearing physiology and behaviour; all species respond to particle motion, but several have adaptations that make them sensitive also to the pressure component of sound. Most species can detect sounds from <50Hz to a few hundred Hz, with some extending this range to approximately 500Hz (e.g. cod, saithe), and those with specialisations to be sensitive to sound pressure being able to detect sounds up to several kHz (e.g. herring) (review in Hawkins & Popper 2017). Broadly applicable sound exposure criteria have been published (Popper *et al.* 2014); the criteria for mortality and potential injury from seismic survey noise for species lacking a swim bladder (sensitive to particle motion only) is >213dB re 1 µPa (peak) and for all other groups is >207dB re 1 µPa (peak).

There have been numerous reviews of the effects of anthropogenic sound on fish (e.g. Popper *et al*. 2014, Hawkins *et al*. 2015, Slabbekoorn *et al*. 2019). Of relevance is Carroll *et al*. (2017), who present a systematic and critical review of scientific studies investigating the impacts of low-frequency sound on marine fish, with a focus on seismic surveys. Of studies investigating adult/juvenile fish mortality and physical injury, the majority showed no effects, some reported temporary hearing loss and one observed long-term hearing damage; none showed mortality. Of six studies investigating mortality of fish eggs or larvae, none reported mortality at realistic known exposure levels. Behavioural effects are the most studied aspect, numbering 15 studies, with most being laboratory or caged field experiments. Startle/alarm responses, avoidance of the sound source or changes in vertical or horizontal distribution were widely reported, while several studies reported no significant response or conflicting results. Observed responses were temporary, and fish returned to pre-exposure behaviour typically within less than an hour of the last exposure. The majority of studies of effects on catch rates or abundance report no effect or conflicting results, although in some cases reduced trawl and/or longline catch occurred; where effects have been reported, these are most likely due to changes in fish distribution and behaviour, such as vertical movements.

As key prey items of fish, there has been increasing interest in the potential effects of seismic and other high amplitude low-frequency noise on plankton. McCauley *et al*. (2017) reported a significant decrease in zooplankton abundance and a significant increase in mortality of adult and larval zooplankton, particularly krill, following repeated exposure to a 150in^3 airgun. By

contrast, Fields *et al*. (2019) found only limited effects on mortality of the copepod *Calanus finmarchicus* (a key food source of commercial fish in the North Atlantic) when exposed to single blasts of a 2x260in^3 airgun cluster. While studies are limited, and further investigation is required, most evidence to date suggests negligible effects on plankton from exposure to seismic survey noise (Carroll *et al*. 2017); it is reasonable to infer that the potential for effects from lower-amplitude acoustic surveys sources will be proportionally less.

Given the reported hearing ranges of fish, it is anthropogenic sound sources generating high amplitude low-frequency noise (i.e. seismic airgun surveys, along with percussive pile-driving and explosions) which are of primary concern to fish. Studies which have experimentally tested the effects of other fairly low-frequency acoustic survey sources (i.e. SBPs) on fish are lacking. The high frequency signals generated by side-scan sonar, echosounders and USBL are above the hearing range of fish.

Given the limited evidence of physical injury to fish from exposure to high amplitude low-frequency seismic survey noise, and the comparatively lower amplitude and higher frequency source characteristics of the potential sources in the planned survey, **the risk of injury to any fish species which is a qualifying interest of a relevant SAC (Section 4.1.1) is considered to be extremely remote and significant effects are not considered to be likely.**

Given the limited and variable evidence of behavioural responses of fish to high amplitude low-frequency seismic survey noise (which are low-level and short-term), the comparative characteristics of the potential sources in the planned survey, in addition to the small spatial footprint and short duration of the planned surveys, **the risk of significant effects on any fish species which is a qualifying interest of a relevant SAC (Section 4.1.1) due to behavioural disturbance is considered to extremely low.**

Diving birds

Information on the underwater hearing abilities of diving birds and evidence of the effects of underwater anthropogenic noise is very limited. Direct effects from underwater acoustic surveys on diving birds could potentially occur through physical damage, given exposure to sufficiently high amplitudes, or through behavioural disturbance. Deeper-diving species which spend longer periods of time underwater (e.g. auks) may be most at risk of exposure, but all species which routinely submerge in pursuit of prey and benthic feeding opportunities in marine and estuarine habitats (i.e. also including divers *Gavia spp*., grebes, diving ducks, cormorant, shag, gannet, and Manx shearwater) may be exposed to anthropogenic noise.

Tests of hearing in a range of diving species suggest a hearing range of approximately 500Hz to 4kHz, with similar results obtained in air and underwater (Crowell 2014, Crowell e*t al.* 2015, Hansen *et al*. 2017). McCauley (1994) inferred from vocalisation ranges that the threshold of perception for low frequency seismic noise in some species (e.g. penguins, considered as a possible proxy for auk species) would be high, hence individuals might be adversely affected only in close proximity to the source.

Very high amplitude low frequency underwater noise may result in acute trauma to diving seabirds, with several studies reporting mortality of diving birds in close proximity (i.e. tens of metres) to underwater explosions (Yelverton *et al*. 1973, Cooper 1982, Stemp 1985, Danil & St Leger 2011). However, mortality of seabirds has not been reported during extensive seismic operations in the North Sea and elsewhere.

With the exception of Pichegru *et al*. (2017), which relates to penguins, there are no published reports of changes in abundance or distribution of diving birds concurrent with seismic or other acoustic survey activity. A study investigated seabird abundance in Hudson Strait (Atlantic

seaboard of Canada) during seismic surveys over three years (Stemp 1985). Comparing periods of shooting and non-shooting, no significant difference was observed in abundance of thick-billed murre (Brünnich's guillemot), or fulmar or kittiwake.

While seabird responses to approaching vessels are highly variable (e.g. Fliessbach *et al*. 2019), flushing disturbance would be expected to displace most diving seabirds from close proximity to the survey vessel and any towed equipment, thereby limiting their exposure to the highest sound pressures generated. Similarly, any behavioural disturbance of seabirds due to the survey activities is most likely to be temporary displacement associated with the physical presence of the vessel, comparable to that experienced by routine shipping traffic (see Section 4.2.1).

While acknowledging limited data and the importance of the Kinsale area to several species of diving birds which are qualifying interests of relevant SPAs (i.e. guillemot, razorbill, northern gannet and Manx shearwater), a consideration of the lack of reported effects of seismic survey on diving birds, the comparatively lower amplitude and higher frequency source characteristics of the potential sources in the planned Kinsale survey, in addition to the small spatial footprint and short duration of the planned survey, leads to the conclusion that **significant effects on diving birds are considered to be highly unlikely.**

4.3 In-combination effects

Sources of potential in-combination effects included a range of other activities which take place within the wider Kinsale area, including fisheries and shipping, for which the addition of up to three vessels for up to 40 days in total, is not considered to represent a significant source of in-combination effect.

Two Foreshore Licences have been applied for in relation to offshore wind farm site investigation work in the territorial waters off Cork (see Section 3.3). The application most of relevance to the survey (both pre- and post-rock placement) is for the Emerald project, though there is also some overlap with the offshore and full overlap with the inshore survey area and the Inis Ealga project area (Figure 3.9). The proposed schedules for the inshore surveys associated with Emerald and Inis Ealga both indicate a five year window from the date of consent to completion. The indicative schedule in their respective applications suggest activities starting in 2021, or likely taking place 2020-2023. As neither application has been approved, there is the potential for the timescale within which works take place to be later than proposed. There is the potential for interaction between the timings of these surveys and work associated with the proposed KADP surveys, but the duration and scale of the surveys are such that there is considerable scope to avoid interactions.

The wind farm proposals associated with the site investigations are at a conceptual stage. No consent application for either development has been made, and no approvals have been granted.

There is the potential for future development associated with the Barryroe oil discovery. An application was made to conduct a site survey within the Barryroe licence area (EL 1/11), which was completed in September 2019 and a further subsequent survey application was made in August 2019 for an area covering a proposed appraisal well ('K'), which overlaps parts of the Seven Heads field. The survey was completed in November 2021 and thus interactions are not considered possible.

Kinsale Energy will maintain awareness and dialogue with the developers of both wind farms, and any further proposals in relation to the Barryroe field, to ensure that activities do not proceed in a matter which could lead to cumulative impacts.

5 AA SCREENING STATEMENT AND CONCLUSIONS

This Screening for Appropriate Assessment has been prepared according to the process and requirements outlined in the *European Communities (Birds and Natural Habitats) Regulations 2011* and the Habitats Directive, and is consistent with European (European Commission 2021a) (see Figure 1.2 of this document) and national (DoEHLG 2010) guidance, and relevant case law. The screening assessment was carried out in accordance with best published scientific knowledge, and taking into consideration each of the relevant sites' conservation objectives, to ascertain if the proposed survey, on its own or in-combination with any other known plan or project, would be likely to have a significant effect on any of the relevant Natura 2000 sites. For the avoidance of doubt, it is confirmed that measures intended to avoid or reduce impacts on any European Site were not considered as part of the screening assessment carried out.

The conclusion of the Screening for Appropriate Assessment is that the activities associated with the proposed surveys (see Section 2) will not result in any likely significant effects (either alone or in-combination with other plans or projects) on the features or conservation objectives of any relevant Natura 2000 site (see Section 3). This conclusion is based on objective scientific evidence and there is no reasonable scientific doubt in relation to this conclusion.

6 ARTICLE 12 ASSESSMENT

6.1 Relevant Annex IV species

Under Article 12 of the Habitats Directive, Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas. Those Annex IV species (cetaceans) that could potentially occur within the survey area are listed (Table 6.1) and described below.

Table 6.1: Annex IV species relevant to the survey and wider Kinsale area

Group	Common Name	Scientific Name	Habitats Directive Annex (es)
Cetaceans	Harbour porpoise	*Phocoena phocoena*	II and IV
	Common dolphin	*Delphinus delphis*	IV
	Bottlenose dolphin	*Tursiops truncatus*	II and IV
	Risso's dolphin	*Grampus griseus*	IV
	Killer whale	*Orcinus orca*	IV
	Striped dolphin	*Stenella coeruleoalba*	IV
	Northern right whale	*Eubalaena glacialis*	IV
	Blue whale	*Balaenoptera musculus*	IV
	Atlantic white-sided dolphin	*Lagenorhynchus acutus*	IV
	White-beaked dolphin	*Lagenorhynchus albirostris*	IV
	Long-finned pilot whale	*Globicephala melas*	IV
	Northern bottlenose whale	*Hyperoodon ampullatus*	IV
	Minke whale	*Balaenoptera acutorostrata*	IV
	Humpback whale	*Megaptera novaeangliae*	IV
	Fin whale	*Balaenoptera physalus*	IV
	Sei whale	*Balaenoptera borealis*	IV
Marine Reptiles - Turtles	Leatherback turtle	*Dermochelys coriacea*	IV
	Loggerhead turtle	*Caretta caretta*	IV
	Kemp's Ridley turtle	*Lepidochelys kempii*	IV
	Hawksbill turtle	*Eretmochelys imbricata*	IV
	Green turtle	*Chelonia mydas*	IV

There are several key data resources on the species composition and relative abundance of the marine mammal fauna in the area around Kinsale and the wider Celtic Sea. The annual Celtic Sea Herring Acoustic Surveys (CSHAS) cover waters off the south coast of Ireland, typically over a three week period each October and extends from 2-3km off the coast to over 100km offshore (e.g. O'Donnell *et al.* 2017, 2020). Dedicated marine mammal observers recorded sightings when light and environmental conditions permitted; combined data from 13 years of surveys from 2008-2020 are provided in Table 6.2. Data from the Irish Whale and Dolphin Group's (IWDG) casual database and other sources over the period 2005-2011 were synthesised by Wall *et al.* (2013), which includes an assessment of the seasonal occurrence of the most commonly sighted species; the IWDG casual sightings data are not effort

corrected, and are biased towards busier and more accessible coastal waters, and areas subject to research (e.g. Ryan *et al.* 2010, Whooley *et al.* 2011); but provide useful information on the composition and relative abundance of cetacean species of the area.

The harbour porpoise (*Phocoena phocoena*), common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*) are the most common toothed cetaceans off the south coast of Ireland (Table 6.2), where they are sighted year-round (Table 6.3). Risso's dolphin (*Grampus griseus*) are occasionally seen in this region, primarily in summer, while a small number of killer whale (*Orcinus orca*) sightings have occurred close to the coast. Minke (*Balaenoptera acutorostrata*) and fin (*Balaenoptera physalus*) whales are the most commonly sighted baleen whales in summer and late summer-autumn, respectively. Minke whale are also frequently observed during late summer to autumn, albeit in apparently lower abundance. Small numbers of humpback whales also occur in this area, with sightings peaking from late summer through to January.

