INIS EALGA

Foreshore License Application for Marine Survey Work

Natura Impact Statement

P2369_R4922_Rev1_Inis Ealga | 20 December 2019

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DOCUMENT RELEASE FORM

INIS EALGA

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Natura Impact Statement

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1. INTRODUCTION

1.1 Introduction

DP Energy Ireland (DPEI) is investigating the feasibility of developing an offshore floating wind energy prospect off the south coast of Ireland, the Inis Ealga Marine Energy Park (IEMEP). DPEI intend to carry out site investigations within the prospect area, potential export cable corridors and landfall areas to assess the site and associated seabed. The results of which will be used to select optimal cable route(s), landfall option(s), windfarm layout and provide baseline data for environmental impact assessments.

The proposed IEMEP includes two development areas (Figure 1-1). The intention is that the development would be linked by cables, with one export cable to shore. There is currently three potential export cable corridors; one of which will be selected as the preferred route after site investigations.

The IEMEP lies partly within the 12 nautical mile (nm) limit (i.e. state foreshore) and partly outside of the 12nm limit (i.e. not state foreshore). Foreshore licence application (FS006859) will only cover the area within the 12nm limit and three potential export cable routes, hereon referenced to as the application area. The location of the application area is provided in Figure 1-2. The application area covers 92,468 hectares (ha).

The application area is within Ardmore Head Special Area of Conservation (SAC) (site code: IE002123), Ballycotton Bay Special Protection Area (SPA) (site code: IE004022), Cork Harbour SPA (site code: IE004030), Dungarvan Harbour SPA (site code: IE004032) and, Helvick Head to Ballyquin SPA (site code: IE004192). As the project is not directly connected with or necessary to the management of the Natura 2000 sites it is regarded as necessary that the project should be subject to the Appropriate Assessment (AA) process.

Figure 1-1 Inis Ealga Marine Energy Park

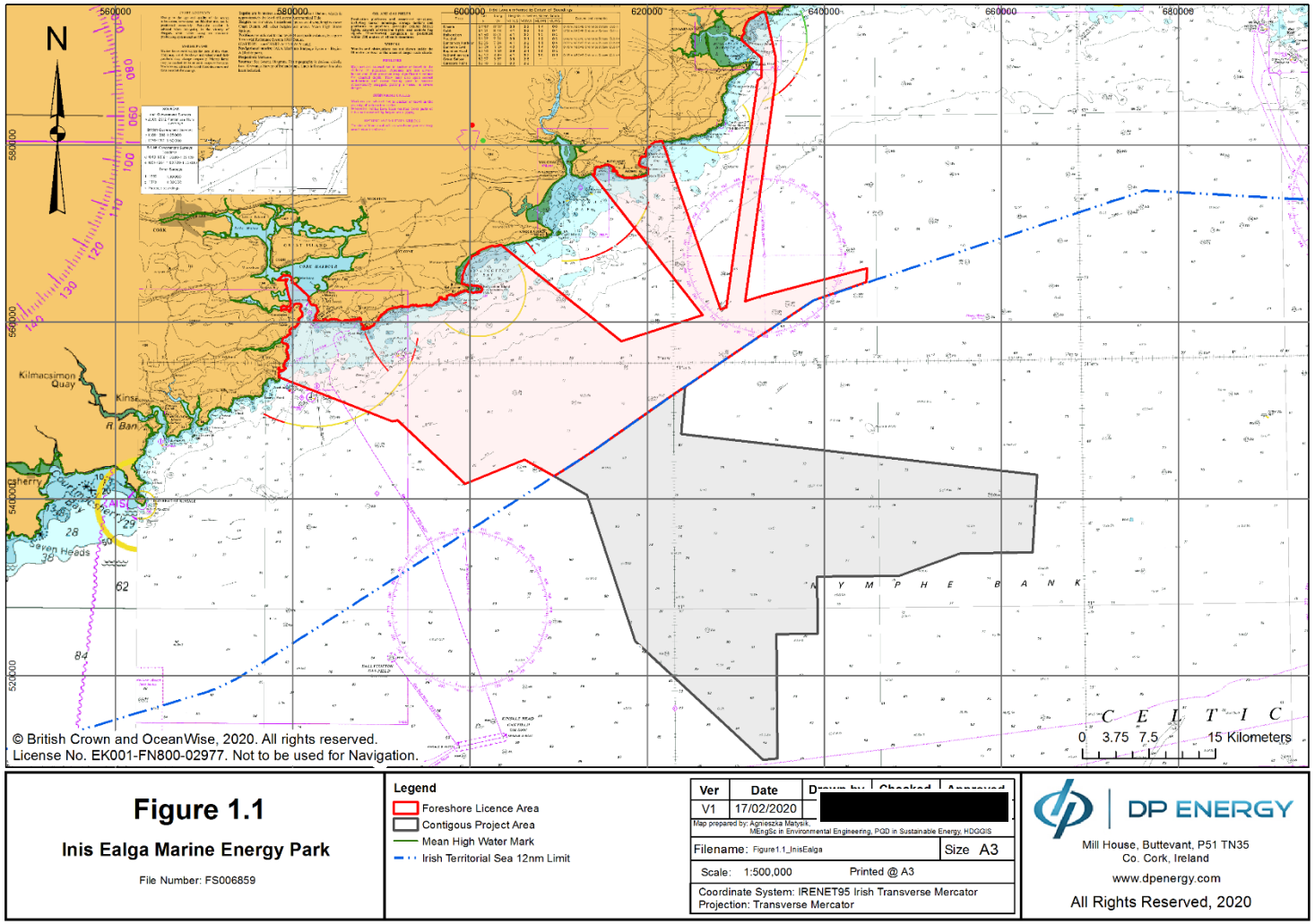

Figure 1-2 Application Area (Figure 3 in ORE application form)

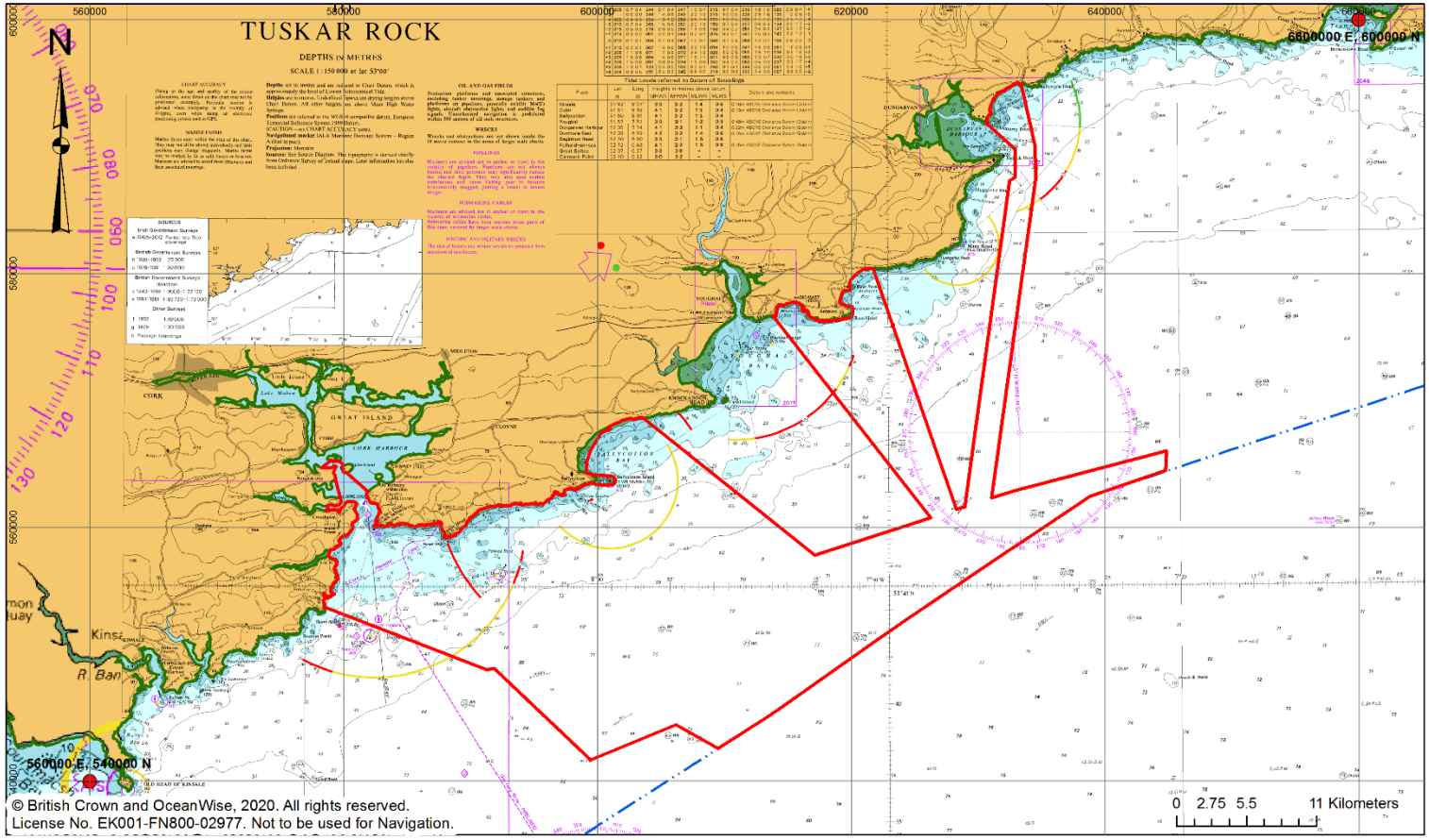

Figure 3

Inis Ealga Site on Admiralty Chart

File Number: FS006859

Inis Ealga Marine Energy Park

Legend
- Foreshore Licence Area
- Irish Territorial Sea 12nm Limit
- Mean High Water Mark
- ITM Grid Coordinate Intersect

Ver	Date	Drawn by	Checked	Approved
V1	17/02/2020	[redacted]		

Map prepared by: Agnieszka Matysik, MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS

Filename: Figure3_InisEalgaSiteonAdmiralty Chart | Size A3

Scale: 1:380,000 Printed @ A3

Coordinate System: IRENET95 Irish Transverse Mercator
Projection: Transverse Mercator

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1.2 Legislative Context

The Birds Directive (2009/147/EC) and the Habitats Directive (92/42/EEC) require European Union (EU) Member States to establish a network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. This network of sites is known as the Natura 2000 network. The network comprises Special Areas of Conservation (SACs) designated under the Habitats Directive, and Special Protection Areas (SPAs) designated under the Birds Directive. SPAs and SACs are designated by the individual member states. Sites which have been submitted to the European Union but which have not formally been adopted e.g. candidate SACs, proposed SPAs and Sites of Community Importance (SCI) also form part of the network and are treated as if fully designated.

A key requirement of the Habitats Directive is that the effects of any plan or project, alone, or in combination with other plans or projects, on the Natura 2000 site network, should be assessed before any decision is made to allow that plan or project to proceed. This process is known as Appropriate Assessment (AA). Each plan or project considered for approval, must take into consideration the possible effects it may have in combination with other plans and projects when going through the AA process.

The obligation to undertake AA derives from Article 6(3) and 6(4) of the Habitats Directive.

Article 6(3) of the Habitats Directive states 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, 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."

This provision is transposed into Irish law in respect of this foreshore application by Part 5 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No. 477 of 2011), (as amended). Regulation 42(1) of the 2011 Regulations provides for screening for Appropriate Assessment as follows:

"A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site."

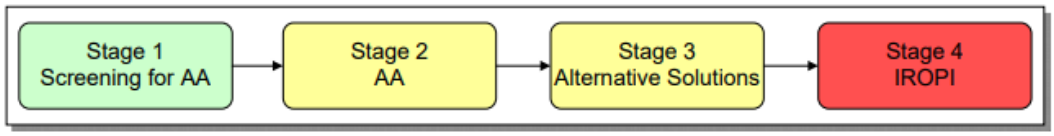
Regulations 42(6) and 42(7) provide for the outcome of screening for Appropriate Assessment as follows:

"The public authority shall determine that an Appropriate Assessment of a plan or project is required where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site. Alternatively, a public authority shall determine that an Appropriate Assessment of a plan or project is not required where: the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site."

Pursuant to the Foreshore Acts 1933 – 2011 (the "Foreshore Acts") this NIS will be submitted to the Foreshore Unit to support Foreshore Licence Application FS006859 for site investigation works at Inis Ealga.

The European Commission's methodological guidance (EC 2001) outlines a four-stage approach to the AA process, where the outcome at each successive stage determines whether a further stage in the process is required. The results at each step must be documented so there is transparency of the decisions made. The four stages are shown in Figure 1-3 and described below.

Figure 1-3 Stages of AA



1.2.2 Stage 1 - Screening for Appropriate Assessment

Stage 1 of the AA process is referred to as screening for Appropriate Assessment and identifies whether the proposed plan or project, either on its own or in combination with other plans or projects, would be "likely to have a significant effect" upon any European site. A likely effect is one that cannot be ruled out on the basis of objective information. The test is a 'possibility' of effects rather than a 'certainty' of effects. The test of significance is whether a plan or project could undermine the site's conservation objectives.