Table 6.2: Cetacean sightings recorded during the annual Celtic Sea Herring Acoustic Surveys

Species	Celtic Sea Herring Acoustic Surveys (CSHASs) 2008-2020	
	Number of years observed (of a maximum of 13)	**Total number of sightings (individuals)**
Toothed cetaceans		
Common dolphin	12	1,230 (15,877)
Harbour porpoise	11	48 (263)*
Bottlenose dolphin	6	8 (40)
Risso's dolphin	4	6 (14)
Killer whale	1	1 (3)
Pilot whale	0	0 (0)
Unidentified dolphin	*na*	*81 (674)*
Baleen whales		
Fin whale	13	139 (237)
Minke whale	12	83 (94)
Humpback whale	7	19 (26)
Unidentified whale	*11*	75 (95)
Total	***na***	***1,690 (17,323)***

*Notes: See main text for a description of the two data sources. * Total harbour porpoise sightings in the CSHASs were heavily influenced by data from the 2016 cruise report where 22 sightings, representing 191 individuals, were reported in the Celtic Deep (>100km east of Barryroe); excluding 2016 data yields a total of 19 harbour porpoise sightings totalling 57 individuals.*
Source: Nolan et al. (2014), O'Donnell et al. (2008, 2011, 2012, 2013, 2015, 2016, 2017, 2018, 2019, 2020) Saunders et al. (2009, 2010)

Table 6.3: Seasonal occurrence of cetaceans

Species	J	F	M	A	M	J	J	A	S	O	N	D
Harbour porpoise	2	2	2	3	3	2	2	2	2	2	2	2
Common dolphin	2	2	2	2	2	2	2	2	1	1	1	1
Bottlenose dolphin	3	3	3	3	3	3	3	3	3	3	3	3
Risso's dolphin	-	-	-	4	4	3	3	3	4	4	4	-

Species	J	F	M	A	M	J	J	A	S	O	N	D
Minke whale	-	-	4	3	3	3	3	3	2	2	2	4
Humpback whale	3	4	-	4	4	4	3	3	3	3	2	3
Fin whale	4	4	-	-	4	4	3	3	3	2	2	3

Source: Wall et al. (2013) and S. Berrow, IWDG (pers. comm. May 2018) (see additional references provided in text below for additional further information) Notes: Information on seasonal abundance of cetaceans is limited, so this table should be regarded as indicative of general trends. Abundance has been ranked from 1-4, where 1 is "very abundant" and 4 is "low abundance". '-' means no sightings were recorded in that month and/or abundance is considered likely to be extremely low.

Two strata surveyed for marine mammals as part of the ObSERVE programme are relevant to the Barryroe Area. These are Stratum 4 (as described above) and Stratum 8, which was only surveyed in summer and winter 2016, and covered 9,506km^2 of coastal waters off the south and south-west coasts. Cetacean sightings and abundance estimates in these two strata are summarised in Table 6.4.

For Stratum 4 (offshore), the abundance of bottlenose, common and unidentified dolphins was considerably higher in winter. The opposite was observed for harbour porpoise, which were by far the most abundant species recorded in Stratum 4 in summer. In Stratum 8 (coastal), both harbour porpoise and all species of dolphin showed higher abundance in summer. Minke whale abundance was estimated to be similar across two summer and one winter surveys, although the number of sightings was low. Within Stratum 8, minke whales were not seen in the winter survey, but observed 20 times in summer, with sightings clustered off the south-west coast. There were very few sightings of pinnipeds off the south coast of Ireland, with those few being clustered in the south-west and south-east, distant from the survey area.

Predicted distribution maps suggested the presence of higher densities of harbour porpoise in summer, bottlenose dolphin in winter, and common dolphin in winter (relative to other surveyed areas for each species). Predicted densities of minke whale are higher in summer than winter, with waters off the south-west coast appearing to be of higher importance.

The ObSERVE aerial survey data provide a greater level of quantification and seasonal information on cetaceans than was previously available for waters off the south coast of Ireland. These new data confirm the high diversity of cetacean species off the south coast, along with the seasonal patterns for the area which previous data had suggested.

Table 6.4: Cetacean sighting numbers and abundance estimates for waters south of Ireland from the ObSERVE aerial surveys in 2015 and 2016

Species & season	Stratum 4 (offshore)		Stratum 8 (coastal)	
	N groups (mean group size)	Abundance; density (CV)	N groups (mean group size)	Abundance; density (CV)
Harbour porpoise				
Summer 2015	41 (1.2)	14,190; 0.227 (27.4)	-	-
Winter 2015-16	11 (1.3)	3,752; 0.060 (41.3)	-	-
Summer 2016	42 (1.3)	14,196; 0.227 (37.2)	8 (1.6)	1,977; 0.208 (62.6)
Winter 2016-17	0 (na)	na	3 (1)	568; 0.060 (73.2)
Bottlenose dolphin[1]				
Summer 2015	7 (6)	3,885; 0.062 (64.3)	-	-

Species & season	Stratum 4 (offshore)		Stratum 8 (coastal)	
	N groups (mean group size)	Abundance; density (CV)	N groups (mean group size)	Abundance; density (CV)
Winter 2015-16	26 (2.9)	6,217; 0.098 (28.4)	-	-
Summer 2016	17 (4)	5,549; 0.088 (47.7)	39 (7.2)	11,266; 1.161 (59.9)
Winter 2016-17	91 (7.8)	58,647; 0.929 (22.3)	17 (3.8)	3,322; 0.342 (47.6)
Common dolphin and common/striped dolphin[2]				
Summer 2015	3 (4.5)	2,554; 0.041 (73.8)	-	-
Winter 2015-16	45 (8.9)	40,027; 0.639 (51.5)	-	-
Summer 2016	0	na	5 (5.2)	1,319; 0.139 (45.5)
Winter 2016-17	0	na	2 (4.0)	779; 0.082 (76.0)
Risso's dolphin[1, 3]				
Summer 2015	0	na	-	-
Winter 2015-16	1 (1)	40; 0.001 (101.6)	-	-
Summer 2016	2 (10)	809; 0.013 (94.8)	3 (7.7)	549; 0.057 (50.9)
Winter 2016-17	0	na	0	na
Unidentified dolphin[1]				
Summer 2015	19 (4.9)	4,814; 0.076 (43.9)	-	-
Winter 2015-16	92	27,348; 0.433 (39.0)	-	-
Summer 2016	27 (3.3)	4,982; 0.079 (37.2)	57 (6.2)	10,047 (45.0); 1.035
Winter 2016-17	107 (7.1)	38,413; 0.608 (20.9)	28 (3.5)	4,142 (41.4); 0.427
Minke whale				
Summer 2015	4 (1.0)	836 (66.6); 0.013	-	-
Winter 2015-16	4 (1.0)	751 (64.8); 0.012	-	-
Summer 2016	4 (1.0)	761 (63.3); 0.012	20 (1.0)	2,242 (66.1); 0.236
Winter 2016-17	0	na	0	na
Fin whale[1, 3]				
Summer 2015	0	na	-	-
Winter 2015-16	0	na	-	-
Summer 2016	0	na	0	na
Winter 2016-17	0	na	1 (2.0)	33 (98.4); 0.003

Notes. [1] Abundance estimates for these species are uncorrected for detection probability and are therefore likely to be underestimates. [2.] Includes a small number of sightings where the two species could not be differentiated; as Strata 4 and 8 are restricted to shelf waters and striped dolphins favour deeper waters, the values presented here can be assumed to be almost exclusively common dolphins. [3.] The abundance estimates for Risso's dolphin and fin whale are based on very few sightings, are highly uncertain and should be interpreted with caution. Abundance estimates are rounded to the nearest whole number; CV rounded to 2 decimal places.
Source: Rogan et al. (2018).

Harbour porpoise

The harbour porpoise is the most abundant and widespread species occurring around the Irish coast, commonly seen in shallow coastal waters in the summer, although surveys suggest highest densities along the south coast occur in autumn (Marine Institute 2013). They move

further offshore in the spring; although the details of this migration are uncertain, it may be linked to calving (DCENR 2015). Harbour porpoise are generally less often encountered in the Celtic Sea than in the Irish Sea, although it may be that this is a result of lower survey effort and higher sea states off the south coast (Wall *et al*. 2013). In the CSHAS data (Table 6.1), harbour porpoise were the second most frequently sighted toothed cetacean, seen both close to shore and in offshore waters. A comparison of the results of the broad-scale SCANS and SCANS-II surveys (SCANS-II 2008) indicate there has been a general shift to the southwest and an increase in the harbour porpoise population in the region over the period between the surveys. Harbour porpoise are a designated feature within the Roaringwater Bay and Islands SAC, ~75km to the north west of the survey area, with a population that has been consistently estimated at between 150-160 individuals (Berrow *et al*. 2014).

Common dolphin

The common dolphin is Ireland's most common dolphin species and it is most abundant off the south and southwest coasts, where they are often seen in very large groups. They tend to move east over the winter, with sightings off County Cork at their greatest between September and January (Berrow *et al*. 2010). Common dolphins were, by a large margin, the most frequently observed and numerous species during the recent CSHAS (Table 6.1). Common dolphins typically move further offshore in the summer and are seen in large groups, moving to inshore waters in autumn, probably linked to the presence of large numbers of schooling pelagic fish (Marine Institute 2013).

Bottlenose dolphin

Bottlenose dolphins are present in the Celtic Sea and there is a small semi-resident population present at Cork Harbour, where six individuals have been repeatedly sighted (Ryan *et al*. 2010), with larger numbers visiting the area during the summer. The species is more commonly seen off the west coasts of the country, with sightings peaking in summer (Berrow *et al*. 2010). Photo-identification data from groups of bottlenose dolphins at several locations around the coast of Ireland have revealed movement of animals between sites separated by 130-650km over durations of 26-760 days, providing evidence that many individuals should be considered highly mobile and transient (O'Brien *et al*. 2009).

Other dolphins

Risso's dolphin are occasionally observed in the wider area, most commonly in the summer months and within a few kilometres of the coast (Wall *et al*. 2013). One Risso's dolphin was recorded outside Cork Harbour during the 2014 CSHAS (Nolan *et al.* 2014), while none were seen off the south coast of Ireland in 2016-2020. A small number of killer whales have been recorded off the south coast, primarily during summer (Wall *et al*. 2013). Records of other toothed cetacean species off the south coast (i.e. white-beaked dolphin *Lagenorhynchus albirostris* and long-finned pilot whale *Globicephala melas*) are very rare and these species would be highly unlikely to be present in proximity to the survey area.

Baleen whales

Baleen whales are sighted along the south coast of Ireland primarily from late summer through autumn. Minke whales are observed in most months of the year, but are most frequently seen from April to November (Berrow *et al*. 2010). The larger fin and humpback whales are regularly observed in small numbers both close to the coast and further offshore, primarily in autumn and winter when these waters are a known foraging ground (Marine Institute 2013). Fin whales sightings peak in November (Berrow *et al*. 2010, Whooley *et al*. 2011), and they were

the most frequently sighted and most numerous baleen whale in the CSHAS data (Table 8.1). Photo-identification data were collected from whale-watching vessels over 79 trips from 2003-2008, which resulted in the identification of 62 individual fin whales, of which 11 were sighted across multiple years (Whooley *et al*. 2011). Ryan *et al*. (2016) analysed several hundred humpback whale sightings from the IWDG casual database collected from 1999-2013, revealing an annual easterly movement along the southern coast; most sightings in the area around Barryroe occurred from October-December.

Turtles

Five species of marine turtle have been recorded in the seas around Ireland and the UK: leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), Kemp's ridley turtle (*Lepidochelys kempii*), green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*). The leatherback turtle is the largest of the marine turtles and is the only species of turtle to have developed adaptions to cold water (Goff & Stenson 1988). The species is covered under Annex IV of the Habitats Directive (see Section 3.2.7).

A significant majority of turtle sightings recorded in Irish waters are of the leatherback turtle (King & Berrow 2009), which migrates into the waters of the Celtic and Irish Seas in response to the distribution of the gelatinous zooplankton which make up their favoured diet (Doyle *et al.* 2008, Fossette *et al.* 2010). Tagging studies show that they migrate across the Atlantic from the eastern American mainland and the Caribbean (Hays *et al.* 2004, Doyle *et al.* 2008). Sightings in the wider region are concentrated off the south and west of Ireland, the southwest of England and the west coast of Wales. Most sightings occur in the summer, peaking in August (Penrose & Gander 2016). The 2014 Celtic Sea Herring Acoustic Survey (Cronin & Barton 2014) made four sightings of leatherback turtle, three of them approximately 70km south of Cork Harbour, although no confirmed sightings of this species were made in subsequent surveys (O'Donnell *et al.* 2016, 2017, 2018, 2019, 2020). Aerial surveys for the ObSERVE project from 2015-2016 recorded a handful of leatherback turtle sightings at the southern limits of Irish offshore waters in summer; none were observed in the survey area (Rogan *et al*. 2018).

6.2 European Protected Species Risk Assessment

Section 3.2 identified and described the main sources of potential effect relevant to the assessment under Article 6(3) of the Habitats Directive, which are:

- physical presence of the survey vessels,
- underwater noise including from the vessel and survey equipment,

and these sources of effect are also those considered to be relevant under Article 12, in keeping with the definitions of, for example, deliberate actions and disturbance as clarified in European Commission (2021b) guidance. These sources of effect have, therefore, been considered against relevant Annex IV species which may be present over the survey area, and an assessment is provided in the sections which follow. This assessment builds on that already provided in Section 4 to cover those additional relevant Annex IV features.

6.2.1 Physical presence of the survey vessels

Marine mammals

The physical presence of the vessels may influence the distribution and movements of sensitive species in the water column, namely marine mammals. As hearing specialists, any displacement of marine mammals is most likely associated with acoustic disturbance, which

is discussed in Section 6.2.2. There may also be responses from marine mammals and fish to the general physical presence of infrastructure and vessels (Sparling *et al.* 2015), along with the risk of collisions from vessels in transit.

The survey will result in a small increase in vessel traffic within the wider Kinsale and Celtic Sea (three vessels), being present at different times for up to 40 days in total (see Section 2). The survey area is known to be frequented by several marine mammal species, however, the physical presence of the vessels around areas of existing activity, and their temporary presence are anticipated to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping, such that **the risk of impacts to Annex IV marine mammals from the planned survey activities is considered to be negligible, and significant effects are not considered to be likely**.

Marine turtles

The physical presence of vessels and equipment during the survey activities are anticipated to cause no more than temporary and localised low-level behavioural responses in Annex IV species, similar to those induced by wider shipping operations in the area. **The risk of impacts to Annex IV marine turtles from the planned survey activities is considered to be negligible, and significant effects are not considered to be likely**.

6.2.2 Underwater noise

Marine mammals

Marine mammals, for which sound is fundamental across a wide range of critical natural functions, show high sensitivity to underwater sound. Generally, the severity of effects tends to increase with increasing exposure to noise with both sound intensity and duration of exposure being important. A distinction can be drawn between effects associated with physical (including auditory) injury and effects associated with behavioural disturbance. With respect to injury, risk from an activity can be assessed using threshold criteria of sound levels, with the most recent criteria presented in Southall *et al.* (2019). Auditory capabilities, and in particular the range of frequencies over which sensitivity is greatest, varies between species and criteria are assigned to functional hearing groups with accompanying injury criteria. Table 6.5 expands upon that given in Table 4.2 of the AA screening, and provides details of the relevant marine mammals listed by functional hearing group, their estimated hearing range and recommended injury criteria, defined as the sound level at which a permanent threshold shift (PTS; permanent hearing damage) is estimated to occur (potential acoustic survey equipment and their indicative source characteristics are presented in Table 4.2).

Table 6.5: Marine mammal auditory injury criteria to pulsed sounds by functional hearing group

Functional hearing group (species relevant to the Kinsale area)	**Estimated hearing range** (region of greatest sensitivity) [frequency of peak sensitivity]	**Proposed injury (PTS onset) threshold criteria to impulsive noise** (dB re 1µPa, peak, unweighted)
Low frequency cetaceans Fin whale (*Balaenoptera physalus*) Minke whale (*Balaenoptera acutorostrata*) Humpback whale (*Megaptera novaeangliae*)	7Hz to 35kHz (200Hz to 19kHz) [5.6kHz]	219

Functional hearing group (species relevant to the Kinsale area)	**Estimated hearing range** (region of greatest sensitivity) [frequency of peak sensitivity]	**Proposed injury (PTS onset) threshold criteria to impulsive noise** (dB re 1µPa, peak, unweighted)
High frequency cetaceans Common dolphin (*Delphinus delphis*) Bottlenose dolphin (*Tursiops truncatus*) Risso's dolphin (*Grampus griseus*) Killer whale (*Orcinus orca*)	150Hz to 160kHz (8.8kHz to 110kHz) [58kHz]	230
Very high frequency cetaceans Harbour porpoise (*Phocoena phocoena)*	275Hz to 160kHz (12kHz to 140kHz) [105kHz]	202
Phocid seals in water Grey seal (*Halichoerus grypus*) Harbour seal (*Phoca vitulina*)	50Hz to 86kHz (1.9kHz to 30kHz) [13kHz]	218

Source: Southall et al. (2019). Notes: The region of greatest sensitivity represents parameters f1 and f2, which are the bounds of the flat, central portion of the frequency-weighting curve region; the frequency of peak sensitivity represents parameter f0.

Of the species likely to occur in the survey area, the harbour porpoise has the lowest threshold criteria for the onset of PTS at 202dB re 1µPa. Given the source characteristics and evidence of propagation presented above, the potential sources in the planned Kinsale survey will either not generate source levels of this amplitude, or will not result in received sound levels exceeding this threshold beyond more than a few metres from the source and/or not overlap frequencies of greatest sensitivity. For all other species/functional hearing groups, the risk is lower still. Therefore, **the risk of injury to Annex IV marine mammals from the planned survey activities is considered to be negligible, and significant effects are not considered to be likely**.

With respect to behavioural disturbance of marine mammals, it has proved much more difficult to establish broadly applicable threshold criteria based on exposure alone (see Section 4.2.2 for more detail). The waters off the south coast of Ireland support a high diversity of cetaceans, and the wider Kinsale-Ballycotton-Seven Heads area may occasionally experience temporarily high localised densities of some species (primarily common dolphins) during the period April-December. However, considering the acoustic characteristics of the potential sources and their propagation, the relevant evidence of effects on marine mammals from vessel noise, seismic survey and the proportionally lower potential for effects of the specific sources being used, in addition to the small spatial footprint and short duration of the planned pre- and post-rock placement surveys, **the risk of behavioural disturbance to any Annex IV species of marine mammal is considered to be extremely low, and significant effects are not considered to be likely.**

The risk of negative effects on marine mammals is considered to be sufficiently low that no mitigation measures are necessary. The planned survey does not include seismic sources (such as airguns, sparkers or boomers) and the location of the offshore survey area is such that it is not necessary to adhere to the DAHG Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (DAHG 2014). This is reflective of the low risk to marine life posed by the potential equipment and the survey environment not being of high sensitivity. As the inshore survey extent, which will use a different vessel to the offshore survey, could be categorised as taking place within a bay or within 1,500m of the entrance of an enclosed bays, the measures outlined in DAHG (2014) will be followed.

Marine turtles

Available information on potential effects of underwater sound on marine turtles is very limited (Nelms *et al*. 2016). The hearing range of cheloniid species has been estimated as between 50-2000Hz, with highest sensitivity below 400Hz (Popper *et al*. 2014). For leatherback turtles, measurements made on hatchlings suggested a similar low frequency sensitivity, with sound detection ranging between 50 and 1200Hz when in water and between 50 and 1600Hz in air (Dow Piniak *et al*. 2012).

A variety of potential functions of hearing have been proposed for marine turtles, although the issue is poorly understood; they do not appear to vocalize or use sound for communication, but may use sound for navigation, locating prey, avoiding predators, and general environmental awareness (see Dow Piniak *et al*. 2012, Nelms *et al*. 2016 and references therein). While some authors have raised concerns over the potential for physical injury (including hearing damage) to marine turtles from seismic surveys (Nelms *et al*. 2016) and disturbance from increasing anthropogenic noise generally (Samuel *et al*. 2005), such potential impacts remain to be investigated, as do any subsequent ecological effects (Nelms *et al*. 2016).

Underwater noise generated by the survey and rock placement vessels may be detectable by leatherback turtles, although their low density and limited seasonal presence in the area dictates that very few individuals are likely to be exposed to noise levels beyond that of the background for the region.

Considering this low likelihood of exposure, the perceived limited sensitivity of the receptor, and the moderate intensity nature of the noise source, **the risk of disturbance or injury to Annex IV marine turtles is considered extremely remote**.

6.3 Conclusion

The assessment considered relevant Annex IV species (Table 6.1) likely to be present in the survey area, and concluded that the risk of disturbance or injury is very low and significant effects are not likely for relevant species of marine turtle and cetaceans.

7 REFERENCES

Boebel O, Clarkson OP, Coates R, LArter R, O'Brien PE, Ploetz J, Summerhayes C, Tyack T, Walton DWH & Wartzok D (2005). Risks posed to the Antarctic marine environment by acoustic instruments: a structured analysis. *Antarctic Science* **17**: 533-540.

Bogdanova MI, Butler A, Wanless S, Moe B, Anker-Nilssen T, Frederiksen M, Boulinier T, Chivers LS, Christensen-Dalsgaard S, Descamps S, Harris MP, Newell M, Olsen B, Phillips RA, Shaw D, Steen H, Strøm H, Thórarinsson TL & Daunt F (2017). Multi-colony tracking reveals spatio-temporal variation in carry-over effects between breeding success and winter movements in a pelagic seabird. *Marine Ecology Progress Series* **578**: 167-181.

Breitzke M, Boebel O, Naggar SE, Jokat W & Werner B (2008). Broad-band calibration of marine seismic sources used by R/V Polarstern for academic research in polar regions. *Geophysical Journal International* **174**: 505-524.

Carroll AG, Przeslawski R, Duncan A, Gunning M, Bruce B (2017). A critical review of the potential impacts of marine seismic surveys on fish & invertebrates. *Marine Pollution Bulletin* 114**,** 9-24.

Carter MID, Cox SL, Scales KL, Bicknell AWJ, Nicholson MD, Atkins KM, Morgan G, Morgan L, Grecian JW, Patrick SC & Votier SC (2016). GPS tracking reveals rafting behaviour of northern gannets (*Morus bassanus*): implications for foraging ecology and conservation. *Bird Study* **63**: 83-95.

Cholewiak D, DeAngelis AI, Palka D, Corkeron PJ & Van Parijs SM (2017). Beaked whales demonstrate a marked acoustic response to the use of shipboard echosounders. *Royal Society Open Science* **4**: 170940.

Cleasby IR, Owen E, Wilson LJ, Bolton M (2018) Combining habitat modelling and hotspot analysis to reveal the location of high density seabird areas across the UK: Technical Report. RSPB Research Report no. 63, 135pp.

Cleasby IR, Wakefield ED, Bearhop S, Bodey TW, Votier SC & Hamer KC (2015). Three-dimensional tracking of a wide-ranging marine predator: flight heights and vulnerability to offshore wind farms. *Journal of Applied Ecology* **52**: 1474-1482.

Cooper J (1982). Methods of reducing mortality of seabirds caused by underwater blasting. *Cormorant* **10**: 109-113.

Cotter E, Murphy P, Bassett C, Williamson B & Polagye B (2019). Acoustic characterization of sensors used for marine environmental monitoring. *Marine Pollution Bulletin* **144:** 205-215.

Cox SL, Embling CB, Hosegood PJ, Votier SC & Ingram SN (2018). Oceanographic drivers of marine mammal and seabird habitat-use across shelf-seas: A guide to key features and recommendations for future research and conservation management. *Estuarine, Coastal and Shelf Science* **212**: 294–310.

Critchley EJ, Grecian WJ, Kane A, Jessopp MJ & Quinn JL (2018). Marine protected areas show low overlap with projected distributions of seabird populations in Britain and Ireland. *Biological Conservation* **224**: 309-317.

Crocker SE & Fratantonio FD (2016). Characteristics of high-frequency sounds emitted during high-resolution geophysical surveys. OCS Study, BOEM 2016-44, NUWC-NPT Technical Report 12, 203pp.

Crocker SE, Fratantonio FD, Hart PE, Foster DS, O'Brien TF & Labak S (2019). Measurement of sounds emitted by certain high-resolution geophysical survey systems. *IEEE Journal of Oceanic Engineering* **44**: 796-813.

Cronin M, Jessop M & del Villar D (2011). Tracking grey seals on Ireland's continental shelf. A report to the National Parks and Wildlife Service (NPWS), 31pp.

Crowell S (2014). In-air and underwater hearing in ducks. Doctoral dissertation, University of Maryland.

Crowell SE, Wells-Berlin AM, Carr CE, Olsen GH, Therrien RE, Yannuzzi SE & Ketten DR (2015). A comparison of auditory brainstem responses across diving bird species. *Journal of Comparative Physiology A* **201**: 803-815.

DAHG (2014). Guidance to Manage the Risk to Marine Mammals from Man made Sound Sources in Irish Waters. Department of the Arts, Heritage and the Gaeltacht, 58pp.

Danil K & St. Leger JA (2011). Seabird and dolphin mortality associated with underwater detonation exercises. *Marine Technology Society Journal* **45**: 89-95.

DCENR (2015). Irish Offshore Strategic Environmental Assessment (IOSEA) 5. Environmental Report, 210pp. + Appendices.

DECC (2016). Offshore Energy Strategic Environmental Assessment 3, Environmental Report. Department of Energy and Climate Change, UK, 652pp plus appendices.

Department of Environment, Heritage and Local Government (2010) Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities.

Duck C & Morris C (2013). An aerial survey of harbour seals in Ireland: Part 2 – Galway Bay to Carlingford Lough, August – September 2012. A report to the National Parks and Wildlife Service (NPWS), 28pp.

Dyndo M, Wisniewska DM, Rojano-Donate L & Madsen PT (2015). Harbour porpoises react to low levels of high frequency vessel noise. *Scientific Reports* **5**: 11083.

Edwards EWJ, Quinn LR and Thompson PM (2016). State-space modelling of geolocation data reveals sex differences in the use of management areas by breeding northern fulmars. *Journal of Applied Ecology* **53**: 1880-1889.

Erbe C, Marley SA, Schoeman RP, Smith JN, Trigg LE, Embling CB (2019). The effects of ship noise on marine mammals - A Review. *Frontiers in Marine Science* **6**: 606.

European Commission (2021a). Assessment of plans and projects in relation to Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC Commission Notice C(2021) 6913 final, 113pp.

European Commission (2021b). Guidance document on the strict protection of animal species of Community interest under the Habitats Directive. Commission notice. C(2021) 7301 final, 117pp.

Fairweather (2016). Application for incidental harassment authorization for 2016 anchor retrieval program Chukchi and Beaufort Seas Alaska. Prepared for Fairweather LLC by Fairweather Science LLC, April 2016.

Fayet AL, Freeman R, Shoji A, Padget O, Perrins CM & Guilford T (2015). Lower foraging efficiency in immatures drives spatial segregation with breeding adults in a long-lived pelagic seabird. *Animal Behaviour* **110**: 79-89.

Fields DM, Handegard NO, Dalen J, Eichner C, Malde K, Karlsen Ø, Skiftesvik AB, Durif CMF & Browman HI (2019). Airgun blasts used in marine seismic surveys have limited effects on mortality, and no sublethal effects on behaviour or gene expression, in the copepod *Calanus finmarchicus*. *ICES Journal of Marine Science*: 1-12, doi:10.1093/icesjms/fsz126.

Fliessbach KL, Borkenhagen K, Guse N, Markones N, Schwemmer P & Garthe S (2019). A ship traffic Disturbance Vulnerability Index for Northwest European seabirds as a tool for marine spatial planning. *Frontiers in Marine Science* **6**: 192.