1.2.3 Stage 2 - Appropriate Assessment

If effects are considered likely to be significant, potentially significant or uncertain, or if the screening process becomes overly complicated, the process must proceed to Stage 2: Appropriate Assessment, with the preparation of a Natura Impact Statement to inform the Appropriate Assessment that is to be conducted by the competent authority.

The European Court of Justice has also made a relevant ruling on what should be contained within an Appropriate Assessment4:

"[The Appropriate Assessment] cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the works proposed on the protected site concerned".

1.2.4 Stage 3 – Alternative solutions

This stage examines any alternative solutions or options that could enable the plan or project to proceed without adverse effects on the integrity of a Natura 2000 site. Demonstrating that all reasonable alternatives have been considered and assessed, and that the least damaging option has been selected, is necessary to progress to Stage 4.

1.2.5 Stage 4 - Imperative Reasons of Overriding Public Interest (IROPI)/Derogation

Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a Natura 2000 site to proceed in cases where it has been established that no less damaging alternative solution exists.

The extra protection measures for Annex I priority habitats come into effect when making the IROPI case. IROPI reasons that may be raised for sites hosting priority habitats are those relating to human health, public safety or beneficial consequences of primary importance to the environment. In the

case of other IROPI for Annex I priority habitats, the opinion of the European Commission is necessary and should be included in the AA. Compensatory measures must be proposed and assessed. The European Commission must be informed of the compensatory measures. Compensatory measures must be practical, implementable, likely to succeed, proportionate and enforceable, and they must be approved by the Minister for Housing, Planning, Community and Local Government.

1.3 Aim of this Report

The aim of this report is to inform the AA process in determining whether the proposed site investigations, both alone and in combination with other plans or projects, are likely to have a significant effect on any Natura 2000 site. The effects of the site investigations on the Natura 2000 sites are considered in the context of the SPA and SAC conservation objectives and specifically on the habitats and species for which the Natura 2000 sites have been designated. If significant effects are likely then effects are examined to determine if they will either alone, or in combination with other plans or projects effect the integrity of the Natura 2000 site.

The NIS provides a description of the site investigation works (Section 2); the receiving environment (Section 3); and the potential pressures that could arise from the planned activities on the receiving environment (Section 4). It determines it there is any connectivity between the site investigation works and any Natura 2000 sites (Stage 1 AA Screening, Section 4) and considers the potential for adverse effects on the conservation objectives and qualifying interests within the affected Natura 2000 site(s) (Stage 2 Natura Impact Statement, Section 5). It concludes, in Section 5, with a statement for each Natura 2000 site as to whether the integrity of the site will be adversely affected and if necessary proposes mitigation to reduce the significance of effects.

This report has been prepared in accordance with current guidance:

- The European Commission notice "Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC", 21 November 2018;
- The Department of Arts, Heritage and the Gaeltacht “Marine Natura Impact Statements in Irish Special Areas of Conservation: A Working Document, April 2012.”
- The Department of Environment, Heritage and Local Government (DEHLG) Guidance “Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities, 11 February 2010.”
- The European Commission Guidance “Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, November 2001”.

2. PROJECT DESCRIPTION

2.1 Project Overview

The proposed site investigations (geophysical, geotechnical and environmental surveys) will enable:

- Detailed mapping of nearshore shallow geological and seabed character;
- Reconnaissance level mapping of seabed relief and features (i.e. archaeology);
- Greater understanding of metocean conditions; and
- Baseline environmental mapping.

The knowledge gained from the proposed survey would be used to minimise uncertainty in ground conditions at an early design stage and optimise cable routeing within the selected cable corridor.

Depending on the results of the proposed site investigations, other consents and permissions required to develop, install, operate and ultimately decommission an offshore wind energy project and associated export cables may be sought at a future date. Data acquired during the proposed survey would be used to inform environmental assessments in support of any required applications by providing information on the current situation and allowing impacts to be predicted, and subsequently appropriate mitigation to be developed. It may also be used at a later date to provide a baseline against which to monitor post construction effects of construction, operation and decommissioning.

2.2 Survey Schedule

The survey works will be carried out between April and October within the five years following award of the Foreshore licence and subject to weather conditions.

- **Geophysical survey (including Archaeology and Benthic)**: Summer 2020 (3 months window Mid-April to Mid-July) in association with the benthic sampling programme.
- **Geotechnical:** Option for preliminary survey Summer 2022 (2-month window August to September) and main survey Spring/Summer 2023 (4-month window).
- **Wind Resource Monitoring**: Start Summer 2020 for a minimum of 12 months and a maximum of 36 months.
- **Metocean Survey:** Current resource monitoring – Start Summer 2020 for a period of 3 months
- **Intertidal:** Spring 2021
- **Birds & Marine Mammal Survey:** Spring 2020 (2 years duration seasonal)

2.3 Geophysical Survey

Objective: The objective of the proposed geophysical survey is to:

- Map the seabed and sub-surface to optimise positioning of moorage/anchoring and cable routeing within the application area and to enable assessment of cable burial depth;
- Plan the scope and positioning of the geotechnical sampling programme in the application area;
- Identify marine habitat areas from which the benthic survey can be undertaken;
- Identify sensitive marine habitats that may need to be avoided during geotechnical and environmental sampling and infrastructure installation; and
- Provide the geophysical data from which a marine archaeological assessment can be undertaken as part of the consenting process.

Location: At this time the foreshore project area and potential export cable locations are based on desktop assessments, therefore, to be judicious it has been assumed that the geophysical surveys will be conducted across the whole of the application area. The survey will be undertaken within the boundary of the site and along the potential cable export routes and across mooring/anchorage areas. For each of the potential export cable corridors, it is likely that only a 1km corridor width within the application area will be surveyed. The spacing and number of the geophysical survey lines will be determined following further desk-based studies and liaison with geophysical survey contractors.

Equipment: Indicative equipment for the survey is provided below:

- **Multibeam echosounder (MBES) -** Equipment suppliers include: Konsberg and Teledyne RESON.
- **Side scan sonar (SSS) -** Examples include: GeoAcoustics 160 system, Klein Hydro Scan or similar. The SSS will be a dual frequency hydrographic sonar with a lowest operating frequency of not less than 100 kHz. Due to consent conditions in Irish waters, the higher frequency of the side scan sonar must be between 410 and 500 kHz.
- **Sub-bottom profiler (SBP) –** It is likely that two different systems will be used; a high-resolution profiler that will emphasise the top 3 to 5m of sediment with a resolution of 0.25m or better in a variety of geological conditions; and a system that provides increased penetration of up to twenty metres. Three systems (pinger, boomer and chirp) will be made available so that the most appropriate system can be chosen dependent on the seabed conditions. Examples include: GeoAcoustics 5430A profiling system, Edgetech 3100 or similar pinger system, Ultra High Resolution Seismic (UHRS) (sparker/boomer), Applied acoustics boomer plate AA251/AA301 or similar, Seismic Energy Source Applied Acoustics CSP-L or similar. The sub bottom profiler used during the proposed survey will only target the top 10m of sediments. Seismic equipment used in oil and gas industry is a lot more powerful, targeting hundreds of meters of sediment. Therefore, sounds generated from the proposed survey will be less intense and less harmful than sounds generated from oil and gas seismic surveys.
- **Magnetometer survey -** The marine magnetometer will be of the Caesium Vapour type and capable of recording variations in magnetic field strength during survey to an accuracy of±0.5nT. Examples include: Magnetometry (Total magnetic field survey) Geometrics G-882 caesium vapour magnetometer, Seaspy or similar.

Survey points and spacing: The swathe width for each piece of equipment will depend on water depth encountered. It is anticipated that the width of each swathe will allow for a 50% overlap between each swathe.

Vessel: Geophysical survey vessels are typically between 15m and 60m in length and have an endurance of up to 14 days. These vessels are likely to use a local port for mobilisation and replenishment.

2.4 Geotechnical Survey

Objective: The purpose of the proposed geotechnical survey is to evaluate the nature and mechanical properties of the superficial seabed sediments and intertidal sediments in the application area.

Location: At this time the foreshore project area and potential export cable locations are not known, therefore, to be judicious it has been assumed that the geotechnical sampling will be conducted across the whole of the application area. However, once the geophysical data has been analysed, the geotechnical sampling will be undertaken within the boundary of the site, along the potential cable export route, and across mooring/anchorage areas.

Vessel: Geotechnical survey vessels are typically between 55m and 90m in length and have an endurance of up to 28 days. Their port of mobilisation will depend on previous work but may be Irish, UK, or another European location.

Survey points and spacing: The exact location, quantity, type, and penetration of the geotechnical samples will be determined following interpretation of geophysical survey. Proposed geotechnical sample locations will be communicated to the National Monuments Service – Underwater Archaeology Unit for approval ahead of works commencing. Proposed locations will be accompanied by an assessment of the geophysical data by a qualified and experienced marine archaeologist.

Equipment: Geotechnical sampling will comprise:

- **200 no. Vibrcores (VC)**
  - Method: A vibrocore will be used to retrieve a soil sample by the lowering of a sample tube that is vibrated into the seabed.
  - Location: To be determined following review of geophysical data but indicative locations are provided in Figure 2-1.
  - Dimensions: Vibrocores may penetrate up to 6m into the seabed and have a diameter of 150mm. Therefore, sample volumes will be up to 0.12m^3. For 200 collected samples, the worst-case volume of sediment removed will be 24m^3.
  - Equipment: Indicative equipment to be used is a high performance corer (HPC) or a modular vibrocorer.
- **200 no. Cone Penetration Test (CPT)**
  - Method: A CPT will be used to test the characteristics of the soil by pushing an instrumented cone into the ground at a constant speed, with continuous measurement of the cone end resistance, the friction along the sleeve of the cone, and the pore water pressure.
  - Location: To be determined following review of geophysical data but indicative locations are provided in Figure 2-1.
  - Dimensions: CPT can achieve penetrations of up to 40m. No sediment will be removed from the seabed.
  - Equipment type: Indicative equipment to be used is a Seacalf seabed cone penetrometer test (CPT) system or similar and a deck mounted CPT.
- **2 no. Boreholes**
  - Method: There is potential for two boreholes to be drilled at the chosen landfall. A borehole is a method of drilling into the seabed to recover samples and enable downhole geotechnical testing to be completed. A drilling head is lowered to the seabed via a drill string. The drill string is then rotated to commence boring. Tools are lowered into the drill string to recover samples or conduct in-situ soil testing.
  - Equipment: The two boreholes will be drilled from a jack-up barge (JUB) using a percussion and a rotary corer. The number of legs used by the JUB is dependent on seabed conditions, current strength and wave action. For the application area, four legs are the most likely scenario. Each leg has a seabed footprint of approximately 2.54m^2.
  - Location: The exact location of boreholes will not be known until the preferred export cable route and landfall has been chosen. At this time it is assumed that it could be any landfall area in the application area.
  - Dimensions: Each borehole will acquire a core sample up to 112mm in diameter, creating a hole (and therefore a seabed footprint) 143mm in diameter (0.016m^2). Assuming a borehole depth of 25m (the likely maximum depth), the core sample removed will be approximately 0.25m^3. Risings dispersed around the drill site will have a volume of approximately 0.15m^3. Assuming cuttings will form a simple cone with an 18° slope angle around the drill head it has been

estimated that they will cover an area of 1.82m^2. The borehole will be left to collapse naturally following completion of drilling where the cuttings are likely to fall back down the hole.

The total expected seabed footprint of the geotechnical borehole sampling is shown in Table 2-1 below.

Table 2-1 Calculated footprint for 2 boreholes

Activity	Seabed footprint (m^2)
Jack-up barge legs (worst case assumes 4 legs deployed)	20.32
Borehole extraction*	0.032
Drill cuttings	3.64
Total	**23.96m^2**

*Footprint from borehole extraction is not included within total as it is assumed that it will be within the area of seabed disturbed by drill cuttings

2.5 Environmental Survey

Objective: The purpose of the proposed environmental survey is to map the distribution and extent of marine benthic habitats.

Location: Environmental sampling will be undertaken within the boundary of the site, along the three potential cable export routes, and across mooring/anchorage areas.

Survey points and spacing: The exact location and quantity of the environmental samples will be determined following interpretation of geophysical survey.