Fossette S, Hobson VJ, Girard C, Calmettes B, Gaspar P, Georges J & Hays H (2010). Spatio-temporal foraging patterns of a giant zooplanktivore, the leatherback turtle. *Journal of Marine Systems* **81**: 225-234

Francois RE & Garrison GR (1982). Sound absorption based on ocean measurements: Part II: Boric acid contribution and equation for total absorption. Journal of the Acoustical Society of America **72**:1879-90.

Garthe S & Hüppop O (2004). Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. *Journal of Applied Ecology* **41**: 724-734.

Genesis (2011). Review and Assessment of Underwater Sound Produced from Oil and Gas Sound Activities and Potential Reporting Requirements under the Marine Strategy Framework Directive. Report to Department of Energy and Climate Change. Genesis Oil and Gas Consultants, 72pp.

Gill AB & Bartlett M (2010). Literature review on the potential effects of electromagnetic fields and subsea noise from marine renewable energy developments on Atlantic salmon, sea trout and European eel. Scottish Natural Heritage Commissioned Report No.401, 43pp.

Gomez C, Lawson JW, Wright AJ, Buren AD, Tollit D & Lesage V (2016). A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy. *Canadian Journal of Zoology* **94**: 801-819.

Halvorsen MB & Heaney KD (2018). Propagation Characteristics of High-Resolution Geophysical Surveys: Open Water Testing. OCS Study BOEM 2018-052, 806p.

Hammond PS, Northridge SP, Thompson D, Gordon JCD, Hall AJ, Murphy SN & Embling CB (2008). Background information on marine mammals for Strategic Environmental Assessment 8. Report to the Department for Business, Enterprise and Regulatory Reform. Sea Mammal Research Unit, St. Andrews, Scotland, UK, 52pp.

Hansen KA, Maxwell A, Siebert U Larsen ON & Wahlberg M (2017). Great cormorants (*Phalacrocorax carbo*) can detect auditory cues while diving. *The Science of Nature* **104**: 45.

Harding H, Bruintjes R, Radford AN & Simpson SD (2016). Measurement of hearing in the Atlantic salmon (*Salmo salar*) using auditory evoked potentials, and effects of pile driving playback on salmon behaviour and physiology. Scottish Marine and Freshwater Science Report 7 No 11, 51pp.

Harding HR, Gordon TAC, Eastcott E, Simpson SD (2019). Causes and consequences of intraspecific variation in animal responses to anthropogenic noise. *Behavioural Ecology*, 1-11, doi:10.1093/beheco/arz114.

Hawkins AD & Johnstone ADF (1978). The hearing of the Atlantic Salmon, *Salmo salar*. *Fish Biology* **13**: 655-673.

Hawkins AD & Popper AN (2017). A sound approach to assessing the impact of underwater noise on fish and invertebrates. *ICES Journal of Marine Science* **74**: 635-951.

Heinänen S & Skov H (2015). The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area. JNCC Report No. 544, Joint Nature Conservation Committee, Peterborough, UK, 108pp.

IAMMWG (2021). Updated abundance estimates for cetacean Management Units in UK waters. JNCC Report No. 680, 16pp.

Jones EL, McConnell BJ, Smout S, Hammond PS, Duck CD, Morris CD, Thompson D, Russell DJF, Vincent C, Cronin M, Sharples RJ & Matthiopoulos J (2015). Patterns of space use in sympatric marine colonial predators reveal scales of spatial partitioning. *Marine Ecology Progress Series* **534**: 235-249.

Kaiser MJ (2002). Predicting the displacement of common scoter *Melanitta nigra* from benthic feeding areas due to offshore windfarms. Centre for Applied Marine Sciences, School of Ocean Sciences, University of Wales, BANGOR. Report for COWRIE, 8pp.

Kaiser MJ, Galanidi M, Showler DA, Elliott AJ, Caldow RWG, Rees EIS, Stillman RA & Sutherland WJ (2006). Distribution and behaviour of common scoter *Melanitta nigra* relative to prey resources and environmental parameters. *Ibis* **148**: 110-128.

Labak SJ (2019). Memorandum for the Record, concerning utilization of the data and information in the Bureau of Ocean Management (BOEM) OCS Study 2018-052, "Propagation Characteristics of High-Resolution Geophysical Surveys: Open Water Testing," by Halvorsen MB & Heaney KD, 2018. 4pp.

Langston RHW, Teuten E & Butler A (2013). Foraging ranges of northern gannets *Morus bassanus* in relation to proposed offshore wind farms in the UK: 2010-2012. RSPB document produced as part of the UK Department of Energy and Climate Change's offshore energy Strategic Environmental Assessment programme, 74pp

Marine Institute (2013). Marine mammals and megafauna in Irish waters – behaviour, distribution and habitat use. Marine Research Sub-Programme, NDP 2007-13 Series, 200pp.

Mattson MG, Thomas JA & Aubin DS (2005). Effects of boat activity on the behaviour of bottlenose dolphins (*Tursiops truncatus*) in waters surrounding Hilton Head Island, South Carolina. *Aquatic Mammals* **31**: 133-140.

McCauley RD (1994). Seismic surveys. *In: Swan, JM, Neff, JM and Young, PC (Eds) Environmental implications of offshore oil and gas developments in Australia - The findings of an independent scientific review.* Australian Petroleum Exploration Association, Sydney, NSW. 696pp.

McCauley RD, Day RD, Swadling KM, Fitzgibbon QP, Watson RA & Semmens JM (2017). Widely used marine seismic survey air gun operations negatively impact zooplankton. *Nature Ecology & Evolution* **1**: 0195.

Mendel B, Schwemmer P, Peschko V, Müller S, Schwemmer H, Mercker M & Garthe S (2019). Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of Loons (*Gavia* spp.). *Journal of Environmental Management* **231**: 429-438.

Mickle MF, Miehls SM, Johnson NS, Higgs DM (2019). Hearing capabilities and behavioural response of sea lamprey (*Petromyzon marinus*) to low-frequency sounds. *Canadian Journal of Fisheries and Aquatic Sciences* 2019 **76**(9), 1541-1548.

MMO (2018). Displacement and habituation of seabirds in response to marine activities. Report by Natural Power for the MMO, 71pp.

Neptune LNG (2016). Application for incidental harassment authorization for the non-lethal taking of marine mammals – Neptune LNG Deepwater Port. Prepared for Neptune LNG LLC by CSA Ocean Sciences, Inc. June 2016.

NMFS (2016). Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing: underwater acoustic thresholds for onset of permanent and temporary threshold shifts. National Marine Fisheries Service, U.S. Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178pp.

Ó Cadhla O, Strong D, O' Keeffe C, Coleman M, Cronin M, Duck C, Murray T, Dower P, Nairn R, Murphy P, Smiddy P, Saich C, Lyons D & Hiby L (2008). An assessment of the breeding population of grey seals in the Republic of Ireland, 2005. Irish Wildlife Manuals No. 34. National Parks & Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland. 60pp.

O'Donnell C, Mullins E, Lynch D, Lyons K, Connaughton P & Perez Tadeo M (2020). Celtic Sea Herring Acoustic Survey cruise report 2020. FSS Survey Series 2020/04, 54pp.

O'Donnell C, Mullins E, Lynch D, Lyons K, Connaughton P & Power J (2019). Celtic Sea Herring Acoustic Survey cruise report 2019. FSS Survey Series 2019/04, 49pp.

O'Donnell C, Mullins E, Lynch D, Lyons K, Keogh N & O'Callaghan S (2018). Celtic Sea Herring Acoustic Survey cruise report 2018. FSS Survey Series 2018/04, 44pp.

OSPAR (2009). Overview of the impacts of anthropogenic underwater sound in the marine environment. OSPAR Commission Biodiversity Series 2009. Publication Number 441/2009, 134pp.

Owl Ridge Natural Resource Consultants (2016). Application for incidental harassment authorization for the taking of marine mammals in conjunction with proposed Alaska Phase of the Quintillion Subsea Project 2016. Prepared for Quintillion Subsea Operations LLC by Owl Ridge Natural Resource Consultants, January 2016.

Palka DL & Hammond PS (2001). Accounting for responsive movement in line transect estimates of abundance. *Canadian Journal of Fisheries and Aquatic Sciences* **58**: 777–787.

Pichegru L, Nyengera R, McInnes AM & Pistorius P (2017). Avoidance of seismic survey activities by penguins. *Scientific Reports* **7**: 16305.

Pirotta E, Brookes KL, Graham IM & Thompson PM (2014). Variation in harbour porpoise activity in response to seismic survey noise. *Biology Letters* **10**: 20131090.

Pirotta E, Merchant MD, Thompson PM, Barton TR & Lusseau D (2015). Quantifying the effect of boat disturbance on bottlenose dolphin foraging activity. *Biological Conservation* **181**: 82–89.

Popper AN, Hawkins AD, Fay RR, Mann DA, Bartol S, Carlson TJ, Coombs S, Ellison WT, Gentry RL, Halvorsen MB, Løkkeborg S, Rogers PH, Southall BL, Zeddies DG & Tavolga WN (2014). Sound exposure guidelines for fishes and sea turtles: A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI.

Rakka M & Minto C (2015). An investigation into the effects of environmental and observational variables on haul-out counts of harbour seals (*Phoca vitulina vitulina*) in Ireland. A report by the Marine and Freshwater Research Centre, Galway-Mayo Institute of Technology, 201pp.

Risch D, Wilson B & Lepper P (2017). Acoustic assessment of SIMRAD EK60 high frequency echo sounder signals (120 & 200kHz) in the context of marine mammal monitoring. Scottish Marine and Freshwater Science Vol. 8, No. 13, published by Marine Scotland Science, 27pp.

Rogan E, Breen P, Mackey M, Cañadas A, Scheidat M, Geelhoed S & Jessopp M (2018). Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2015-2017. Department of Communications, Climate Action & Environment and National Parks and Wildlife Service (NPWS), Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland. 297pp.

Rolland RM, Parks SE, Hunt KE, Castellote M, Corkeron PJ, Nowacek DP, Wasser SK & Kraus SD (2012). Evidence that ship noise increases stress in right whales. *Proceedings of the Royal Society B* **279**: 2363-2368.

Rutenko AN & Ushchipovskii VG (2015). Estimates of noise generated by auxiliary vessels working with oil-drilling platforms. *Acoustical Physics* **61**: 556-563.

Sarnocińska J, Teilmann J, Balle JD, van Beest FM, Delefosse M, Tougaard J (2020). Harbor Porpoise (*Phocoena phocoena*): Reaction to a 3D Seismic Airgun Survey in the North Sea. *Frontiers in Marine Science* 6, 824.

Schwemmer P, Mendel B, Sonntag N, Dierschke V & Garthe S (2011). Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. *Ecological Applications* **21**: 1851-1860.

Scott Wilson, Levett-Therivel Sustainability Consultants, Treweek Environmental Consultants and Land Use Consultants (2006) Appropriate Assessment of plans.

Slabbekoorn H, Dalen J, de Haan D, Winter HV, Radford C, Ainslie MA, Heaney KD, van Kooten T, Thomas L, Harwood J (2019). Population-level consequences of seismic surveys on fishes: An interdisciplinary challenge. *Fish and Fisheries* **20**: 653-685.

Soanes LM, Bright JA, Angel LP, Arnould JPY, Bolton M, Berlincourt M, Lascelles B, Owen E, Simon-Bouhet B & Green JA (2016). Defining marine important bird areas: Testing the foraging radius approach. *Biological Conservation* **196**: 69–79.

Southall B, Finneran JJ, Reichmuth C, Nachtigall PE, Ketten DR, Bowles AE, Ellison WT, Nowacek DP & Tyack PL (2019). Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals* **45**: 125-232.

Sparling C, Smith K, Benjamins S, Wilson B, Gordon J, Stringell T, Morris C, Hastie G, Thompson D & Pomeroy P (2015). Guidance to inform marine mammal site characterisation requirements at wave and tidal stream energy sites in Wales. NRW Evidence Report No. 82. Report to Natural Resources Wales, 88pp.

Stemp R (1985). Observations on the effects of seismic exploration on seabirds. In: Greene GD, Engelhardt FR & Paterson RJ (Eds) Proceedings of the workshop on effects of explosives use in the marine environment. Jan 29-31, 1985, Halifax, Canada.

Teague N & Clough SC (2011). Investigations into the response of 0+ twaite shad (*Alosa fallax*) to ultrasound and its potential as an entrainment deterrent. *International Fish Screening Techniques* 153-163.

Thaxter CB, Lascelles B, Sugar K, ASCP Cook, Roos S, Bolton M, Langston RHW & Burton NHK (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. *Biological Conservation* **156**: 53–61.

Thaxter CB, Ross-Smith VH, Clark NA, Conway GJ, Johnston A, Wade HM, Masden EA, Bouten W & Burton NHK (2014). Measuring the interaction between marine features of Special Protection Areas with offshore windfarm development sites through telemetry: final report. Report for the Department of Energy and Climate Change.

Thaxter CB, Scragg ES, Clark NA, Clewley G, Humphreys EM, Ross-Smith VH, Barber L, Conway GJ, Harris SJ, Masden EA, Bouten W and Burton NHK (2018). Measuring the interaction between Lesser Black-backed Gulls and Herring Gulls from the Skokholm and Skomer SPA and Morecambe Bay SPA and offshore wind farm development sites: final report. BTO Research Report No. 702, 162p

Thompson PM, Brookes KL, Graham IM, Barton TR, Needham K, Bradbury G & Merchant ND (2013). Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises. *Proceedings of the Royal Society B* **280**: 20132001.

UKMMAS (2010). Charting Progress 2: Healthy and Biological Diverse Seas Feeder Report. (Eds. Frost M & Hawkridge J) Published by Department for Environment Food and Rural Affairs on behalf of the UK Marine Monitoring and Assessment Strategy. 672pp.