Equipment: Environmental survey will indicatively comprise:

- **80 no. Grab sampling**
  - Method: A grab sampler will be used to retrieve a soil sample of the seabed by the lowering of a mechanical grab. The grab will be launched from a vessel crane or A-frame. It is likely that three grab samples will be taken at each station; two for faunal analysis and one for sediment and chemical analysis.
  - Dimensions: Each grab samples a volume of approximately 0.1m^3. Grabs are required to obtain a sample greater than 5cm in depth, to try and achieve this, samples will be repeated for up to three attempts. If three samples are taken at each of 80 stations, then grab sampling will remove approximately 24m^3 of sediment.
  - Location: To be determined following review of geophysical data but indicative locations (informed by EMODnet habitat data) are provided in Figure 2-1.
  - Equipment: Indicative equipment is Day or Hamon Grab.
- **Drop-down camera and video transects**
  - Method: A minimum of four still photographs will be acquired at each environmental sampling station. Additional photographs or video footage will be acquired along transects to characterise sensitive habitats or features.
  - Dimensions: This technique involves no intrusive seabed sampling.
  - Location: To be determined following review of geophysical data but indicative locations (informed by EMODnet habitat data) are provided in Figure 2-1.

- Equipment: Indicative equipment to be used is a SeaSpyder using Canon EOS 100D Digital Still Camera with dedicated strobe and an integrated video system capable of performing full HD recordings.

- **Intertidal**
  - Objective: The aim of the survey will be to identify and map the extent and distribution of intertidal biotopes.
  - Method: Intertidal floral and faunal surveys at proposed cable landfall locations to include transects, quadrats and core sampling.
  - Location: The exact location of the intertidal survey will not be known until the preferred export cable route and landfall has been chosen. At this time, it is assumed that it could take place at any landfall area in the application area.

2.6 Birds & Marine Mammal Survey

Objective: To record the species type and distribution of marine mammal, turtle and bird species observed in the application area.

Method: Boat based marine mammals/reptile and seabird surveys including towed hydrophonic acoustic array and static acoustic monitoring using C-PODS.

Location: Location will depend on the location of the geophysical and geotechnical survey.

2.7 Wind Resource and Metocean Survey

Objective: To evaluate wind, wave and tidal conditions within the application area.

Equipment: Deployment of three seawatch wind LiDAR buoys or similar. Deployment of three acoustic doppler current profilers (ADCP) with marker buoys next to the LiDAR buoys.

Method: The LiDAR will be mounted on a buoy and will be moored using 150m long mooring chain and 3 tonne concrete anchor. The buoy will be moored to the seabed for a duration of 12 to 36 months and will be powered by solar panels and micro wind turbine generators. The buoy will be yellow in colour and will be clearly marked with two navigation lights (flashing amber, 5 flashes every 20 seconds, nominal range 3-6 nm visibility and fitted with a Radar reflector. The ADCP will be deployed via a vessel on-board crane and will sit on the seabed.

Location: Exact details of the LiDAR buoy, and ADCP deployment location within the application area, associated mooring arrangement and installation vessel will not be available until a contract has been awarded.

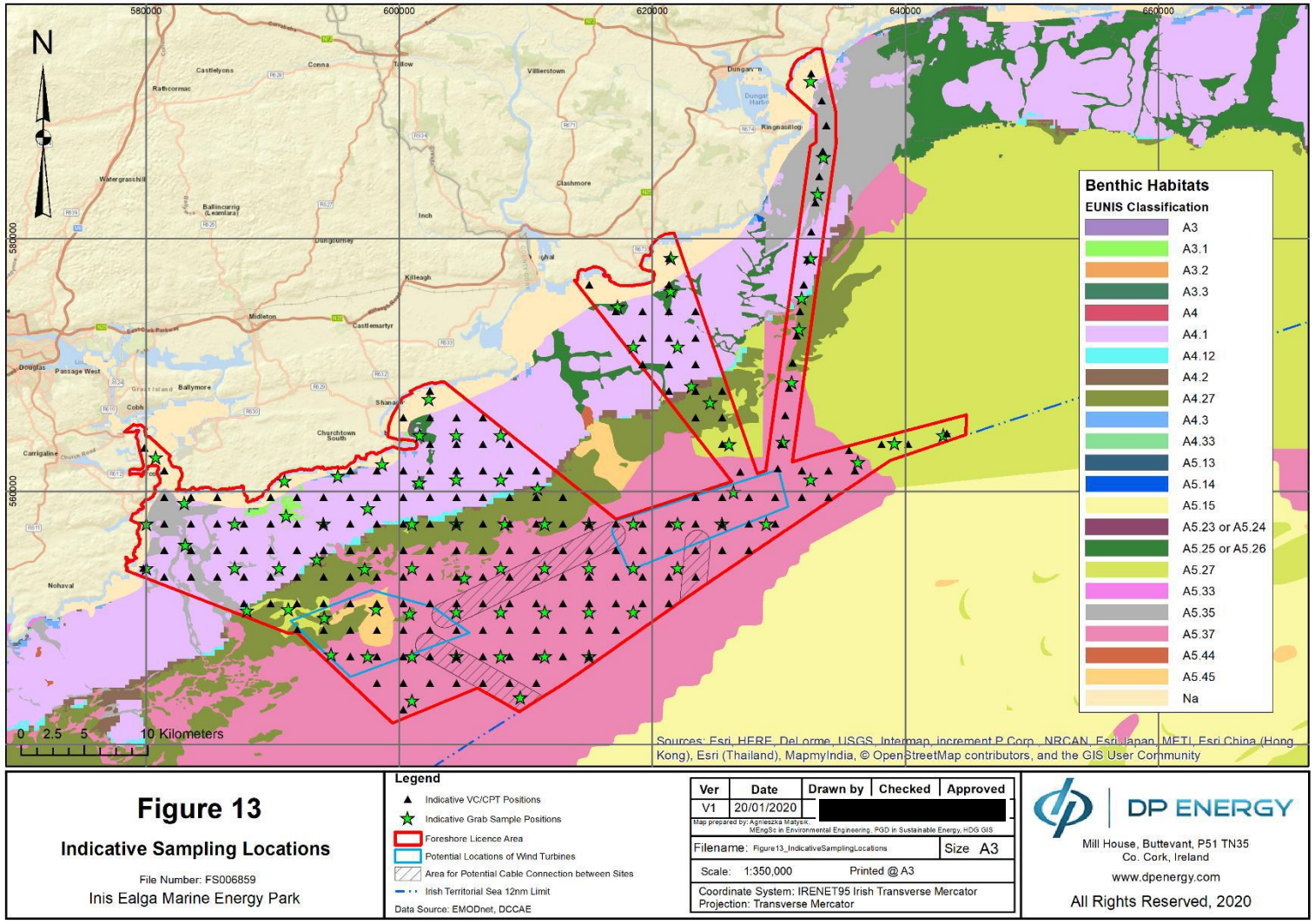
2.8 General Requirements

The survey contractor and vessels will comply with international and national statute as appropriate. In addition, the following standard environmental procedures/protocols will be followed during the survey campaign:

- All vessels will comply with the latest International Maritime Organization (IMO) and Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or offshore waters to be operated in.
- The contractor will take particular care when handling or storing hazardous materials, radiation sources and chemicals.
- Liquid or non-liquid pollutants or waste material will not be dumped, thrown or otherwise disposed of into the sea.

- All refuse and materials shall be kept onboard the vessel and safely disposed of onshore according to the MARPOL convention.
- All substances handled and/or used whilst undertaking the works will be handled, used, stored and documented in accordance with assessments and recommendations of the Control of Substances Hazardous to Health (COSHH) Regulations 1994.
- Where Fuels, Oils and Lubes are required to bestowed on boats, suitable containers will be used and stowed to allow ventilation and safe dissipation of any accidental leaked gas and retention of any leaked liquid.
- No liquid will be discharged into the water at any stage of the work on site. No smoking will be permitted in the vicinity of fuel in storage or when in use.
- The survey contractor will follow the Department of Arts Heritage and the Gaeltacht (DAHG) 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014); in particular Section 4.3.4 (ii) applicable to MBES, SSS and SBP surveys.

Figure 2-1 Seabed sampling locations (Figure 13 in ORE application form)



3. ENVIRONMENTAL BASELINE

An understanding of the likely significant effects of an operation on the environment requires a clear understanding of the present state of the environmental baseline. For the purposes of this report this section focuses on the environmental receptors associated with the Natura 2000 sites screened in Section 3.

The description of the environment is based on publicly available data sources, as referenced in the text.

3.1 Protected Sites

Natura 2000 sites (SACs and SPAs) within 15km of the application area are shown on Figure 3-1 and are listed in Table 3-1.

Table 3-1 Protected Sites within 15km

Designation	Site Code & Name	Site Code
SAC	Ardmore Head	002123
SPA	Ballycotton Bay	004022
SPA	Ballymacoda Bay	004023
SAC	Ballymacoda (Clonpriest and Pillmore)	000077
SPA	Blackwater Estuary	004028
SAC	Blackwater River	002170
SPA	Cork Harbour	004030
SAC	Comeragh Mountains	001952
SPA	Dungarvan Harbour	004032
SAC	Glendine Wood	002324
SAC	Great Island Channel	001058
SAC	Helvick Head	000665
SPA	Helvick Head to Ballyquin	004192
SPA	Mid- Waterford Coast	004193
SPA	Sovereign Islands	004124

Figure 3-1 Protected sites within 15km of application area (Figure 9 in ORE application form)

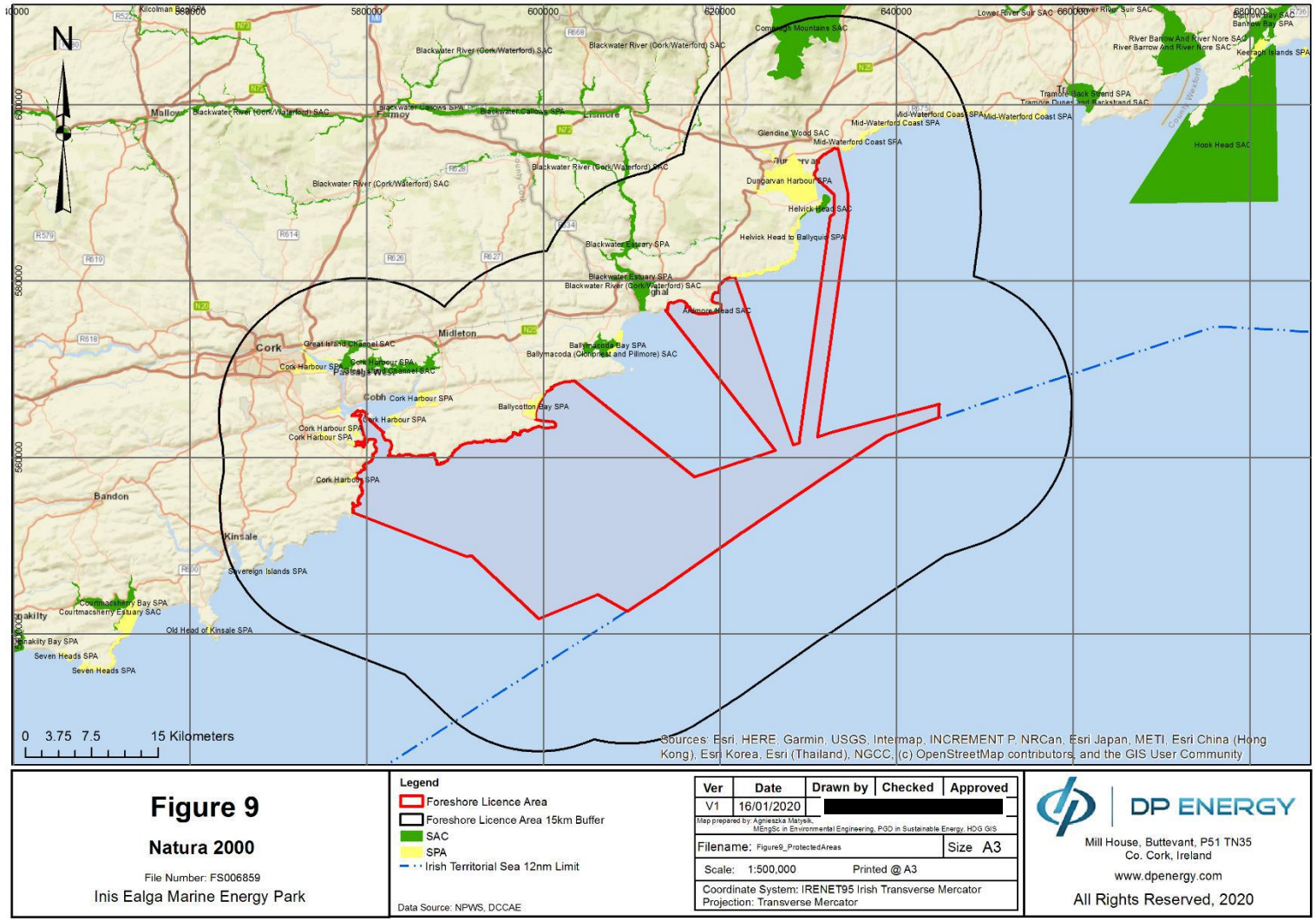


Figure 9

Natura 2000

File Number: FS006859

Inis Ealga Marine Energy Park

Legend

- Foreshore Licence Area
- Foreshore Licence Area 15km Buffer
- SAC
- SPA
- Irish Territorial Sea 12nm Limit

Data Source: NPWS, DCCAE

Ver	Date	Drawn by	Checked	Approved
V1	16/01/2020	[redacted]		

Map prepared by: Agnieszka Matyek, MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDG GIS

Filename: Figure9_ProtectedAreas | Size A3

Scale: 1:500,000 Printed @ A3

Coordinate System: IRENET95 Irish Transverse Mercator
Projection: Transverse Mercator

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3.2 Intertidal and Benthic Communities

Intertidal and benthic ecology comprises the habitats and species (flora and fauna) present in, on or closely associated with the seabed. A high-level assessment of the key sensitive intertidal and benthic habitats and species within the application area has been made by reviewing:

- European Marine Observation Data Network (EMODnet) Seabed Habitats project (www.emodnet-seabedhabitats.eu) - EUSeaMap broad-scale predictive mapping based on physical hydrographic information within different habitats areas and water depths

This data is predictive rather than definitive, however it does provide some indication to the types of benthic habitats that may be found within the application area. The habitats identified within the foreshore area, along with their European Nature Information System (EUNIS) code, are listed in Table 3-2 and shown in Figure 3-2 below.