Veirs S, Veirs V & Wood JD (2016). Ship noise extends to frequencies used for echolocation by endangered killer whales. *PeerJ* **4**: e1657.

Votier SC, Grecian WJ, Patrick S & Newton J (2011). Inter-colony movements, at-sea behaviour and foraging in an immature seabird: results from GPS-PPT tracking, radio-tracking and stable isotope analysis. *Marine Biology* **158**: 355-362.

Wakefield ED, Cleasby IR, Bearhop S, Bodey TW, Davies R, Miller PI, Newton J, Votier SC & Hamer KC (2015). Long-term individual foraging site fidelity – why some gannets don't change their spots. *Ecology* **96**: 3058–3074.

Wakefield ED, Owen E, Baer J, Carroll MJ, Daunt F, Dodd SG, Green JA, Guilford T, Mavor RA, Miller PI, Newell MA, Newton SF, Robertson GS, Shoji A, Soanes LM, Votier SC, Wanless S & Bolton M (2017). Breeding density, fine-scale tracking and large-scale modeling reveal the regional distribution of four seabird species. *Ecological Applications* **27**: 2074-2091.

Wall D, Murray C, O'Brien J, Kavanagh L, Wilson C, Ryan C, Glanville B, Williams D, Enlander I, O'Connor I, McGrath D, Whooley P & Berrow S (2013). Atlas of the distribution and relative abundance of marine mammals in Irish offshore waters 2005 - 2011. Irish Whale and Dolphin Group, Merchants Quay, Kilrush, Co Clare.

Wang L, Heaney K, Pangerc T, Theobald P, Robinson S & Ainslie M (2014). Review of underwater acoustic propagation models. National Physical Laboratory Report AC 12, 35pp.

Webb A (2016). Operational effects of Lincs and LID wind farms on red-throated divers in the Greater Wash. Presentation at the International Diver Workshop, Hamburg, 24-25 November 2016. http://www.divertracking.com/international-workshop-on-red-throated-divers-24-25-november-2016-hamburg/

Wisniewska DM, Johnson M, Teilmann J, Siebert U, Galatius A, Dietz R & Madsen PT (2018). High rates of vessel noise disrupt foraging in wild harbour porpoises (*Phocoena phocoena*). *Proceedings of the Royal Society B* **285**: 20172314. http://dx.doi.org/10.1098/rspb.2017.2314

Woodward I, Thaxter CB, Owen E & Cook ASCP (2019). Desk-based revision of seabird foraging ranges used for HRA screening. Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate. BTO Research Report No. 724, 139pp.

Yelverton JT, Richmond DR, Fletcher ER & Jones RK (1973). Safe distances from underwater explosions for mammals and birds. Report to the Defense Nuclear Agency. National Technical Information Service, US Department of Commerce, 64pp.

APPENDIX 1: NATURA 2000 SITE INFORMATION

The tabulations in this Appendix contain lists of the qualifying interests for each Natura 2000 site for which a potential interaction has been identified (Table 4.1) and those features of relevance to the survey programme. Additional information on site conservation objectives is also provided, which along with the qualifying interests inform a consideration of the nature of the interaction with the potential sources of likely significant effect.

Special Areas of Conservation (SAC)

Site Name: Roaringwater Bay and Islands SAC
Site Code: 000101

Site information

Relevant qualifying interests: Large shallow inlets and bays, reefs, vegetated sea cliffs of the Atlantic and Baltic coasts, harbour porpoise *Phocoena phocoena*, otter *Lutra lutra*, grey seal *Halichoerus grypus*, European dry heaths, submerged or partly submerged sea caves

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: harbour porpoise *Phocoena phocoena,* grey seal *Halichoerus grypus*

Summary Conservation objectives:

- To maintain the favourable conservation condition of large shallow inlets and bays
- To maintain the favourable conservation condition of reefs
- To maintain the favourable conservation condition of vegetated sea cliffs of the Atlantic and Baltic coasts
- To maintain the favourable conservation condition of harbour porpoise
- To restore the favourable conservation condition of otter
- To maintain the favourable conservation condition of grey seal
- To maintain the favourable conservation condition of European dry heaths
- To maintain the favourable conservation condition of submerged or partly submerged sea caves

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000101.pdf

Closest distance to the survey: 73km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (e.g. harbour porpoise and grey seal) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping activity in the Kinsale and wider Celtic Sea areas. However, given the potential presence of these qualifying species the survey area there is the potential for interaction which is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise is from the use of survey equipment (one or more high-resolution geophysical survey (HRSG) sources). Given the potential presence of noise-sensitive qualifying species (e.g. harbour porpoise and grey seal) in the survey area, there is the potential for interaction which is considered further in Section 4.2.2.

Site Name: Blasket Islands SAC
Site Code: 0002172

Site information

Relevant qualifying interests: reefs, vegetated sea cliffs of the Atlantic and Baltic coasts, harbour porpoise *Phocoena phocoena*, otter *Lutra lutra*, grey seal *Halichoerus grypus*, European dry heaths, submerged or partly submerged sea caves

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: harbour porpoise *Phocoena phocoena*

Summary Conservation objectives:

- To maintain the favourable conservation condition of reefs
- To restore the favourable conservation condition of vegetated sea cliffs of the Atlantic and Baltic coasts
- To maintain the favourable conservation condition of harbour porpoise
- To restore the favourable conservation condition of otter
- To maintain the favourable conservation condition of grey seal
- To maintain the favourable conservation condition of European dry heaths
- To maintain the favourable conservation condition of submerged or partly submerged sea caves

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002172.pdf
Further supporting information on the site conservation objectives:
https://www.npws.ie/sites/default/files/publications/pdf/Blasket%20Islands%20SAC%20(002172)%20Conservation%20objectives%20supporting%20document%20-%20Marine%20habitats%20[Version%201]_1.pdf

Closest distance to the survey: 188km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (harbour porpoise) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping activity in the Kinsale and wider Celtic Sea areas. However, given the potential presence of these qualifying species the survey area there is the potential for interaction which is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise is from the use of survey equipment (one or more high-resolution geophysical survey (HRSG) sources). Given the potential presence of noise-sensitive qualifying species (harbour porpoise) in the survey area, the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: Rockabill to Dalkey Island SAC
Site Code: 0003000

Site information

Relevant qualifying interests: reefs, *Phocoena phocoena*

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: harbour porpoise *Phocoena phocoena*

Summary Conservation objectives:

- To maintain the favourable conservation condition of reefs
- To maintain the favourable conservation condition of harbour porpoise

Site Name: Rockabill to Dalkey Island SAC
Site Code: 0003000

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO003000.pdf
Further supporting information on the site conservation objectives:
https://www.npws.ie/sites/default/files/publications/pdf/003000_Rockabill%20to%20Dalkey%20Island%20SAC%20Marine%20Supporting%20Doc_V1.pdf

Closest distance to the survey: 260km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (harbour porpoise) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping activity in the Kinsale and wider Celtic Sea areas. However, given the potential presence of these qualifying species the survey area there is the potential for interaction which is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise is from the use of survey equipment (one or more high-resolution geophysical survey (HRSG) sources). Given the potential presence of noise-sensitive qualifying species (harbour porpoise) in the survey area, the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: Bandon River SAC
Site Code: 0002171

Site information

Relevant qualifying interests: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*, freshwater pearl mussel *Margaritifera margaritifera*, brook lamprey *Lampetra planeri*

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: freshwater pearl mussel *Margaritifera margaritifera*

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002171.pdf

Closest distance to the survey: 69km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
While supporting a population of Atlantic salmon, this is not a qualifying interest of the site. As Atlantic salmon forms a critical part of the lifecycle of the freshwater pearl mussel interest feature, it is considered here as if it were an interest feature. With respect to this potentially sensitive species, survey activities would be expected to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping activity in the Kinsale and Celtic Sea areas, and the potential for significant effects on the site has therefore not been identified.

Underwater noise from vessel and survey activities
As above, in view of the freshwater pearl mussel interest feature, the potential for interaction with Atlantic salmon is considered here. The primary contributor to underwater noise from the survey will be vessel activity and noise associated with the survey equipment. In view of the qualifying

Site Name: Bandon River SAC
Site Code: 0002171

interest dependency on a potentially noise sensitive feature (Atlantic salmon), the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: Blackwater River (Cork/Waterford) SAC
Site Code: 0002170

Site information

Relevant qualifying interests: Freshwater pearl mussel *Margaritifera margaritifera*, white-clawed crayfish *Austropotamobius pallipes*, sea lamprey *Petromyzon marinus*, brook Lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar* (only in fresh water), estuaries, mudflats and sandflats not covered by seawater at low tide, perennial vegetation of stony banks, *Salicornia* and other annuals colonizing mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), otter, Mediterranean salt meadows (*Juncetalia maritimi*), Killarney fern *Trichomanes speciosum*, water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, old sessile oak woods with *Ilex* and *Blechnum* in the British Isles, alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*), *Taxus baccata* woods of the British Isles.

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar*, freshwater pearl mussel *Margaritifera margaritifera*

Summary Conservation objectives:

- To restore the favourable conservation condition of the freshwater pearl mussel
- To maintain the favourable conservation condition of white-clawed crayfish
- To restore the favourable conservation condition of sea lamprey
- To maintain the favourable conservation condition of brook lamprey
- To maintain the favourable conservation condition of river lamprey
- To restore the favourable conservation condition of twaite shad
- To maintain the favourable conservation condition of Atlantic salmon
- To maintain the favourable conservation condition of estuaries
- To maintain the favourable conservation condition of mudflats and sandflats not covered by seawater at low tide
- To maintain the favourable conservation condition of perennial vegetation of stony banks
- To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand
- To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- To restore the favourable conservation condition of otter
- To maintain the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*)
- To maintain the favourable conservation condition of Killarney fern
- To maintain the favourable conservation condition of water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- To restore the favourable conservation condition of old sessile oak woods with *Ilex* and *Blechnum*
- To restore the favourable conservation condition of alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*
- The status of *Taxus baccata* woods of the British Isles as a qualifying Annex I habitat for the Blackwater River (Cork/Waterford) SAC is currently under review.

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf

Site Name: Blackwater River (Cork/Waterford) SAC
Site Code: 0002170

Closest distance to the survey: 26km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (e.g. sea lamprey, river lamprey, twaite shad, Atlantic salmon and by association the freshwater pearl mussel) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from current normal shipping activity in the Kinsale and Celtic Sea areas. However, given the migratory nature of some of the qualifying species, there is the potential for interaction with site qualifying interests, which are considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise from the survey will be vessel activity and noise associated with the survey equipment. In view of the potential noise sensitivity of qualifying interests which have the potential to occur in or near the survey area (e.g. Atlantic salmon, sea lamprey), the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: River Barrow and River Nore SAC
Site Code: 0002162

Site information

Relevant qualifying interests: Desmoulin's whorl snail *Vertigo moulinsiana*, freshwater pearl mussel *Margaritifera margaritifera*, white-clawed crayfish *Austropotamobius pallipes*, sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar* (only in fresh water), estuaries, mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonizing mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), otter *Lutra lutra*, Mediterranean salt meadows (*Juncetalia maritimi*), Killarney fern *Trichomanes speciosum*, Nore freshwater pearl mussel *Margaritifera durrovensis*, water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, European dry heaths, hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, petrifying springs with tufa formation (*Cratoneurion*), old sessile oak woods with *Ilex* and *Blechnum* in the British Isles alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar*, freshwater pearl mussel *Margaritifera margaritifera*

Summary Conservation objectives:

- The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review.
- To maintain the favourable conservation condition of white-clawed crayfish
- To restore the favourable conservation condition of sea lamprey
- To restore the favourable conservation condition of brook lamprey
- To restore the favourable conservation condition of river lamprey
- To restore the favourable conservation condition of twaite shad
- To restore the favourable conservation condition of salmon
- To maintain the favourable conservation condition of estuaries
- To maintain the favourable conservation condition of the mudflats and sandflats not covered by seawater at low tide
- To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand
- To restore the favourable conservation condition of Atlantic salt meadows
- To restore the favourable conservation condition of otter

Site Name: River Barrow and River Nore SAC
Site Code: 0002162

- To restore the favourable conservation condition of Mediterranean salt meadows
- To maintain the favourable conservation condition of Killarney fern
- To restore the favourable conservation condition of the Nore freshwater pearl mussel
- To maintain the favourable conservation condition of water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- To maintain the favourable conservation condition of European dry heaths
- To maintain the favourable conservation condition of hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- To maintain the favourable conservation condition of petrifying springs with tufa formation (*Cratoneurion*)
- To restore the favourable conservation condition of old oak woodland with *Ilex* and *Blechnum*
- To restore the favourable conservation condition of alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002162.pdf

Closest distance to the survey: 92km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (e.g. sea lamprey, river lamprey, twaite shad, Atlantic salmon and by association the freshwater pearl mussel) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from current normal shipping activity in the Kinsale and Celtic Sea areas. However, given the migratory nature of some of the qualifying species, there is the potential for interaction with site qualifying interests, which are considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise from the survey will be vessel activity and noise associated with the survey equipment. In view of the potential noise sensitivity of qualifying interests which have the potential to occur in or near the survey area (e.g. Atlantic salmon, sea lamprey), the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: Lower River Suir SAC
Site Code: 0002137

Site information

Relevant qualifying interests: Freshwater pearl mussel *Margaritifera margaritifera*, white-clawed crayfish *Austropotamobius pallipes*, sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar*, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), otter *Lutra lutra*, Mediterranean salt meadows (*Juncetalia maritimi*), water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, old sessile oak woods with *Ilex* and *Blechnum* in the British Isles, alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*), *Taxus baccata* woods of the British Isles.

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar*, freshwater pearl mussel *Margaritifera margaritifera*

Summary Conservation objectives:

- To restore the favourable conservation condition of Atlantic salt meadows
- To restore the favourable conservation condition of Mediterranean salt meadows

Site Name: Lower River Suir SAC
Site Code: 0002137

- (*Juncetalia maritimi*)
- To maintain the favourable conservation condition of Water courses of plain to montane
- levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation
- To maintain the favourable conservation condition of Hydrophilous tall herb fringe
- communities of plains and of the montane to alpine levels
- To restore the favourable conservation condition of Old sessile oak woods with Ilex and Blechnum in the British Isles
- To restore the favourable conservation condition of Alluvial forests with Alnus glutinosa
- and Fraxinus excelsior (Alno-Padion, *Alnion incanae*, *Salicion albae*)
- To restore the favourable conservation condition of *Taxus baccata* woods of the British
- Isles
- To restore the favourable conservation condition of Freshwater Pearl Mussel
- To maintain the favourable conservation condition of White-clawed Crayfish
- To restore the favourable conservation condition of Sea Lamprey
- To restore the favourable conservation condition of Brook Lamprey
- To restore the favourable conservation condition of River Lamprey
- To restore the favourable conservation condition of Twaite Shad
- To restore the favourable conservation condition of Atlantic Salmon
- To maintain the favourable conservation condition of Otter

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002137.pdf

Closest distance to the survey: 52km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (e.g. sea lamprey, river lamprey, twaite shad, Atlantic salmon and by association the freshwater pearl mussel) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from current normal shipping activity in the Kinsale and Celtic Sea areas. However, given the migratory nature of some of the qualifying species, there is the potential for interaction with site qualifying interests, which are considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise from the survey will be vessel activity and noise associated with the survey equipment. In view of the potential noise sensitivity of qualifying interests which have the potential to occur in or near the survey area (e.g. Atlantic salmon, sea lamprey), the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: Slaney River Valley SAC
Site Code: 0000781

Site information

Relevant qualifying interests: Estuaries, freshwater pearl mussel *Margaritifera margaritifera*, Mudflats and sandflats not covered by seawater at low tide, sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar*, otter *Lutra lutra*, *Phoca vitulina* (harbour seal), Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Mediterranean salt meadows (*Juncetalia maritimi*), water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, old sessile oak woods with *Ilex* and *Blechnum* in the British Isles, alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

Site Name: Slaney River Valley SAC
Site Code: 0000781

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar*, freshwater pearl mussel *Margaritifera margaritifera*

Summary Conservation objectives:

- The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II
- species for the Slaney River Valley SAC is currently under review
- To restore the favourable conservation condition of Sea lamprey
- To restore the favourable conservation condition of Brook lamprey
- To restore the favourable conservation condition of River lamprey
- To restore the favourable conservation condition of Twaite shad
- To restore the favourable conservation condition of Salmon
- To maintain the favourable conservation condition of Estuaries
- To maintain the favourable conservation condition of Mudflats and sandflats not covered by
- seawater at low tide
- To restore the favourable conservation condition of Otter
- To maintain the favourable conservation condition of Harbour Seal
- To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation
- To restore the favourable conservation condition of old sessile oakwoods with Ilex and Blechnum
- To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion)

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000781.pdf

Closest distance to the survey: 123km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (e.g. sea lamprey, river lamprey, twaite shad, Atlantic salmon and by association the freshwater pearl mussel) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from current normal shipping activity in the Kinsale and Celtic Sea areas. However, given the migratory nature of some of the qualifying species, there is the potential for interaction with site qualifying interests, which are considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise from the survey will be vessel activity and noise associated with the survey equipment. In view of the potential noise sensitivity of qualifying interests which have the potential to occur in or near the survey area (e.g. Atlantic salmon, sea lamprey), the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC
Site Code: UK0030396

Site information

Relevant qualifying interests: *Phocoena phocoena*

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: harbour porpoise *Phocoena phocoena*

Summary Conservation objectives:

Site Name: Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC
Site Code: UK0030396

To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters

In the context of natural change, this will be achieved by ensuring that:

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

Further supporting information on the site conservation objectives:
http://archive.jncc.gov.uk/pdf/BristolChApproaches_ConsAdvice.pdf

Closest distance to the survey: 185km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (harbour porpoise) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping activity in the Kinsale and wider Celtic Sea areas. However, given the potential presence of these qualifying species the survey area there is the potential for interaction which is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise is from the use of survey equipment (one or more HRSG sources). Given the potential presence of noise-sensitive qualifying species (harbour porpoise) in the survey area, the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: North Anglesey Marine / Gogledd Môn Forol SAC
Site Code: UK0030398

Site information

Relevant qualifying interests: *Phocoena phocoena*

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: harbour porpoise *Phocoena phocoena*

Summary 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 (FCS) for Harbour Porpoise in UK waters

In the context of natural change, this will be achieved by ensuring that:

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

Further supporting information on the site conservation objectives:
http://archive.jncc.gov.uk/pdf/NAnglesey_ConsAdvice.pdf

Closest distance to the survey: 294km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (harbour porpoise) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping activity in the Kinsale and wider Celtic

Site Name: North Anglesey Marine / Gogledd Môn Forol SAC
Site Code: UK0030398

Sea areas. However, given the potential presence of these qualifying species the survey area there is the potential for interaction which is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise is from the use of survey equipment (one or more HRSG sources). Given the potential presence of noise-sensitive qualifying species (harbour porpoise) in the survey area, the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: West Wales Marine / Gorllewin Cymru Forol SAC
Site Code: UK0030397

Site information

Relevant qualifying interests: *Phocoena phocoena*

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: harbour porpoise *Phocoena phocoena*

Summary 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 (FCS) for Harbour Porpoise in UK waters

In the context of natural change, this will be achieved by ensuring that:

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

Further supporting information on the site conservation objectives:
https://cdn.naturalresources.wales/media/681439/w-wales-marine-objectives-advice.pdf?mode=pad&rnd=131625760750000000

Closest distance to the survey: 166km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (harbour porpoise) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping activity in the Kinsale and wider Celtic Sea areas. However, given the potential presence of these qualifying species the survey area there is the potential for interaction which is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise is from the use of survey equipment (one or more HRSG sources). Given the potential presence of noise-sensitive qualifying species (harbour porpoise) in the survey area, the potential for likely significant effect is considered further in Section 4.2.2.

Site Name: North Channel SAC
Site Code: UK0030398

Site information

Relevant qualifying interests: *Phocoena phocoena*

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: harbour porpoise *Phocoena phocoena*

Site Name: North Channel SAC
Site Code: UK0030398

Summary 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 (FCS) for Harbour Porpoise in UK waters

In the context of natural change, this will be achieved by ensuring that:

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

Further supporting information on the site conservation objectives:
http://archive.jncc.gov.uk/pdf/NorthChannel_ConsAdvice.pdf

Closest distance to the survey: 368km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
The surveys will result in a small increase in vessel traffic along the Kinsale pipelines (three vessels present, each one for up to 14 days). With respect to potentially sensitive qualifying species (harbour porpoise) these are expected to cause no more than temporary and localised low-level behavioural responses similar to those from normal shipping activity in the Kinsale and wider Celtic Sea areas. However, given the potential presence of these qualifying species the survey area there is the potential for interaction which is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
The primary contributor to underwater noise is from the use of survey equipment (one or more HRSG sources). Given the potential presence of noise-sensitive qualifying species (harbour porpoise) in the survey area, the potential for likely significant effect is considered further in Section 4.2.2.

Special Protection Areas (SPAs)

Site Name: Ballymacoda Bay SPA
Site Code: 0004023

Site information

Relevant qualifying interests: Wigeon (*Anas penelope*), teal (*Anas crecca*), ringed plover (*Charadrius hiaticula*), golden plover (*Pluvialis apricaria*), grey plover (*Pluvialis squatarola*), lapwing (*Vanellus vanellus*), sanderling (*Calidris alba*), dunlin (*Calidris alpina*), black-tailed godwit (*Limosa limos*a), bar-tailed godwit (*Limosa lapponica*), curlew (*Numenius arquata*), redshank (*Tringa totanus*), turnstone (Arenaria interpres), black-headed gull (*Chroicocephalus ridibundus*), common gull (*Larus canus*), lesser black-backed gull (*Larus fuscus*), kittiwake (*Rissa tridactyla),* Wetland & Waterbirds

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: lesser black-backed gull (*Larus fuscus*), kittiwake (*Rissa tridactyla),*

Summary Conservation objectives:

- To maintain the favourable conservation condition of those qualifying interests listed above in Ballymacoda Bay SPA, including the wetland habitat as a resource for the regularly occurring migratory birds that utilise it.

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004023.pdf

Site Name: Ballymacoda Bay SPA
Site Code: 0004023

Closest distance to the survey: 21km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
As noted in Section 3.4, physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from vessels at which flushing of birds could take place is significantly less than the minimum distance of the proposed survey (21km) such that there is no foreseeable interaction. Gull species, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). There is either no potential for interaction in the case of waterbirds, or the qualifying interest which could interact is not sensitive to the proposed activities. However, in view of the potential for interaction, the latter is considered in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Ballycotton Bay SPA
Site Code: 004022

Site information

Relevant qualifying interests: Teal (*Anas crecca*); ringed plover (*Charadrius hiaticula*); golden plover (*Pluvialis apricaria*); grey plover (*Pluvialis squatarola*); lapwing (*Vanellus vanellus*); black-tailed godwit (*Limosa limosa*); bar-tailed godwit (*Limosa lapponica*); curlew (*Numenius arquata*); turnstone (*Arenaria interpres*); common gull (*Larus canus*); lesser black-backed gull (*Larus fuscus*); razorbill (*Alca torda*), Wetland & Waterbirds

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: razorbill (*Alca torda*), lesser black-backed gull (*Larus fuscus*) – note this is a wintering feature of the site

Summary Conservation objectives:

- To maintain the favourable conservation condition of those qualifying interests listed above in Ballycotton Bay SPA, including the wetland habitat as a resource for the regularly occurring migratory birds that utilise it.

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004022.pdf

Closest distance to the survey: 11km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
As noted in Section 3.4, physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from vessels at which flushing of birds could take place is significantly less than the minimum distance of the proposed survey (11km) such that there is no foreseeable interaction. Gull species, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). It should also be noted that lesser black-backed gull is listed as a wintering feature for this site, lessening the potential for any interaction with the qualifying interest due to the proposed survey timing (April-September). There is either no potential for interaction in the case of waterbirds, or the qualifying interest which could interact is not sensitive to the proposed activities. However, in view of the potential for interaction, the latter is considered in Section 4.2.1.

Underwater noise from vessel and survey activities

Site Name: Ballycotton Bay SPA
Site Code: 004022

There is the potential for interactions between diving seabird species (guillemot, razorbill) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Courtmacsherry Bay SPA
Site Code: IE0004219

Site information

Relevant qualifying interests: great northern diver (*Gavia immer*), shelduck (*Tadorna tadorna*), wigeon (*Anas penelope*), red-breasted merganser (*Mergus serrator*), golden plover (*Pluvialis apricaria*), lapwing (*Vanellus vanellus*), dunlin (*Calidris alpina*), black-tailed godwit (*Limosa limosa*), bar-tailed godwit (*Limosa lapponica*), curlew (*Numenius arquata*), black-headed gull (*Chroicocephalus ridibundus*), common gull (*Larus canus*), wetland and waterbirds.

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: common gull (*Larus canus*)

Summary Conservation objectives:

- To maintain the favourable conservation condition of those qualifying interests listed above in Ballymacoda Bay SPA, including the wetland habitat as a resource for the regularly occurring migratory birds that utilise it.

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004023.pdf

Closest distance to the survey: 31km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
While common gull have the potential to forage within range of the survey area (see Woodward *et al.* 2019), they are not regarded to have a high sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Blackwater Estuary SPA
Site Code: 004028

Site information

Relevant qualifying interests: Wigeon (*Anas penelope*), golden plover (*Pluvialis apricaria*), lapwing (*Vanellus vanellus*), dunlin (*Calidris alpina*), black-tailed godwit (*Limosa limosa*), bar-tailed godwit (*Limosa lapponica*), curlew (*Numenius arquata*), redshank (*Tringa totanus*), herring gull (*Larus argentatus*), Wetland & waterbirds

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: herring gull (*Larus argentatus*), lesser black-backed gull (*Larus fuscus*)

Summary Conservation objectives:

- To maintain the favourable conservation condition of those qualifying interests listed above in Blackwater Estuary SPA, including the wetland habitat as a resource for the regularly occurring migratory birds that utilise it.