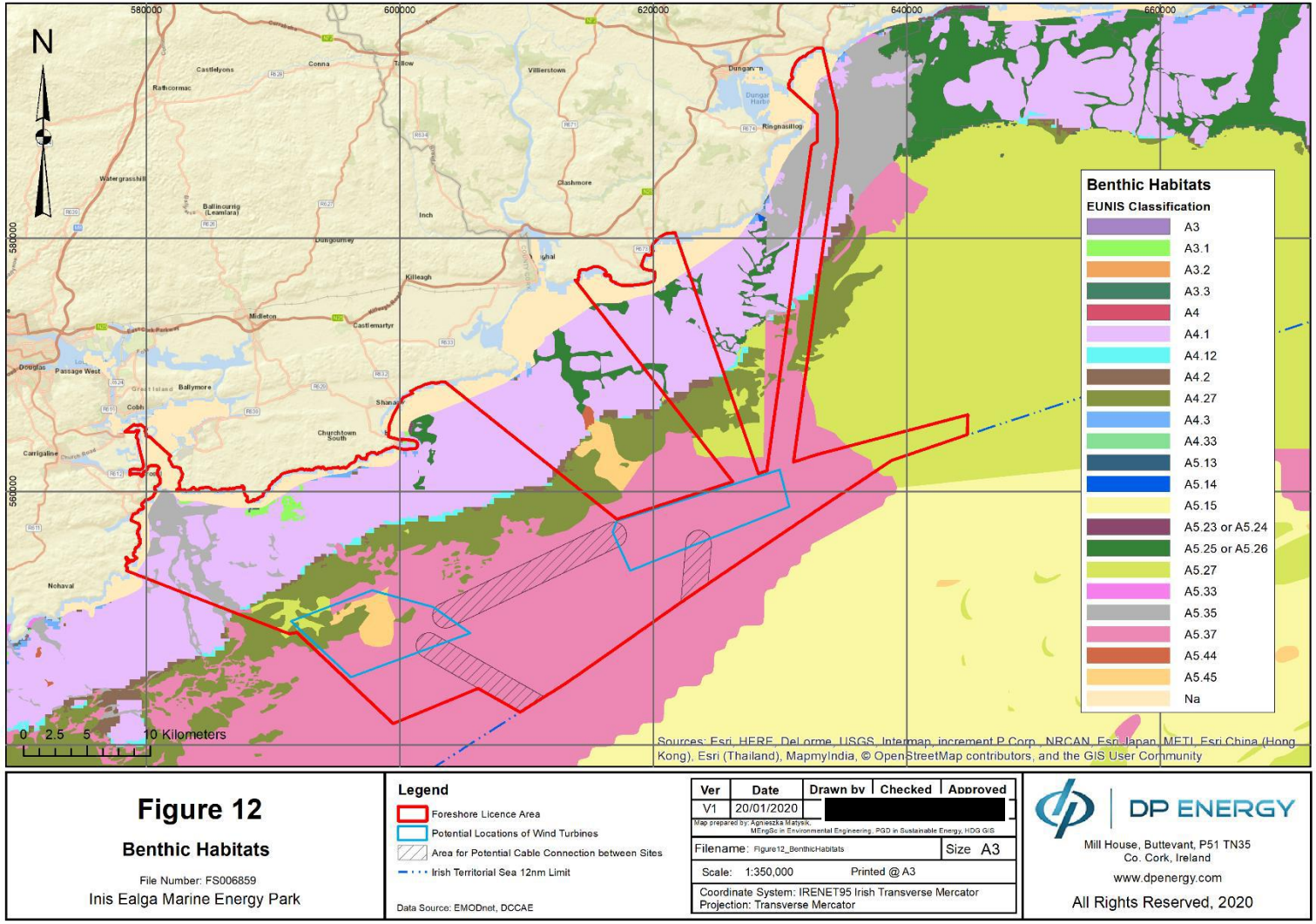
Table 3-2 Habitats present within the application area

EUNIS code	EUNIS name	Typical fauna
A4.1	Atlantic and Mediterranean high energy circalittoral rock	Occurs on extremely wave-exposed to exposed circalittoral bedrock and boulders subject to tidal streams ranging from strong to very strong. Typically found in tidal straits and narrows. The high energy levels found within this habitat complex are reflected in the fauna recorded. Sponges such as *Pachymatisma johnstonia*, *Halichondria panicea*, *Esperiopsis fucorum* and *Myxilla incrustans* may all be recorded. Characteristic of this habitat complex is the dense 'carpet' of the hydroid *Tubularia indivisa*. The barnacle *Balanus crenatus* is recorded in high abundance on the rocky substrata. On rocky outcrops, *Alcyonium digitatum* is often present. In EUSeaMap broad-scale predictive mapping this habitat is classified as 'circalittoral rock and biogenic reef'. It is therefore possible that EC Habitats Directive Annex listed habitat biogenic reef maybe observed in these areas.
A4.12	Sponge communities on deep circalittoral	Occurs on deep (commonly below 30m depth), wave-exposed circalittoral rock subject to negligible tidal streams. The sponge component of this biotope is the most striking feature. *Phakellia ventilabrum*, *Axinella infundibuliformis*, *Axinella dissimilis* and *Stelligera stuposa* dominate. Other sponge species frequently found on exposed rocky coasts are also present in low to moderate abundance. These include *Cliona celata*, *Polymastia boletiformis*, *Haliclona viscosa*, *Pachymatisma johnstonia*, *Dysidea fragilis*, *Suberites carnosus*, *Stelligera rigida*, *Hemimycale columella* and *Tethya aurantium*.
A4.27	Faunal communities on deep moderate energy circalittoral rock	These communities populate hard substrata with low hydrodynamics and strong sedimentation.
A3.1	Atlantic and Mediterranean	Rocky habitats in the infralittoral zone subject to exposed to extremely exposed wave action or strong tidal streams. Typically, the rock supports a community of kelp *Laminaria hyperborea* with foliose seaweeds and animals, the latter tending to become more

EUNIS code	EUNIS name	Typical fauna
	high energy infralittoral rock	prominent in areas of strongest water movement. The depth to which the kelp extends varies according to water clarity. The sublittoral fringe is characterised by dabberlocks *Alaria esculenta*.
A5.27	Offshore circalittoral sand	Offshore (deep) circalittoral habitats with fine sands or non-cohesive muddy sands. Very little data is available on these habitats however they are likely to be more stable than their shallower counterparts and characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms.
A5.35	Circalittoral mud	Circalittoral, cohesive sandy mud, typically with over 20% silt/clay, generally in water depths of over 10 m, with weak or very weak tidal streams. This habitat is generally found in deeper areas of bays and marine inlets or offshore from less wave exposed coasts. Sea pens such as *Virgularia mirabilis* and brittlestars such as *Amphiura* spp. are particularly characteristic of this habitat whilst infaunal species include the tube building polychaetes *Lagis koreni* and *Owenia fusiformis*, and deposit feeding bivalves such as *Mysella bidentata* and *Abra* spp.
A5.37	Deep circalittoral mud	In mud and cohesive sandy mud in the offshore circalittoral zone, typically below 50-70 m, a variety of faunal communities may develop, depending upon the level of silt/clay and organic matter in the sediment. Communities are typically dominated by polychaetes but often with high numbers of bivalves such as *Thyasira* spp., echinoderms and foraminifera.
A5.45	Deep circalittoral mixed sediments	Offshore (deep) circalittoral habitats with slightly muddy mixed gravelly sand and stones or shell. This habitat may cover large areas of the offshore continental shelf although there is relatively little data available. Such habitats are often highly diverse with a high number of infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore gravels and coarse sands and in some areas populations of the horse mussel *Modiolus modiolus* may develop in these habitats.

The seabed sediments within the application area are fairly homogenous and largely comprised of deep circalittoral mud (A5.37). These sediments are likely to be characterised by polychaetes, bivalves and echinoderms. Sediments in the foreshore, closer inshore along the eastern export route corridor largely consist of circalittoral mud (A5.35) near the estuarine areas, a large area of circalittoral rock runs parallel (A4.1), which is likely to be dominated by sponges, hydroids and barnacles.

Figure 3-2 Benthic Habitats (Figure 12 in ORE application form)



3.3 Birds

The coastal sea cliffs, estuaries and offshore islands of Ireland are host to nationally and internationally important bird species, with many areas designated as SPAs.

At least 45 species of seabird (including divers and grebes) have been recorded during at-sea surveys in Irish waters, of which 23 species regularly breed around Ireland (Pollock et al 2008, Mackey et al 2004). In addition, a further 59 species of waterfowl and wader regularly occur at coastal sites such as estuaries around Ireland; including 5 grebe species, 2 heron species, 26 species of wildfowl and 26 wader species (Crowe 2005). Some of these species are migratory and are present only during migration periods in spring and autumn; others come to Ireland to breed or to spend the winter, while some are resident all year round.

The application area lies within or near the following SPAs, designated for breeding and over-wintering bird species:

- Ballycotton Bay SPA
- Ballymacoda Bay SPA
- Blackwater Estuary SPA
- Cork Harbour SPA
- Dungarvan Harbour SPA
- Helvick Head to Ballyquin SPA
- Mid-Waterford Coast SPA
- Sovereign Islands SPA

Further details on these sites are provided in Section 4 – Stage 1 Screening for Appropriate Assessment.

3.4 Fish

Offshore gravelly sediments on the shelf in the Irish Sea are dominated by elasmobranchs (rays, skates and sharks), gurnards, cod, large whiting and a few flatfish species. Soft muddy sediments have higher numbers of gadoids and lower densities of plaice and dab than found in shallower sandy areas. The seasonal distributions of pelagic species such as mackerel, horse mackerel and herring are present within Irish waters largely on a seasonal basis, migrating between spawning and feeding grounds (DCCAE 2015).

Fish communities present within coastal areas include juvenile flatfish and sandeel over sandy sediments, with seasonal influxes of sprat, herring, juvenile gadoids and mullet. Rocky shore fish assemblages are diverse and dominated by small species such as wrasses, gobies and blennies, as well as juvenile pollock and saithe (DCCAE 2015).

The application area is within the spawning and nursery grounds for nine species of fish (Figure 3-3). A summary of the spawning and nursery periods for seven of these commercially important fish species is outlined in Table 3-3. The application area is a primary spawning ground for Atlantic cod (*Gadus morhua*), European hake (*Merluccius merluccius*), Herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), Whiting (*Merlangius merlangus*) and Haddock (*Melanogrammus aeglefinus)* (see Table 3-3 below). As indicated by Figure 3-3, the application area is also within the nursery grounds of white belly angle monk (*Lophius* sp) and megrim (*Leidorhombus whiffiagonis*). No data on spawning and nursery period is available for these two species.

The EC Habitats Directive Annex II listed species, sea lamprey, river lamprey, brook lamprey, twaite shad and Atlantic salmon are listed as designated features of the River Barrow and River Nore SAC and Blackwater River (Cork/Waterford) SAC. All of these (except for brook lamprey) are migratory species that may be found in the application area at certain times of the year:

- Sea lamprey – late April to early June
- River lamprey – September to June
- Twaite shad – year round and migrate into rivers from April-July
- Atlantic salmon – May to June and autumn months.

Brook lamprey do not migrate to the sea and therefore will not be observed in the application area. Twaite shad are the only fish from the above list known to be sensitive to underwater noise. As part of the clupeidea family, they are considered a high sensitivity hearing species because they have a specialisation of the auditory apparatus where the swim bladder and inner ear are intimately connected. Clupeids are able to detect frequencies to over 3kHz; with optimum sensitivity between 300Hz-1kHz (Nedwell et al. 2007). Species, such as Atlantic salmon and sea and river lamprey have a lower sensitivity to sound as their swim bladder is located far from the ear (Popper et al 2004). Therefore, these species will only be sensitive to sound sources with a rapid pressure change, i.e. unexploded ordnance detonation.