Feature attributes and targets defining favourable conservation status:

Site Name: Blackwater Estuary SPA
Site Code: 004028

https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004028.pdf

Closest distance to the survey: 28km

Consideration of site interest features against potential sources of likely significant effect

As noted in Section 3.4, physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from vessels at which flushing of birds could take place is significantly less than the minimum distance of the proposed survey (28km) such that there is no foreseeable interaction. Gull species, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). There is either no potential for interaction in the case of waterbirds, or the qualifying interest which could interact is not sensitive to the proposed activities. However, in view of the potential for interaction, the latter is considered in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Cork Harbour SPA
Site Code: 004030

Site information

Relevant qualifying interests: Little grebe (*Tachybaptus ruficollis*), great crested grebe (*Podiceps cristatus*), cormorant (*Phalacrocorax carbo*), grey heron (*Ardea cinerea*), shelduck (*Tadorna tadorna*), wigeon (*Anas penelope*), teal (*Anas crecca*), pintail (*Anas acuta*), shoveler (*Anas clypeata*), red-breasted merganser (*Mergus serrator*), oystercatcher (*Haematopus ostralegus*), golden plover (*Pluvialis apricaria*), grey plover (*Pluvialis squatarola*), Lapwing (*Vanellus vanellus*), dunlin (*Calidris alpina*), Black-tailed Godwit (*Limosa limosa*), bar-tailed godwit (*Limosa lapponica*), curlew (*Numenius arquata*), redshank (*Tringa totanus*), black-headed gull (*Chroicocephalus ridibundus*), common gull (*Larus canus*), lesser black-backed gull (*Larus fuscus*), common tern (*Sterna hirundo*), Wetland & Waterbirds

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: common gull (*Larus canus*), lesser black-backed gull (*Larus fuscus*), cormorant (*Phalacrocorax carbo*)

Summary Conservation objectives:

- To maintain the favourable conservation condition of those qualifying interests listed above in Cork Harbour SPA, including the wetland habitat as a resource for the regularly occurring migratory birds that utilise it.

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004030.pdf

Closest distance to the survey: 5km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
As noted in Section 3.4, physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from vessels at which flushing of birds could take place is less than the minimum distance of the proposed survey (5km). The coastal nature of the foraging activities of waterbirds further limits the potential for interaction between such birds and the offshore aspects of the survey, however, there is the potential for interaction with certain wintering features associated with Cork Harbour SPA (e.g. cormorant, red-breasted merganser), though this could be avoided depending on survey timing. Gull species, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). There is either limited potential for interaction in the case of waterbirds, or the qualifying interest which could interact is not sensitive to the

Site Name: Cork Harbour SPA
Site Code: 004030

proposed activities. In view of the potential for interaction with sensitive qualifying interests of the site, the latter is considered in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between a diving species (cormorant, red-breasted merganser) which are potentially sensitive to underwater noise, and the survey activities, which is considered further in Section 4.2.

Site Name: Dungarvan Harbour SPA
Site Code: 004032

Site information

Relevant qualifying interests: Great crested grebe (*Podiceps cristatus*), light-bellied brent goose (*Branta bernicla hrota*), shelduck (*Tadorna tadorna*), red-breasted merganser (*Mergus serrator*), oystercatcher (*Haematopus ostralegus*), golden plover (*Pluvialis apricaria*), grey plover (*Pluvialis squatarola*), lapwing (*Vanellus vanellus*), knot (*Calidris canutus*), dunlin (*Calidris alpina*), black-tailed godwit (*Limosa limosa*), bar-tailed godwit (*Limosa lapponica*), curlew (*Numenius arquata*), redshank (*Tringa totanus*), turnstone (*Arenaria interpres*), Wetland & Waterbirds

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: lesser black-backed gull (*Larus fuscus*)

Summary Conservation objectives:

- To maintain the favourable conservation condition of those qualifying interests listed above in Dungarvan Harbour SPA, including the wetland habitat as a resource for the regularly occurring migratory birds that utilise it.

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004032.pdf

Closest distance to the survey: 47km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
As noted in Section 3.4, physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from vessels at which flushing of birds could take place is significantly less than the minimum distance of the proposed survey (47km) such that there is no foreseeable interaction. Gull species, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). There is either no potential for interaction in the case of waterbirds, or the qualifying interest which could interact is not sensitive to the proposed activities. However, in view of the potential for interaction, the latter is considered in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Galley Head to Duneen Point SPA
Site Code: 004190

Site information

Relevant qualifying interests: Chough (*Pyrrhocorax pyrrhocorax*), northern fulmar (*Fulmarus glacialis*), herring gull (*Larus argentatus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: herring gull (*Larus argentatus*), northern fulmar (*Fulmarus glacialis*)

Site Name: Galley Head to Duneen Point SPA
Site Code: 004190

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above).

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004190.pdf

Closest distance to the survey: 48km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar and herring gull, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Helvick Head to Ballyquin SPA
Site Code: 004192

Site information

Relevant qualifying interests: Cormorant (*Phalacrocorax carbo*), peregrine (*Falco peregrinus*), herring gull (*Larus argentatus*), kittiwake (*Rissa tridactyla),* chough (*Pyrrhocorax pyrrhocorax*), northern fulmar (*Fulmarus glacialis*), great black-backed gull (*Larus marinus*), shag (*Phalacrocorax aristotelis),* guillemot (*Uria aalge*), razorbill (*Alca torda*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), guillemot (*Uria aalge*), razorbill (*alca torda*), kittiwake (*Rissa tridactyla*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004192.pdf

Closest distance to the survey: 39km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
While fulmar, common guillemot, razorbill and kittiwake have the potential to forage within range of the survey area (see Woodward *et al.* 2019), they are not regarded to have a high sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between a diving seabird species (guillemot, razorbill) which is potentially sensitive to underwater noise, and the survey activities, which is considered further in Section 4.2.

Site Name: Old Head of Kinsale SPA
Site Code: 004021

Site information

Relevant qualifying interests: Kittiwake (*Rissa tridactyla*), guillemot (*Uria aalge*), shag (*Phalacrocorax aristotelis),* northern fulmar (*Fulmarus glacialis*), herring gull (*Larus argentatus*), razorbill (*Alca torda*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), guillemot (*Uria aalge*), herring gull (*Larus argentatus*), razorbill (*Alca torda*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004021.pdf

Closest distance to the survey: 25km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, herring gull, common guillemot and razorbill have the potential to forage within range of the survey area (see Woodward *et al.* 2019), and are of low to moderate sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). In view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (guillemot, razorbill) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Seven Heads SPA
Site Code: 004191

Site information

Relevant qualifying interests: Chough (*Pyrrhocorax pyrrhocorax*), herring gull (*Larus argentatus*), peregrine (*Falco peregrinus*), cormorant (*Phalacrocorax carbo*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: herring gull (*Larus argentatus*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004191.pdf

Closest distance to the survey: 34km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Herring gull has the potential to forage within range of the survey area (see Woodward *et al.* 2019) but has a low to sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). In view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities

Site Name: Seven Heads SPA
Site Code: 004191

Herring gull is not a diving seabird likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Sheep's Head to Toe Head SPA
Site Code: 004156

Site information

Relevant qualifying interests: Chough (*Pyrrhocorax pyrrhocorax*), herring gull (*Larus argentatus*), peregrine (*Falco peregrinus*), shag (*Phalacrocorax aristotelis),* northern fulmar (*Fulmarus glacialis*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004156.pdf

Closest distance to the survey: 65km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Saltee Islands SPA
Site Code: 004002

Site information

Relevant qualifying interests: Razorbill (*Alca torda*), peregrine (*Falco peregrinus*), Atlantic puffin (*Fratercula arctica*), northern fulmar (*Fulmarus glacialis*), lesser black-backed gull (*Larus fuscus*), cormorant (*Phalacrocorax carbo*), Manx shearwater (*Puffinus puffinus*), red-billed chough (*Pyrrhocorax pyrrhocorax*), black-legged kittiwake (*Rissa tridactyla*), northern gannet (*Morus bassanus*), guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), lesser black-backed gull (*Larus fuscus*), Manx shearwater (*Puffinus puffinus*), northern gannet (*Morus bassanus*), black-legged kittiwake (*Rissa tridactyla*), Atlantic puffin (*Fratercula arctica*),

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004002.pdf

Site Name: Saltee Islands SPA
Site Code: 004002

Closest distance to the survey: 112km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, lesser black-backed gull, Manx shearwater, northern gannet, puffin and kittiwake have the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low to moderate (puffin) for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (Manx shearwater, northern gannet, puffin) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Puffin Island SPA
Site Code: 004003

Site information

Relevant qualifying interests: Razorbill (*Alca torda*), Atlantic puffin (*Fratercula arctica*), northern fulmar (*Fulmarus glacialis*), European storm-petrel (*Hydrobates pelagicus*), herring gull (*Larus argentatus*), lesser black-backed gull (*Larus fuscus*), Manx shearwater (*Puffinus puffinus*), red-billed chough (*Pyrrhocorax pyrrhocorax*), black-legged kittiwake (*Rissa tridactyla*), guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), Manx shearwater (*Puffinus puffinus*), European storm-petrel (*Hydrobates pelagicus*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004003.pdf

Closest distance to the survey: 150km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, Manx shearwater and European storm-petrel, have the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (Manx shearwater) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Cliffs of Moher SPA
Site Code: 004005

Site information

Relevant qualifying interests: razorbill (*Alca torda*), peregrine falcon (*Falco peregrinus*), Atlantic puffin (*Fratercula arctica*), northern fulmar (*Fulmarus glacialis*), red-billed chough (*Pyrrhocorax pyrrhocorax*), black-legged kittiwake (*Rissa tridactyla*), common guillemot (*Uria aalge*)

Site Name: Cliffs of Moher SPA
Site Code: 004005

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004005.pdf

Closest distance to the survey: 310km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Skelligs SPA
Site Code: 004007

Site information

Relevant qualifying interests: razorbill (*Alca torda*), peregrine falcon (*Falco peregrinus*), Atlantic puffin (*Fratercula arctica*), northern fulmar (*Fulmarus glacialis*), European storm-petrel (*Hydrobates pelagicus*), Manx shearwater (*Puffinus puffinus*), red-billed chough (*Pyrrhocorax pyrrhocorax*), black-legged kittiwake (*Rissa tridactyla*), northern gannet (*Morus bassanus*), common guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), northern gannet (*Morus bassanus*), Manx shearwater (*Puffinus puffinus*), European storm-petrel (*Hydrobates pelagicus*),

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004007.pdf

Closest distance to the survey: 160km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, Manx shearwater, northern gannet and European storm-petrel have the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities

Site Name: Skelligs SPA
Site Code: 004007

There is the potential for interactions between diving seabird species (Manx shearwater, northern gannet) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Blasket Islands SPA
Site Code: 004008

Site information

Relevant qualifying interests: razorbill (*Alca torda*), peregrine falcon (*Falco peregrinus*), Atlantic puffin (*Fratercula arctica*), northern fulmar (*Fulmarus glacialis*), European storm-petrel (*Hydrobates pelagicus*), common gull (*Larus canus*), lesser black-backed gull (*Larus fuscus*), leach's storm-petrel (Oceanodroma leucorhoa), Manx shearwater (*Puffinus puffinus*), red-billed chough (*Pyrrhocorax pyrrhocorax*), black-legged kittiwake (*Rissa tridactyla*), Arctic tern (*Sterna paradisaea*), guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), Manx shearwater (*Puffinus puffinus*), European storm-petrel (*Hydrobates pelagicus*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004008.pdf

Closest distance to the survey: 187km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, European storm-petrel and Manx shearwater have the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (Manx shearwater) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: The Bull and The Cow Rocks SPA
Site Code: 004066

Site information

Relevant qualifying interests: razorbill (*Alca torda*), Atlantic puffin (*Fratercula arctica*), northern fulmar (*Fulmarus glacialis*), European storm-petrel (*Hydrobates pelagicus*), herring gull (*Larus argentatus*), cormorant (*Phalacrocorax carbo carbo*), black-legged kittiwake (*Rissa tridactyla*), northern gannet (*Morus bassanus*), guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), northern gannet (*Morus bassanus*), European storm-petrel (*Hydrobates pelagicus*), black-legged kittiwake (*Rissa tridactyla*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Site Name: The Bull and The Cow Rocks SPA
Site Code: 004066

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004066.pdf

Closest distance to the survey: 136km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, northern gannet, black-legged kittiwake and European storm petrel have the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (northern gannet) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Lambey Island SPA
Site Code: 004069

Site information

Relevant qualifying interests: razorbill (*Alca torda*), greylag goose (Anser anser), ruddy turnstone (Arenaria interpres), brent goose (*Branta bernicla*), purple sandpiper (*Calidris maritima*), peregrine falcon (*Falco peregrinus*), Atlantic puffin (*Fratercula arctica*), northern fulmar (*Fulmarus glacialis*), Eurasian oystercatcher (Haematopus ostralegus), lesser black-backed gull (*Larus fuscus*), Eurasian curlew (*Numenius arquata*), cormorant (*Phalacrocorax carbo carbo*), Manx shearwater (*Puffinus puffinus*), black-legged kittiwake (*Rissa tridactyla*), common shelduck (*Tadorna tadorna*), guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), Manx shearwater (*Puffinus puffinus*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004069.pdf

Closest distance to the survey: 282km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar and Manx shearwater have the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (Manx shearwater) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Tacumshin Lake SPA
Site Code: 004092

Site information

Relevant qualifying interests: reed warbler (*Acrocephalus scirpaceus*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), Eurasian teal (*Anas crecca*), Eurasian wigeon (*Anas penelope*), mallard (*Anas platyrhynchos*), garganey (*Anas querquedula*), gadwall (*Anas strepera*), greenland white-fronted goose (*Anser albifrons flavirostris*), common pochard (*Aythya ferina*), tufted duck (*Aythya fuligula*), brent goose (*Branta bernicla*), dunlin (*Calidris alpina*), curlew sandpiper (*Calidris ferruginea*), little stint (*Calidris minuta*), Eurasian marsh harrier (*Circus aeruginosus*), tundra swan (*Cygnus columbianus bewickii*), whooper swan (*Cygnus cygnus*), common coot (*Fulica atra*), lesser black-backed gull (*Larus fuscus*), black-headed gull (*Larus ridibundus*), black-tailed godwit (*Limosa limosa*), Eurasian curlew (*Numenius arquata*), ruff (*Philomachus pugnax*), European golden plover (*Pluvialis apricaria*), grey plover (*Pluvialis squatarola*), common shelduck (*Tadorna tadorna*), spotted redshank (*Tringa erythropus*), wood sandpiper (*Tringa glareola*), common greenshank (*Tringa nebularia*), green sandpiper (*Tringa ochropus*), common redshank (*Tringa totanus*), northern lapwing (*Vanellus vanellus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: lesser black-backed gull (*Larus fuscus*) – note this is a wintering feature of the site