Important *Nephrops norvegicus* grounds occur on soft muddy sediments within the Celtic and Irish Seas. Brown, or edible, crabs are distributed throughout the continental shelf area to the north and west of Ireland and the rocky areas of the Irish Sea. Populations of scallops and queen scallops may also occur in areas of gravelly sediments (DCENR 2015). Fisheries data from the Marine Management Organisation (MMO) and Scientific, Technical and Economic Committee for Fisheries (STECF) fisheries (landings and activity) has found that the area is important for lobster, Nephrops, crabs, scallops, razor clams and whelks (STECF 2018 and MMO 2018).

Table 3-3 Summary of spawning and nursery periods for commercially important fish species within the application area

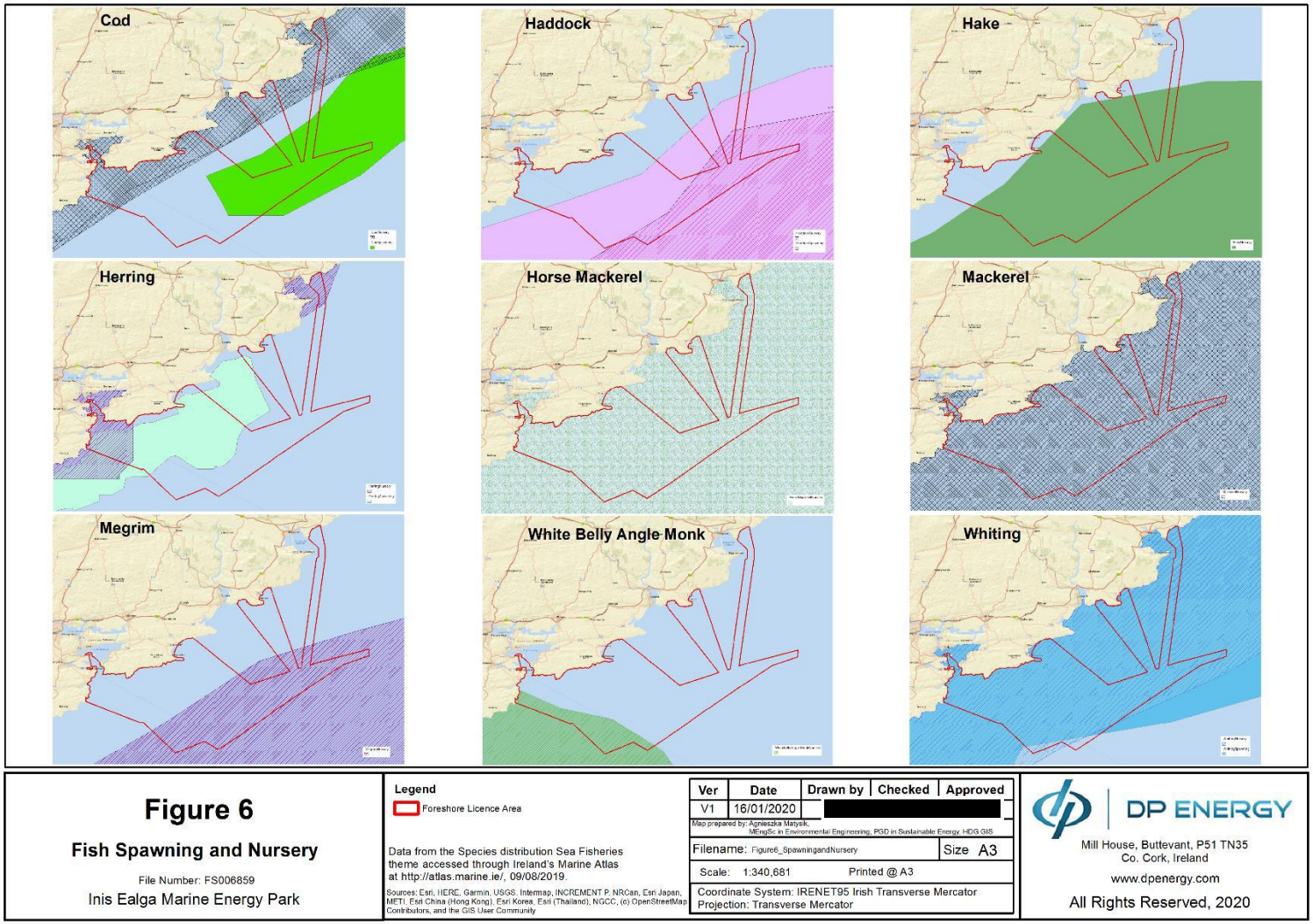
Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Atlantic cod (N)	SN	S*N	S*N	SN	N	N						
European hake (N)	N	N	N	N	N	N	N	N				
Herring (S) (N)	SN	SN	SN	N	N							
Atlantic mackerel (N)			N	N	N	N	N	N	N			
Whiting (S) (N)		SN	SN	SN	SN	SN	N	N				
Haddock (S) (N)		SN	SN	SN	SN	N	N					
Horse Mackerel (N)			N	N	N	N	N	N	N	N		

S = Spawning, N = Nursery, SN = Spawning and Nursery, Blank = No Data, *peak spawning.

Grey shading indicates likely survey period.

Source: Coull *et al*. 1998; Ellis *et al*. 2012.

Figure 3-3 Fish spawning and nursery grounds (Figure 6 in ORE application form)



3.5 Marine Mammals

Marine mammals present in the application area are cetaceans (whales, dolphins and porpoises) and pinnipeds (seals), with otter possibly present in the nearshore area.

Of the 24 species of cetacean recorded in Irish waters, approximately 12 of these have been recorded off the south-south east coast and may be present in the application area at least on a seasonal basis. These species are listed in Table 3-4. It is unlikely that deep water species such as the blue whale and long-finned pilot whale will be present.

The Irish Whale and Dolphin Group (IWDG) website (http://www.iwdg.ie/) has 623 records of cetacean sightings near the survey area for the period December 2018 to December 2019. Species identified include harbour porpoise; minke whale; Risso's dolphin; bottlenose dolphin; common dolphin; killer whale, fin whale and humpback whale. Observations have been included in Table 3-4.

Most cetaceans are wide-ranging, and individuals encountered within Irish waters form part of a much larger biological population whose range extends into adjacent jurisdictions. As a result, management units (MUs) have been outlined for seven of the common regularly occurring species following advice from the Sea Mammals Research Unit (DECC 2016) and the International Council for the Exploration of the Sea (ICES). These provide an indication of the spatial scales at which impacts of anthropogenic activities should be taken into consideration. The relevant MUs are listed in Table 3-4.

Table 3-4 Cetacean species whose distribution includes the application area

Species	Frequency of sightings*	IWDG sightings (April – October 2019)	Estimation of density (animals/km²)**	Applicable MU***	Abundance of animals in MU***
Toothed whales (odontocetes)					
Harbour porpoise (*Phocoena phocoena*)	Common from June through the autumn/winter. Peak period in August.	82 sightings; All year, December - December	0.118-0.239	Celtic and Irish Seas	47,229
Short-beaked common dolphin (*Delphinus delphis*)	Peak period is spring and summer and winter peak on the south coast associated with prey items.	232 sightings; All year, December – December	0.374	Celtic & Greater North Seas	56,556
Bottlenose dolphin (*Tursiops truncatus*)	Common year round but most frequent in summer.	19 sightings; April, May July, August.	0.008 - 0.06	Offshore Channel and SW England	4,856
Risso's dolphin (*Grampus griseus*)	Peak period in April - Sept	7 sightings; May, June, July	0.031	Celtic & Greater North Seas	No data available
White-beaked dolphin (*Lagenorhynchus albirostris*	Irregular in Irish Sea. More regular in late summer – autumn.	No sightings	No data available	Celtic & Greater North Seas	15,895
Long-finned pilot whale (*Globicephala melas*)	Most frequent between April and September	No sightings	No data available	N/A	No data available
Killer whale (*Orcinus orca*)	Occasional sightings in Irish Sea waters.	2 sightings; July	No data available	N/A	No data available
Baleen whales (mysticetes)					
Minke whale (*Balaenoptera acutorostrata*)	Peak period July and August	170 sightings; March - November	0.017	Celtic & Greater North Seas	23,528
Humpback whale	Occasional sightings in Irish Sea waters.	51 sightings; May - December	No data available	N/A	No data available

Species	Frequency of sightings*	IWDG sightings (April – October 2019)	Estimation of density (animals/km²)**	Applicable MU***	Abundance of animals in MU***
(*Megaptera novaeangliae*)					
Fin whale (*Balaenoptera physalus*)	Unclear, contradictory evidence with sightings during summer months, and acoustic monitoring data suggest a peak in November – December.	60 sightings; May - November	No data available	N/A	No data available

Sources: * Marine Institute (2019a), Reid et al. (2003), IWDG (2019); ** Hammond et al (2017) ICES Management Units D (Irish seas) and *** DECC (2016).

All cetaceans are European Protected Species (EPS) protected under Annex IV of the EC Habitats Directive (92/43/EEC), which lists species of Community Interest in need of strict protection. It is an offence to deliberately capture, kill, injure or disturb animals classed as EPS. In addition, harbour porpoise, bottlenose dolphin, grey seal and common/harbour seal are listed under Annex II of the Habitats Directive, which lists species whose conservation requires designation of SAC.

In 1997, the Habitats Directive was transposed into Irish national law through Statutory Instrument (S.I) Number 94/1997 - European Communities (Natural Habitats) Regulations 1997. These were subsequently revised and consolidated in S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011, which covers the terrestrial environment and marine waters up to the 12nm limit.

The application area is within the Celtic and Irish Sea MU for harbour porpoise. Within the MU there are five SACs designated for the conservation of harbour porpoise; Rockabill to Dalkey Island SAC and the Roaringwater Bay and Islands SAC in Irish waters; and the Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC, West Wales Marine / Gorllewin Cymru Forol SAC; North Anglesey Marine/ Gogledd Môn Forol SAC in UK waters (JNCC 2017). As harbour porpoise are highly mobile species, animals from these sites maybe visitors to the application area. In UK waters, the Cardigan Bay/Bae Ceredigion SAC has been designated for the conservation of bottlenose dolphin.

Two species of seal are resident within Irish waters and will be observed in the application area; grey seal (*Halichoerus grypus*) and harbour (or common) seal (*Phoca vitulina*). Ireland's Marine Atlas identifies the coastline of the application area as within the distribution of Ireland's populations of both grey and harbour seal. Russel et al (2017) provide grey seal densities in the application area as <5 animals per 25km^{2,} whilst harbour seal densities are lower at <1 animal per 25km^2.

The closest SACs listing grey seal as a designating feature are the Saltee Islands SAC (51km east of the application area) and Roaringwater Bay SAC (98km west of the application area). The closest SAC for harbour seal is the Slaney River SAC, 72km north east of the application area.

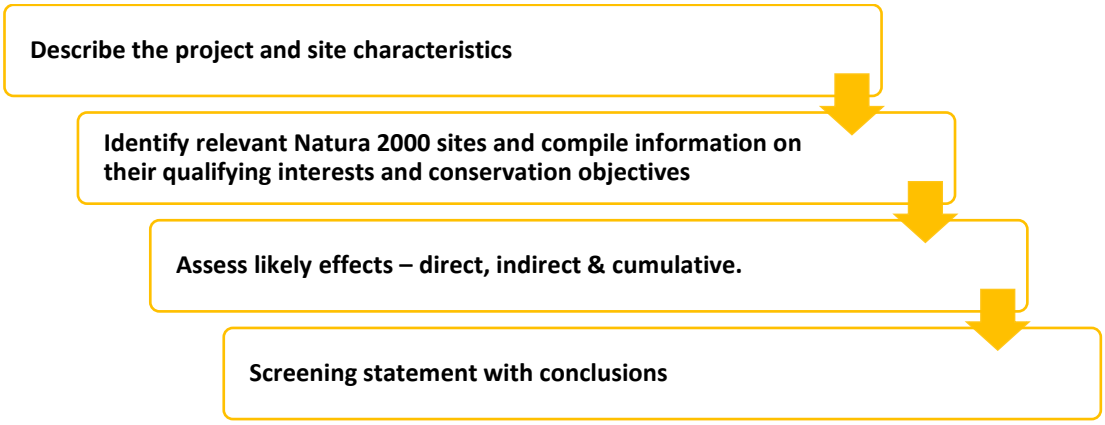
Otter (*Lutra lutra*) are protected within Ireland under the Wildlife Amendment Act (2000) where it is now illegal to hunt, disturb, or intentionally kill otters. The otter is also listed on Annex II and Annex IV of the EU Habitats Directive (92/43/EEC). The National Biodiversity Data Centre (www.maps.biodiveristy.ireland.ie) have sightings data for otter along the coastline within the application area, although none of the SACs within 15km of the application area list otter as a Designating Feature.

4. STAGE 1 – APPROPRIATE ASSESSMENT (AA) SCREENING

4.1 Approach to AA Screening

This AA screening has been undertaken according to the process set out in the National Parks and Wildlife Services (NPWS) and Department of the Environment, Heritage and Local Government (DEHLG) (2010) Guidance; following the process illustrated in Figure 4-1. It has considered all case law relevant to the Habitats Directive summarised in the recently issued European Commission Guidance (European Commission 2018).

Figure 4-1 AA Screening Process



The structure for the remainder of the AA screening therefore reflects the key steps in this process.

4.2 Describe the Project and Site Characteristics

Full details of the scope of work are provided in Section 2 above. The site characteristics i.e. the baseline environment within the application area, are described in Section 3.

4.3 Identification of Relevant Natura 2000 Sites

The potential for a Natura 2000 site to be significantly effected depends on whether receptors which are designating features of a Natura 2000 site:

a. Can come into contact with the surveys; and

b. Are sensitive to the survey activities to the extent that the activity is likely to have an adverse effect on the conservation objectives for the features.

Identifying relevant Natura 2000 sites has therefore been achieved by applying the following steps:

1. Identify which receptors could be sensitive to the survey activities;
2. Identify potential effects the surveys could have on these receptors and what the zone of influence for these receptors is, i.e. how far from the survey could a receptor be potentially effected;
3. Screen SACs and SPAs within these zones of influence to identify designating features and assess whether interest features of the site could be significantly affected by the proposed survey activities; and

4. Assess whether any SACs and SPAs further afield from the survey area have mobile qualifying species which may travel into the zone of influence and have the potential to be significantly affected.

4.3.1 Identification of sensitive receptors

The receptors which could potentially be affected by the marine surveys and could be the designating interest features of Natura 2000 sites in the region are:

- Benthic habitats;
- Fish;
- Birds; and
- Marine mammals.

4.3.2 Identification of potential effects, defined zones of influence and search area

Irish Guidance states that all sites within 15km should be screened. However, this approach does not take into consideration the mobility of the receptor and the zone of influence of the activities proposed. Therefore, although all Natura 2000 sites with marine components within 15km of the application area have been screened consideration has also been given to the how sensitive receptors could be affected and what the zone of influence (the geographical extent over which an effect on the receiving environment is predicted to occur) is likely to be in defining the search area for relevant Natura 2000 sites.

The geographical extent of the likely zone of influence for non-mobile receptors such as benthic communities will represent the required search area for relevant Natura 2000 sites. For highly mobile species such as fish, birds and marine mammals the Natura 2000 sites which are most likely to be significantly affected will be those within or near the zone of influence. A justification for the established zone of influence and search area for each receptor is explained below:

Benthic habitats have the potential to be directly affected in three ways:

- During the geotechnical and environmental surveys from the very small removal of sediment samples;
- Through very localised temporary smothering by the deposition of risings from the geotechnical boreholes; and
- Through smothering by positioning of equipment on the seabed e.g. JUB legs, or concrete anchors.

Given that sampling points have not been determined (positions on figures are indicative only), the zone of influence for benthic communities has been assumed to be the entire application area. Relevant sites would include SACs designated for Annex I habitats which support benthic communities. Therefore, only SACs designated for benthic habitats which the application area passes directly through have been screened for Annex I habitats.

Fish have the potential to be affected by the geophysical survey from changes in underwater noise. Effects range from temporary behavioural changes, or temporary hearing loss, through to migration pathways being impeded by a noise barrier. As discussed in Section 3.4, of the four migratory Annex II species known to be present in the vicinity of the application area, only twaite shad are known to be sensitive to underwater noise.

Underwater noise modelling, provided in Appendix A, concludes that the zone of influence for direct effects from underwater noise to hearing sensitive fish species is within 2.2km of the application area. However, there is the potential that the noise could also impede migration from rivers near the

application area. Natura 2000 sites within 40km of the application area have therefore been screened for the presence of twaite shad as a designating interest feature.

Marine birds – the physical presence of the survey vessels could cause a small degree of disturbance to birds in the vicinity of the works. Whilst birds present on the surface waters near the survey vessel could be temporarily displaced from their chosen feeding/resting location, they are likely to readily move to another nearby location. Given the short duration of the operations with the vessel moving steadily forward along the survey route any disturbance at a given location is likely to be minimal. Combined with the existing shipping activity in the region, the introduction of the survey vessel(s) is unlikely to be felt against typical fluctuations in background levels. Therefore, most birds are unlikely to be significantly disturbed.

Advice on how to present assessment information on the extent and potential consequences of seabird displacement from offshore wind farm developments published by the UK Joint Statutory Nature Conservation Bodies (JNCC 2017) states that for most bird species a standard displacement buffer of 2km is recommended. For divers and sea ducks this should be extended to 4km. The most vulnerable birds to disturbance would be nesting birds in the breeding season in the immediate vicinity of the survey. Disturbance to nesting birds caused by the presence of the survey vessel could have an effect on the success rate of the breeding population. The zone of influence of disturbance on nesting birds has been assessed as up to 2km from the application area.

To allow for the mobility of bird species which could forage into the zone of influence, all sites designated for bird species within 15km have been screened. The designating species have then been studied to determine the potential for interaction with the proposed survey works.

Marine mammals have the potential to be effected by changes in underwater noise. EC Habitats Directive Annex II marine mammal species present in the application area include grey seal, harbour sea, bottlenose dolphin and harbour porpoise.

Underwater noise modelling, provided in Appendix A, concludes that the zone of influence for disturbance from underwater noise is 2.6km from the sound source. Relevant sites would include SACs designated for marine mammals within 3km of the application area. However, in recognition of the highly mobile nature of marine mammals, the following has been assumed and used to define the area of search for relevant Natura 2000 sites:

- Any harbour porpoise or bottlenose dolphin from Natura 2000 sites located in the relevant Management Unit could be present in the application area. The MU for harbour porpoise is the Celtic and Irish Sea; for bottlenose dolphin it is the Irish Sea and offshore Channel and SW England;
- It is estimated that grey seal forage up to 100km from their haul out sites (DECC 2016); and
- Harbour seal are not known to make trips greater than 50km from haul out sites (DECC 2016).

In summary, Table 4-1 defines the search areas used to identify relevant Natura 2000 sites for screening.

Table 4-1 Search areas and zone of influence

Interest feature	Species	Search Area	Zone of influence
Fish	Atlantic Salmon; twaite shad	40km	2.2km
Birds	Most bird species	15km	2km
	Divers, seaduck	15km	4km
Cetacean	Harbour porpoise	Celtic and Irish Sea MU	2.6km (disturbance)
	Bottlenose dolphin	Irish Sea and Offshore Channel and SW England MU	
Pinniped	Grey seal	100km	
	Harbour seal	50km	

4.3.3 In-combination effects

A key requirement of the Habitats Directive is that the effects of any project on the Natura 2000 site network should be considered in combination with other plans or projects.

A search of Foreshore Applications for surveys or other activities which could interact with the proposed works was conducted using the DHPLG 'Applications and Determinations' website. Table 4-2 and Figure 4-3 lists all applications listed on the website which could interact with the application area.

Table 4-2 Development applications near to Inis Ealga application area

Name of development	Licence ref	Type of activity	Commencement date	Licence Status	Distance from application area (km)
IFC-1- Ireland - France Subsea Cable Ltd - Clonea	FS006766	MBES, magnetometer, SSS, grab, CPT, VC and archaeological	September 2017 August 2018	Complete*	Intersects far eastern export route
PiPiper infrastructure fibre optic data cable	FS006528	Cable installation	2015	Consultation	Intersects western export route
Current Oil and Gas Authoirsations	DCENR website indicates that there are currently no planned seismic surveys for these areas in the next 5 years.				
Helvick (oil exploration) field		Lease Undertaking – no current plans for survey	1 March – 28 February 2018	Complete	1.5km
Energia – windfarm Helvick Head (PSE Kinsale Energy)	FS006982	Geophysical, Geotechnical, Archaeological, Ecological, Oceanographic and Meteorological investigations	Geophys and Geotech and ecological – Spring -September 2020 Completion campaign – spring/summer 2021	Consultation	Intersects eastern export cable route
Celtic Sea Array Survey	FS006983	Assumed to be - MBES, magnetometer, SSS, grab, CPT, VC, ecological, archaeological, wind and current monitoring	Between April and October within the five years of license award (likely 2020 -2025)	Consultation	7.2km
Greenlink Interconnector	FS006582	Geophysical, Geotechnical, Archaeological, Ecological,	Complete Autumn 2018	Complete	60km
Greenlink Interconnector	FS007050	Cable installation (including pre-installation geophysical survey- MBES, magnetometer, SSS)	2020 -2023	Consultation	60km

* DHPLG website says in Consultation but Intertek are aware that this has been completed.

PiPiper infrastructure fibre optic data cable – Ballycotton Bay
The foreshore licence application was submitted in October 2014 and installation was planned to commence in 2015. This application is still under consultation which suggests the project has been put on hold.

Energia – windfarm Helvick Head
A foreshore licence application was submitted on May 2019, to determine optimum windfarm layout design of a 600-1000MW development. The proposed survey works will likely be carried out between April and September 2020 with the completion campaign being carried out in spring/summer 2021. The geophysical survey campaign is expected take up to 3 months. Geotechnical survey works will be undertaken once geophysical works have been completed and the necessary archaeological assessment of data has been carried out. Geotechnical survey works are expected to take up to 2 months. DHPLG website indicates that the application is still in the 'Consultation' phase which would indicate that permission has not yet been granted. There is potential that the survey works for this project would overlap (in time) with the Inis Ealga proposed survey works.

Celtic Sea Array Survey – Waterford
A foreshore licence application was submitted on 19 March 2019, to carry out survey works to assess the site and seabed to assess the suitability of two areas of interest for cable installation associated with a potential circa 800MW offshore wind development. The proposed survey works will likely be carried out between April and October within the five years following award of the Foreshore Licence (likely Q4 2019). The geophysical survey campaign is expected take up to 2 months. Geotechnical survey works will be undertaken once geophysical works have been completed and the necessary archaeological assessment of data has been carried out. Geotechnical survey works are expected to take up to 3 months. DHPLG website indicates that the application is still in the 'Consultation' phase which would indicate that permission has not yet been granted. There is potential that the survey works for this project would overlap (in time) with the Inis Ealga proposed survey works .

Greenlink Interconnector – Greenlink Interconnector Limited - Baginbun Beach
A Foreshore Licence application was submitted on 21 December 2017 to carry out survey works to assess the site and seabed in order to select an optimum route for two submarine electricity power cables. Public consultation was carried out from 23 January 2018 to 22 February 2018. Although the DHPLG website indicates that the application is still in the 'Consultation' phase, DP Energy is aware that the licence was granted and geophysical surveys were completed in autumn 2018. A second Foreshore Licence application was submitted in August 2019 (ref FS007050) for the installation of the interconnector and is currently under consultation. The cable is due to be installed in 2020-2023, subject to obtaining the necessary permits and consents. There is therefore the potential that cable installation works could occur at the same time as the proposed Inis Ealga survey.

4.4 Screening of Natura 2000 sites

A geographic information system (GIS) was used to map the boundaries of SACs and SPAs in relation to the application area. All SACs and SPAs which are within the defined search areas for identified receptors have been listed along with their qualifying features in Table 4-3. A total of 19 sites were screened in this assessment.

For each site the potential effects to the designating features were identified and it was determined whether there is the potential for an interaction between the proposed survey and the receptors i.e. whether there is an impact-receptor pathway. This is determined by comparing information such as the extent of the zone of influence with information regarding the conservation feature e.g. species foraging distances, spatial extent of habitats etc. The interactions were defined as follows:

- Yes: A pathway between the proposed survey and the conservation feature can be identified that is likely to result in an effect; or

- No: Either a pathway between the proposed survey and the conservation features cannot be identified or a pathway exists but there is no physical overlap of the impact and the conservation feature.

For all Qualifying Interests where it is determined there is a pathway, the likely significance of the effect assessed in light of the conservation objectives for the site in Section 4.5.

For all Qualifying Interests where it is determined that there is no pathway, the Qualifying Interest has been screened out from further assessment.