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004069.pdf

Closest distance to the survey: 124km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
As noted in Section 3.4, physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from vessels at which flushing of birds could take place is significantly less than the minimum distance of the proposed survey (124km) such that there is no foreseeable interaction. Gull species, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). It should also be noted that this species is listed as a wintering feature, lessening the potential for any interaction with the qualifying interest due to the proposed survey timing. There is either no potential for interaction in the case of waterbirds, or the qualifying interest which could interact is not sensitive to the proposed activities. However, in view of the potential for interaction, the latter is considered in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Kilcolman Bog SPA
Site Code: 004095

Site information

Relevant qualifying interests: northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), Eurasian teal (*Anas crecca*), Eurasian wigeon (*Anas penelope*), mallard (*Anas platyrhynchos*), common pochard (*Aythya ferina*), tufted duck (*Aythya fuligula*), whooper swan (*Cygnus cygnus*), common coot (*Fulica atra*), lesser black-backed gull (*Larus fuscus*), black-headed gull (*Larus ridibundus*), European golden plover (*Pluvialis apricaria*), northern lapwing (*Vanellus vanellus*); Wetland and Waterbirds

Site Name: Kilcolman Bog SPA
Site Code: 004095

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: lesser black-backed gull (*Larus fuscus*) – note this is a wintering feature of the site

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)
- To maintain or restore the favourable conservation condition of the wetland habitat at Kilcolman Bog SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004095.pdf

Closest distance to the survey: 124km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
As noted in Section 3.4, physical disturbance of seaduck and other waterbird flocks by vessel traffic is possible, but the distance from vessels at which flushing of birds could take place is significantly less than the minimum distance of the proposed survey (124km) such that there is no foreseeable interaction. Gull species, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). It should also be noted that lesser black-backed gull is listed as a wintering feature for this site, lessening the potential for any interaction with the qualifying interest due to the proposed survey timing (April-September). There is either no potential for interaction in the case of waterbirds, or the qualifying interest which could interact is not sensitive to the proposed activities. However, in view of the potential for interaction, the latter is considered in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Howth Head Coast SPA
Site Code: 004113

Site information

Relevant qualifying interests: razorbill (*Alca torda*), peregrine (*Falco peregrinus*), northern fulmar (*Fulmarus glacialis*), black-legged kittiwake (*Rissa tridactyla*), common guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004113.pdf

Closest distance to the survey: 270km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels

Site Name: Howth Head Coast SPA
Site Code: 004113

Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Illaunonearaun SPA
Site Code: 004114

Site information

Relevant qualifying interests: Barnacle goose (*Branta leucopsis*), northern fulmar (*Fulmarus glacialis*), herring gull (*Larus argentatus*), lesser black-backed gull (*Larus fuscus*), cormorant (*Phalacrocorax carbo carbo*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004114.pdf

Closest distance to the survey: 269km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Loop Head SPA
Site Code: 004119

Site information

Relevant qualifying interests: Razorbill (*Alca torda*), peregrine (*Falco peregrinus*), northern fulmar (*Fulmarus glacialis*), red-billed chough (*Pyrrhocorax pyrrhocorax*), black-legged kittiwake (*Rissa tridactyla*), common guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Site Name: Loop Head SPA
Site Code: 004119

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004119.pdf

Closest distance to the survey: 260km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Ireland's Eye SPA
Site Code: 004117

Site information

Relevant qualifying interests: razorbill (*Alca torda*), peregrine (*Falco peregrinus*), Atlantic puffin (*Fratercula arctica*), northern fulmar (*Fulmarus glacialis*), cormorant (*Phalacrocorax carbo carbo*), black-legged kittiwake (*Rissa tridactyla*), northern gannet (*Morus bassanus*), common guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), northern gannet (*Morus bassanus*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004117.pdf

Closest distance to the survey: 274km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar and gannet, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (northern gannet) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Skerries Islands SPA
Site Code: 004122

Site information

Relevant qualifying interests: Eurasian wigeon (*Anas penelope*), mallard (*Anas platyrhynchos*), ruddy turnstone (Arenaria interpres), short-eared owl (*Asio flammeus*), brent goose (*Branta*

Site Name: Skerries Islands SPA
Site Code: 004122

bernicla), purple sandpiper (*Calidris maritima*), ringed plover (*Charadrius hiaticula*), northern fulmar (*Fulmarus glacialis*), common snipe (Gallinago gallinago), Eurasian oystercatcher (Haematopus ostralegus), Eurasian curlew (*Numenius arquata*), cormorant (*Phalacrocorax carbo carbo*), European golden plover (*Pluvialis apricaria*), grey plover (*Pluvialis squatarola*), northern lapwing (*Vanellus vanellus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004122.pdf

Closest distance to the survey: 294km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Magharee Islands SPA
Site Code: 004125

Site information

Relevant qualifying interests: Barnacle goose (*Branta leucopsis*), northern fulmar (*Fulmarus glacialis*), common gull (*Larus canus*), lesser black-backed gull (*Larus fuscus*), cormorant (*Phalacrocorax carbo carbo*), red-billed chough (*Pyrrhocorax pyrrhocorax*), little tern (*Sterna albifrons*), common tern (*Sterna hirundo*), Arctic tern (*Sterna paradisaea*), European storm-petrel (*Hydrobates pelagicus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), European storm-petrel (*Hydrobates pelagicus*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004125.pdf

Closest distance to the survey: 238km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar and European storm-petrel, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe

Site Name: Magharee Islands SPA
Site Code: 004125

& Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Wicklow Head SPA
Site Code: 004127

Site information

Relevant qualifying interests: Razorbill (*Alca torda*), peregrine falcon (*Falco peregrinus*), northern fulmar (*Fulmarus glacialis*), black-legged kittiwake (*Rissa tridactyla*), common whitethroat (*Sylvia communis*), common guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004127.pdf

Closest distance to the survey: 227km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Dingle Peninsula SPA
Site Code: 004153

Site information

Relevant qualifying interests: Peregrine (*Falco peregrinus*), northern fulmar (*Fulmarus glacialis*), red-billed chough (*Pyrrhocorax pyrrhocorax*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004153.pdf

Site Name: Dingle Peninsula SPA
Site Code: 004153

Closest distance to the survey: 196km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Iveragh Peninsula SPA
Site Code: 004154

Site information

Relevant qualifying interests: Razorbill (*Alca torda*), peregrine falcon (*Falco peregrinus*), northern fulmar (*Fulmarus glacialis*), herring gull (*Larus argentatus*), European shag (*Phalacrocorax aristotelis*), cormorant (*Phalacrocorax carbo carbo*), red-billed chough (*Pyrrhocorax pyrrhocorax*), black-legged kittiwake (*Rissa tridactyla*), common guillemot (*Uria aalge*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), black-legged kittiwake (*Rissa tridactyla*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004154.pdf

Closest distance to the survey: 147km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar and black-legged kittiwake, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Beara Peninsula SPA
Site Code: 004155

Site information

Relevant qualifying interests: Peregrine falcon (*Falco peregrinus*), northern fulmar (*Fulmarus glacialis*), herring gull (*Larus argentatus*), European shag (*Phalacrocorax aristotelis*), red-billed chough (*Pyrrhocorax pyrrhocorax*)

Site Name: Beara Peninsula SPA
Site Code: 004155

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004155.pdf

Closest distance to the survey: 123km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Deenish Island and Scariff Island SPA
Site Code: 004175

Site information

Relevant qualifying interests: Northern fulmar (*Fulmarus glacialis*), European storm-petrel (*Hydrobates pelagicus*), herring gull (*Larus argentatus*), lesser black-backed gull (*Larus fuscus*), Manx shearwater (*Puffinus puffinus*), red-billed chough (*Pyrrhocorax pyrrhocorax*), Arctic tern (*Sterna paradisaea*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*), Manx shearwater (*Puffinus puffinus*), European storm-petrel (*Hydrobates pelagicus*), lesser black-backed gull (*Larus fuscus*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004175.pdf

Closest distance to the survey: 146km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, Manx shearwater, lesser black-backed gull and European storm petrel, have the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities

Site Name: Deenish Island and Scariff Island SPA
Site Code: 004175

There is the potential for interactions between diving seabird species (Manx shearwater) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Kerry Head SPA
Site Code: 004189

Site information

Relevant qualifying interests: peregrine (*Falco peregrinus*), northern fulmar (*Fulmarus glacialis*), red-billed chough (*Pyrrhocorax pyrrhocorax*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: northern fulmar (*Fulmarus glacialis*)

Summary Conservation objectives:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (above)

Feature attributes and targets defining favourable conservation status:
Not listed - https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004189.pdf

Closest distance to the survey: 254km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Fulmar, while having the potential to forage within range of the survey area (see Woodward *et al.* 2019), are regarded to have a low sensitivity to shipping traffic (Garthe & Hüppop 2004, Fliessbach *et al.* 2019). However, in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
None of the qualifying interests are diving seabirds which are likely to be most at risk of any underwater noise effects, and therefore no interactions with the survey are considered to be possible.

Site Name: Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA
Site Code: UK9014051

Site information

Relevant qualifying interests: Atlantic puffin (*Fratercula arctica*), Manx shearwater (*Puffinus puffinus*), European storm-petrel (*Hydrobates pelagicus*), lesser black-backed gull (*Larus fuscus*), red-billed chough (*Pyrrhocorax pyrrhocorax*), short-eared owl (*Asio flammeus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: Manx shearwater (*Puffinus puffinus*), lesser black-backed gull (*Larus fuscus*), European storm-petrel (*Hydrobates pelagicus*)

Summary Conservation objectives:
Only draft conservation objectives are presently available for the site**:**
https://cdn.naturalresources.wales/media/675733/skomer-skokholm-and-seas-off-pembs-pspa-draft-conservation-objectives-final.pdf?mode=pad&rnd=131625760740000000

Closest distance to the survey: 131km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels

Site Name: Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA
Site Code: UK9014051

Lesser black-backed gull, Manx shearwater and European storm-petrel have the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (Manx shearwater) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Grassholm SPA
Site Code: UK9014041

Site information

Relevant qualifying interests: Northern gannet (*Morus bassanus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: Northern gannet (*Morus bassanus*)

Summary Conservation objectives:
The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The population will not fall below 30,000 pairs in three consecutive years,
- It will not drop by more than 25% of the previous year's figures in any one year.
- There will be no decline in this population significantly greater than any decline in the North Atlantic population as a whole.

https://naturalresources.wales/media/674134/Grassholm%20SPA%20Management%20Plan%2021%5B1%5D.4.08%20(English).pdf

Closest distance to the survey: 174km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Northern gannet has the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (northern gannet) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Irish Sea Front SPA
Site Code: UK9020328

Site information

Relevant qualifying interests: Manx shearwater (*Puffinus puffinus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: Manx shearwater (*Puffinus puffinus*),

Summary Conservation objectives:
To avoid significant deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is

Site Name: Irish Sea Front SPA
Site Code: UK9020328

maintained in the long term and makes an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species. This contribution would be achieved through delivering the following objectives for each of the sites qualifying features:

- Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term;
- Maintain the habitats and food resources of the qualifying features in favourable condition.
- Ensure access to the site from linked breeding colonies

https://hub.jncc.gov.uk/assets/0032da71-db02-44b5-b4e1-022d77ef7ee3#irish-sea-front-sas-conservation-objectives.pdf

Closest distance to the survey: 315km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Manx shearwater has the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (Manx shearwater) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Copeland Islands SPA
Site Code: UK9020291

Site information

Relevant qualifying interests: Manx shearwater (*Puffinus puffinus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: Manx shearwater (*Puffinus puffinus*),

Summary Conservation objectives:
To maintain each feature in favourable condition. Component objectives for breeding Manx shearwater are, no significant decrease in population against national trends and, fledging success sufficient to maintain or enhance population

https://www.daera-ni.gov.uk/publications/special-protection-area-copeland-islands

Closest distance to the survey: 422km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Manx shearwater has the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (Manx shearwater) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.

Site Name: Aberdaron Coast and Bardsey Island SPA
Site Code: UK9013121

Site information

Relevant qualifying interests: Manx shearwater (*Puffinus puffinus*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: Manx shearwater (*Puffinus puffinus*),

Summary Conservation objectives:
The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Breeding population of Manx shearwater (confined to Ynys Enlli) is stable or increasing.
- Reproductive rates remain stable.
- Deaths from the lighthouse attractions, fencing and other infrastructure are minimal.
- No ground predators are introduced.
- Nesting birds are not disturbed by restoration works on boundary walls or recreational activities.
- All factors affecting the achievement of these conditions are under control.

See the following document for performance indicators for the feature:
https://naturalresources.wales/media/672092/Glannau%20Aberdaron%20Plan%20English.pdf

Closest distance to the survey: 254km

Consideration of site interest features against potential sources of likely significant effect

The physical presence of survey vessels
Manx shearwater has the potential to forage within range of the survey area (see Woodward *et al.* 2019). Sensitivity to vessel movements is considered to be low for those species (see Garthe & Hüppop 2004, MMO 2018, Fliessbach *et al.* 2019), but in view of the potential for interaction, this is considered further in Section 4.2.1.

Underwater noise from vessel and survey activities
There is the potential for interactions between diving seabird species (Manx shearwater) which are potentially sensitive to underwater noise, and the survey activities. This is considered further in Section 4.2.2.