Figure 4-2 Other Developments (Figure 4 in ORE application form)

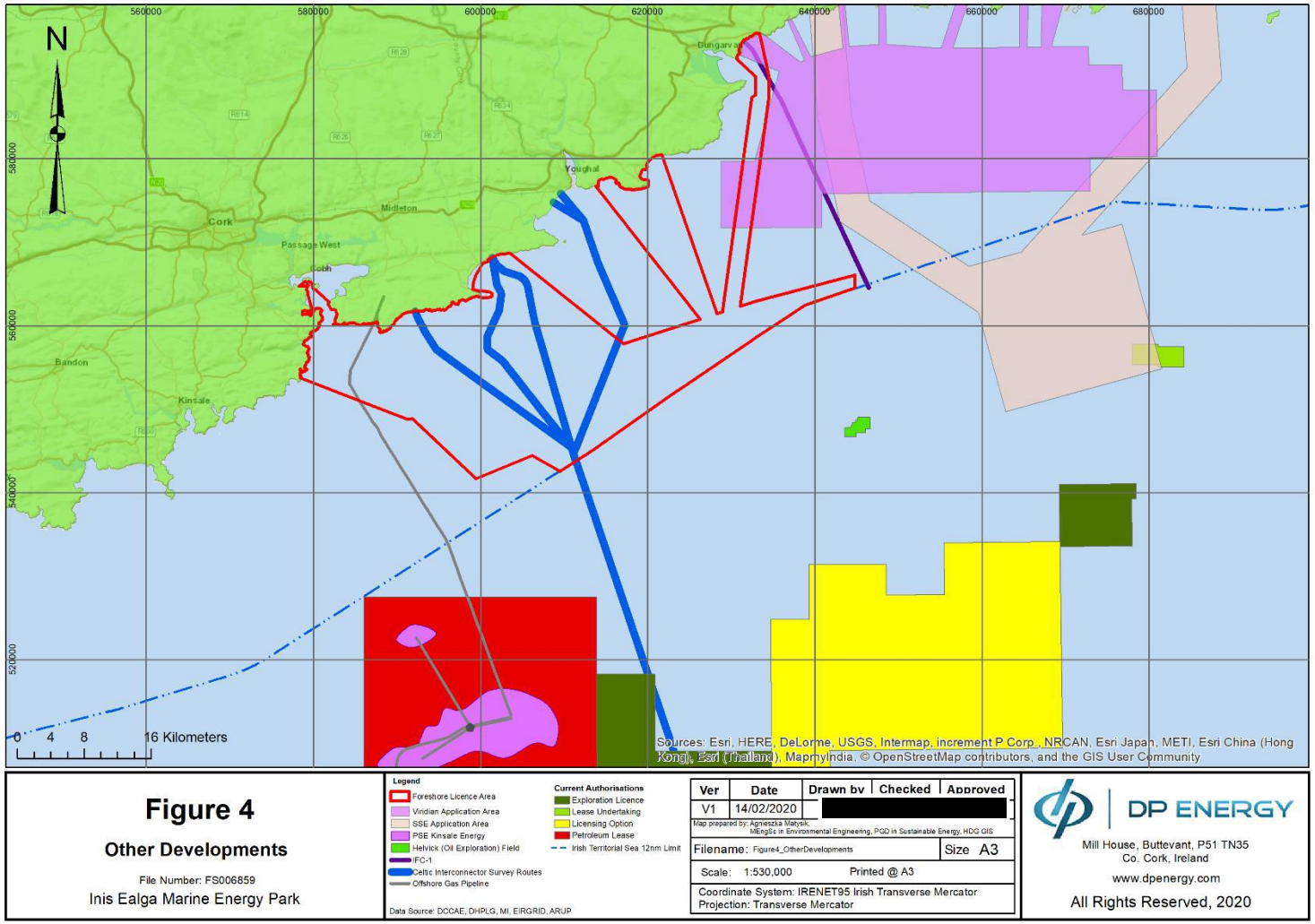


Table 4-3 Screening Assessments

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
IE002123 Ardmore Head SAC	▪ Vegetated sea cliffs of the Atlantic and Baltic coasts ▪ European dry heaths (NPWS, 2016a)	0km	None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pressure receptor pathway	**SCREENED OUT**
IE004022 Ballycotton Bay SPA	**Wetland and Waterbirds – wintering:** ▪ 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*) (NPWS, 2014a)	0.01km	Visual disturbance	**No** - The SPA is important for overwintering birds and not breeding birds. As the survey will be conducted during summer months (April to October) outside of the over wintering period there will not be a temporal overlap between the Qualifying Interest of the site and the proposed works.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
IE004023 Ballymacoda Bay SPA	**Wintering wetland, waterbirds and seabirds:** ▪ Teal (*Anas crecca*) ▪ Ringed Plover (*Charadrius hiaticula*) ▪ Golden Plover (*Pluvialis apricaria*) ▪ Grey Plover (*Pluvialis squatarola*) ▪ Lapwing (*Vanellus vanellus*) ▪ Sanderling (*Calidris alba*) ▪ Black-tailed Godwit (*Limosa limosa*) ▪ Bar-tailed Godwit (*Limosa lapponica*) ▪ Curlew (*Numenius arquata*) ▪ Turnstone (*Arenaria interpres*) ▪ Black-headed Gull (*Chroicocephalus ridibundus*) ▪ Common Gull (*Larus canus*) ▪ Lesser Black-backed Gull (*Larus fuscus*) ▪ Wigeon (*Anas penelope*) ▪ Redshank (*Tringa totanus*) (NPSW, 2015b)	6.3km	Visual disturbance	**No** - The SPA is important for overwintering birds and not breeding birds. As the survey will be conducted during summer months (April to October) outside of the over wintering period there will not be a temporal overlap between the Qualifying Interests of the site and the proposed works.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
IE004028 Blackwater Estuary SPA	**Overwintering waterfowl and wildfowl:** ▪ Golden Plover (*Pluvialis apricaria*) ▪ Lapwing (*Vanellus vanellus*) ▪ Black-tailed Godwit (*Limosa limosa*) ▪ Bar-tailed Godwit (*Limosa lapponica*) ▪ Curlew (*Numenius arquata*) ▪ Dunlin (*Calidris alpina*) ▪ Redshank (*Tringa totanus*) ▪ Wigeon (*Anas penelope*) (NPWS, 2012a)	2.7km	Visual disturbance	**No** - The SPA is important for overwintering birds and not breeding birds. As the survey will be conducted during summer months (April to October) outside of the over wintering period there will not be a temporal overlap between the Qualifying Interests and the proposed works.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**
IE002170 Blackwater River SAC	▪ Estuaries, ▪ Mudflats and sandflats not covered by seawater at low tide, ▪ Perennial vegetation of stony bank, ▪ Salicornia and other annuals colonizing mud and sand, ▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), ▪ Mediterranean salt meadows (*Juncetalia maritimi*), ▪ Freshwater pearl mussel (*Margaritifera margaritifera*) ▪ White-clawed crayfish (*Austropotamobius pallipes*) (NPWS, 2012b)	2km	None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**
	▪ Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation,		None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pressure receptor pathway	**SCREENED OUT**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
	▪ Old sessile oak woods with Ilex and Blechnum in the British Isles, ▪ Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior *Alno-Padion*,					
	Fish species: ▪ Twaite shad *(Alosa fallax fallax*)		Underwater sound changes	**Yes** - Underwater noise from geophysical survey could disturb twaite shad during migration.	**Yes -** Potential for in-combination effect with Energia – windfarm Helvick Head	**SCREENED IN**
	▪ Atlantic salmon (*Salmo salar*) ▪ Sea lamprey *(Petromyzon marinus*) ▪ River Lamprey *(Lampetra fluviatilis*)		Underwater sound changes	**No** – Atlantic salmon, sea lamprey and river lamprey are not sensitive to underwater sound changes.	**No** potential for in-combination effect as species are not sensitive to underwater noise changes.	**SCREENED OUT**
	▪ Otter (*Lutra lutra*) ▪ Brook lamprey (*Lampetra planeri*) (NPWS, 2012b)		Underwater sound changes	**No** – These species are restricted to the estuary or close to the shore and therefore animals from the site will not be observed in the application area.	**No** potential for in-combination effect as these species will be restricted to the estuary and coast and away from the zone of influence.	**SCREENED OUT**
IE004030 Cork Harbour SPA	**Wintering waterfowl** (NPWS 2014b) ▪ 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*)	0km	Visual disturbance	**No -** The SPA is important for overwintering birds and not breeding birds. As the survey will be conducted during summer months (April to October) outside of the over wintering period there will not be a temporal overlap between the Qualifying Interests and the proposed works.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
IE004030 Cork Harbour SPA	**Wintering waterfowl** (NPWS 2014b) ▪ 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*)		Visual disturbance	**No -** The SPA is important for overwintering birds and not breeding birds. As the survey will be conducted during summer months (April to October) outside of the over wintering period there will not be a temporal overlap between the Qualifying Interests and the proposed works.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**
IE004030 Cork Harbour SPA	**Breeding seabirds** (NPWS 2014b)**:** ▪ Common Tern (*Sterna hirundo*)		Visual disturbance	**Yes –** It is possible that survey activities could disturb breeding and nesting birds. In 1995 102 breeding pairs were recorded in the site, nesting in several artificial structures including steal barges and the roof of Martello Tower.	**No** potential for in-combination effect from visual disturbance as there will be no spatial or temporal overlap with other projects in the area.	**SCREENED IN**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
IE004032 Dungarvan Harbour SPA	**Wintering waterbirds** (NPWS 2012c) ▪ 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*) ▪ Black-tailed Godwit (*Limosa limosa*) ▪ Bar-tailed Godwit (*Limosa lapponica*) ▪ Curlew (*Numenius arquata*) ▪ Turnstone (*Arenaria interpres*) ▪ Dunlin (*Calidris alpina*) ▪ Redshank (*Tringa totanus*)	0.01km	Visual disturbance	**No** - The SPA is important for overwintering birds and not breeding birds. As the survey will be conducted during summer months (April to October) outside of the over wintering period there will not be a temporal overlap between the designating features and the proposed works. Birds will not be disturbed by the proposed works. In addition, there is no spatial overlap between the important habitat and the intrusive survey works.	**No** potential for in-combination effect from visual disturbance as there will be no spatial or temporal overlap with other projects in the area.	**SCREENED OUT**
IE004192 Helvick Head to Ballyquin SPA	**Breeding birds** (NPWS 2018b): ▪ Cormorant (*Phalacrocorax carbo)* ▪ Herring gull (*Larus argentatus)* ▪ Kittiwake (*Rissa tridactyla*) ▪ Peregrine (*Falco peregrinus*) ▪ Chough (*Pyrrhocorax pyrrhocorax*)	0km	Visual disturbance	**Yes –** It is possible that survey activities could disturb breeding and nesting birds.	**Yes -** Potential for in-combination effect with Energia – windfarm Helvick Head	**SCREENED IN**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
IE004193 Mid-Waterford Coast SPA	**Breeding birds** (NPWS 2018c): ▪ Cormorant (*Phalacrocorax carbo)* ▪ Herring Gull (*Larus argentatus)* ▪ Peregrine (*Falco peregrinus)* ▪ Chough (*Pyrrhocorax pyrrhocorax)*	0.3km	Visual disturbance	**Yes –** It is possible that survey activities could disturb breeding and nesting birds.	**Yes -** Potential for in-combination effect with Energia – windfarm Helvick Head	**SCREENED IN**
IE004124 Sovereign Islands SPA	**Breeding waterbirds** (NPWS 2018e): ▪ Cormorant (*Phalacrocorax carbo)*	12km	Visual disturbance	**No** - birds identified as being sensitive to the proposed survey are nesting birds and individuals within 2km of the application area. It is recognised that cormorant from this site could be foraging in the zone of influence. However, disturbance will be limited in extent and duration and there is sufficient space in the surrounding environment for birds to temporarily relocate.	**No** potential for in-combination effect from visual disturbance as there will be no spatial or temporal overlap with other projects in the area.	**SCREENED OUT**
UK0030396 Bristol Channel Approaches/ Dynesfeydd Mor Hafren SAC	▪ Harbour porpoise *(Phocoena phocoena)* JNCC (2019a)	168km	Underwater sound changes	**Yes -** Underwater noise from the geophysical survey could affect harbour porpoise from the site if they are in the application area.	**No** potential for in-combination effect - Given that the zone of influence for disturbance is 2.6km, it is unlikely that there will be a spatial overlap of disturbance between Inis Ealga and other projects. There is however potential that marine mammals could be displaced from one zone of influence to another, however this effect would be temporary and localised.	**SCREENED IN**
UK0012712 Cardigan Bay/ Bae Ceredigion SAC	▪ Bottlenose dolphin (*Tursiops truncatus*) JNCC (2019b)	173km	Underwater sound changes	**Yes -** Underwater noise from the geophysical survey could affect bottlenose dolphin from the site if they are in the application area.	**No** potential for in-combination effect - Given that the zone of influence for disturbance is 2.6km, it is unlikely that there will be a spatial overlap of disturbance between Inis Ealga and other projects. There is however potential that marine mammals could be displaced from one zone of influence to another, however this effect would be temporary and localised.	**SCREENED IN**
UK0030398 North Anglesey	▪ Harbour porpoise (*Phocoena phocoena*	137km	Underwater sounds changes	**Yes -** Underwater noise from the geophysical survey could affect harbour	**No** potential for in-combination effect - Given that the zone of influence for disturbance is 2.6km, it is unlikely that there will be a spatial	**SCREENED IN**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
Marine/ Gobledd Mon Forol SAC	(JNCC 2019)			porpoise from the site if they are in the application area.	overlap of disturbance between Inis Ealga and other projects. There is however potential that marine mammals could be displaced from one zone of influence to another, however this effect would be temporary and localised.	
UK0030399 North Channel SAC	▪ Harbour porpoise (*Phocoena phocoena*) JNCC (2019e)	310km	Underwater sound changes	**Yes -** Underwater noise from the geophysical survey could affect harbour porpoise from the site if they are in the application area.	**No** potential for in-combination effect - Given that the zone of influence for disturbance is 2.6km, it is unlikely that there will be a spatial overlap of disturbance between Inis Ealga and other projects. There is however potential that marine mammals could be displaced from one zone of influence to another, however this effect would be temporary and localised.	**SCREENED IN**
IE002162 River Barrow and River Nore SAC	▪ Estuaries ▪ Mudflats and sandflats not covered by seawater at low tide ▪ Reefs ▪ Salicornia and other annuals colonizing mud and sand ▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) ▪ Mediterranean salt meadows (*Juncetalia maritimi*) ▪	37km	None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**
IE002162 River Barrow and River Nore SAC	▪ Freshwater pearl mussel *Margaritifera durrovensis* ▪ Freshwater pearl mussel *Margaritifera margaritifera,* ▪ White-clawed crayfish *Austropotamobius pallipes*, ▪ Killarney fern *Trichomanes speciosum* ▪ Water courses of plain to montane levels with the *Ranunculion fluitantis*		None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
	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.* ▪ Desmoulin's whorl snail *Vertigo moulinsiana*,					
IE002162 River Barrow and River Nore SAC	▪ Otter (*Lutra lutra)* ▪ Brook lamprey (*Lampetra planeri)*		Underwater sounds changes	**No** – Will not be present in application area or zone of influence for underwater sound changes.	**No** potential for in-combination effect as these species will be restricted to the estuary and Coast and away from the zone of influence.	**SCREENED OUT**
IE002162 River Barrow and River Nore SAC	▪ River lamprey (*Lampetra fluviatilis)* ▪ Sea lamprey (*Petromyzon marinus)* ▪ Atlantic salmon (*Salmo salar*) (only in fresh water)			**No** – Atlantic salmon, sea lamprey and river lamprey are not considered sensitive to underwater sound changes.	**No** potential for in-combination effect as this species is not sensitive to underwater noise	**SCREENED OUT**
	▪ Twaite shad *Alosa fallax* NPWS (2016a)			**Yes** - Underwater noise from geophysical survey could disturb twaite shad during migration.	**No** potential for in-combination effect - Given that the zone of influence for temporary injury is 2.2km, it is unlikely that there will be a spatial overlap of injury to twaite shad.	**SCREENED IN**
IE000101 Roaringwater Bay and Islands SAC	▪ Large shallow inlets and bays ▪ Reefs ▪ Submerged or partially submerged sea caves	98km	None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**
	▪ Vegetated sea cliffs of the Atlantic and Baltic coasts ▪ European dry heaths		None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
	▪ Otter (*Lutra lutra)*		Underwater sounds changes	**No** – Will not be present in application area or zone of influence for underwater sound changes.	**No potential for in-combination effect** as these species will be restricted to the estuary and Coast and away from the zone of influence.	**SCREENED OUT**
	▪ Harbour Porpoise (*Phocoena phocoena*). ▪ Grey Seal (*Halichoerus grypus*)		Underwater sounds changes	**Yes** - Underwater noise from the geophysical survey could disturb grey seal and harbour porpoise from the site if they are in the application area.	**No** potential for in-combination effect - Given that the zone of influence for disturbance is 2.6km, it is unlikely that there will be a spatial overlap of disturbance between Inis Ealga and other projects. There is however potential that marine mammals could be displaced from one zone of influence to another, however this effect would be temporary and localised.	**SCREENED IN**
IE003000 Rockabill to Dalkey Island SAC	▪ Reefs	203km	None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**
	▪ Harbour Porpoise (*Phocoena phocoena*). NPWS (2013c)		Underwater sound changes	**Yes** - Underwater noise from the geophysical survey could impact harbour porpoise from the site if they are in the application area.	**No** potential for in-combination effect - Given that the zone of influence for disturbance is 2.6km, it is unlikely that there will be a spatial overlap of disturbance between Inis Ealga and other projects. There is however potential that marine mammals could be displaced from one zone of influence to another, however this effect would be temporary and localised.	**SCREENED IN**
IE003000 Saltee Islands SAC	▪ Mudflats and sandflats not covered by seawater at low tide ▪ Large shallow inlets and bays ▪ Reefs ▪ Vegetated sea cliffs of the Atlantic and Baltic coasts ▪ Submerged or partially submerged sea caves	51km	None	**No** - No pressure receptor pathway identified.	**No** potential for in-combination effect as there is no pathway for effect with the survey.	**SCREENED OUT**
	▪ Grey Seal (*Halichoerus grypus*) NPWS (2013a)		Underwater sound changes	**Possible** - Underwater noise from the geophysical survey could disturb grey seal from the site.	**No** potential for in-combination effect - Given that the zone of influence for disturbance is 2.6km, it is unlikely that there will be a spatial overlap of disturbance between Inis Ealga and other projects. There is however potential that	**SCREENED IN**

Site Code & Name	Qualifying Interests	Distance to application area	Potential Pressures	Likelihood of interaction between survey works and designating feature(s)	Potential for In-combination effects	Conclusion
					marine mammals could be displaced from one zone of influence to another, however this effect would be temporary and localised.	
UK0030397 West Wales Marine/ West Gorllewin Crymru Forol SAC	▪ Harbour porpoise (*Phocoena phocoena*) JNCC (2019c)	129km	Underwater sounds changes	**Yes** - Underwater noise from the geophysical survey could impact harbour porpoise from the site if they are in the application area.	**No** potential for in-combination effect - Given that the zone of influence for disturbance is 2.6km, it is unlikely that there will be a spatial overlap of disturbance between Inis Ealga and other projects. There is however potential that marine mammals could be displaced from one zone of influence to another, however this effect would be temporary and localised.	**SCREENED IN**

4.5 Assessment of Likely Significant Effect

An initial screening of Natura 2000 sites identified 19 Natura 2000 sites within the defined search areas listed in Table 4-3. Table 4-3 identified that a pressure-receptor pathway exists for 13 of the sites; for the remaining five there is no spatial or temporal overlap between the proposed survey and Qualifying Interests of the site.

Table 4-3 identifies that there are two pressures from the proposed survey that could affect the Qualifying Interests of Natura 2000 sites. These are:

- Visual disturbance; and
- Underwater sound changes.

This section describes the possible pressures and potential effects and, assesses the likely significant effect of the proposed survey on the conservation objectives of the site.

4.5.1 Visual Disturbance

Table 4-3 identified a pressure-receptor pathway between the proposed survey and the Qualifying Interest features of the Cork Harbour SPA, the Mid-Waterford Coast SPA and the Helvick Head to Ballyquin SPA for the pressure Visual Disturbance.

Two sources of disturbance have been identified:

- Disturbance from survey vessel movements; and
- Disturbance from geotechnical borehole drilling, if the export cable corridor is selected for geotechnical investigation.

The most vulnerable birds to disturbance would be nesting birds and breeding birds within the breeding season (April to October) within 2km of the proposed survey. There is the potential that breeding and nesting birds may be disturbed by the presence of survey vessels and equipment. Both visual and noise disturbance may result from the presence of the vessels and equipment whilst noise disturbance is likely to be the most significant cause of disturbance during borehole operations.

Prolonged disturbance could result in impaired breeding, disruption to incubation, increased nest failures due to predation and nest abandonment (Valente et al. 2011). These factors could affect the demographic characteristics of the population.

The extent to which a seabird responds to disturbance is dependent upon factors including period of breeding cycle during which disturbance occurs; duration, type and intensity of the disturbance; presence of opportunistic predators; and the degree of habituation with the disturbance (Showler et al. 2010). Some seabirds are more resilient to disturbance than others. The Joint Statutory Nature Conservation Bodies (SNCB) Interim Displacement Advice Note (2017) categorises species by their sensitivity to disturbance and their habitat specialisation. This advice note has been used in the assessments below to inform the assessment of likely significant effects.

The survey operations are planned between April and October; therefore, it is possible that breeding and nesting birds may be present and disturbed by the presence of the JUB and survey vessels close to the coast.

4.5.1.1 Cork Harbour SPA

Conservation objectives

To maintain or restore the favourable conservation condition of common tern in Cork Harbour SPA, which is defined by the following list of attributes and targets:

- Breeding population and abundance – no significant decline

- Productivity rate – no significant decline
- Distribution of breeding colonies - no significant decline
- Prey biomass available – no significant decline
- Barriers to connectively – no significant decline
- Disturbance at the breeding site - Human activities should occur at levels that do not adversely affect the breeding common tern population

Assessment against conservation objectives

The Cork Harbour SPA supports an important breeding colony of Common Tern (102 pairs in 1995). Common tern have nested in Cork Harbour since about 1970 on various artificial structures and the colony largely breeds in derelict steel barges and the roof of a Martello Tower. Common tern is known to breed on the ground from April through to October.

The zone of influence of disturbance on nesting birds is considered by Natural England (NE) and Joint Nature Conservation Committee (JNCC) (2012) to be up to 2km from the survey vessels. Cork Harbour SPA is located at the coastline within the west export corridor search area of the application area. If this region is chosen for survey it is possible that temporary visual and noise disturbance from survey works (presence of survey vessels and drilling of boreholes) could disturb nesting common tern.

Common tern is not included in the Joint SNCB Interim Displacement Advice Note (2017) assessment therefore disturbance sensitivity and habitat specialism for other tern species has been used as a guide. Little tern, black tern, sandwich tern, roseate tern and Arctic tern are all classed as having a moderate habitat specialisation and low susceptibility to disturbance (score of 3 out of 5 for specialism and 2 out of 5 for disturbance) therefore it has been assumed that common tern is also likely to have low susceptibility to disturbance.

Survey vessels will be slow moving, only between 3.6km/h to 5km/h which is slower or the same as walking speed, and at times stationary. At such slow speeds, the vessels are effectively stationary in terms of bird displacement. Studies have shown that slow moving vessels cause little disturbance to birds and birds may habituate to frequent and relatively benign events and noises (Hill et al 1997 in Natural England and Suffolk Coast and Heaths 2012). Cork harbour is a busy harbour with lots of industrial, shipping and recreational activity. As illustrated in Figure 4-3, the Cork Harbour SPA is within an area with high shipping activity. The introduction of a survey vessel will be within the normal weekly fluctuations of shipping activity experienced in the area. Therefore, common tern will be habituated to noise from vessel traffic and other activities going on in the area. This suggests that any disturbance to common tern from the survey vessels will be minimal.

Drilling the geotechnical boreholes will take approximately eight days. During this time there is the potential that breeding common tern could be disturbed. Noise outputs for the proposed borehole survey are not available however indicative values are provided by the following two examples of noise assessments for similar drilling-based activities:

- A borehole survey in the Ribble Estuary (RSK 2011) provides noise data for a comparable geotechnical drilling rig albeit on marshland. The noise output for the cable percussive rig had a sound pressure level (SPL) of 68dB at 25m. This information was used to model the effect of the drilling on the surrounding marsh environment, in this case a UK Site of Special Scientific Interest (SSSI). The model results indicated that drilling boreholes on the marsh would result in a noise level of 55dB(A) or greater, at a maximum radius of 93m and 76dB(A) occurred at approximately 10 – 11m from the rig.
- The noise associated with drilling an exploratory shale-gas well from a 7.2 metre rig on land was calculated to be 75dB(A) at 10m falling to 62dB(A) over 50m (Ecology Services 2013).

Noise generated from borehole works would disturb birds within close proximity and cause nesting birds to startle and take 'complete flight', which indirectly may leave eggs or juveniles exposed to predation and could therefore effect breeding success.

Jackson (2012) provide thresholds for a likely significant effect on bird populations as 70dB for continuous noise and 50dB for impulsive noise, based on a review of relevant research and literature. These figures take into account more sensitive species reactions to concur with the requirements of the Habitats Directive to adopt a 'precautionary principle'.

The Wilson Report (HMSO 1963) indicates that limited data suggests a noise level of approximately 85dB is required to scare a bird; which has been assumed to result in 'complete flight'. However, the use of this level as a limit to avoid 'complete flight' has limitations because it is based on specific species (RSK 2011).

RSK (2011) conducted a review of published research for the UK Environment Agency, which concluded that due to the inter and intra-species variability, seasonal effects and difficulties of conducting research which distinguishes the effect of noise from other disturbances, there is considerable uncertainty in identifying thresholds that clearly demonstrate that noise has no adverse effect on the integrity of a protected site.

Based on the examples provided above it would suggest that drilling activity is potentially below the suggested threshold of 85dB which could cause a 'complete flight' startle reaction, but sufficient to cause disturbance (i.e. above 55dB) within 100m of borehole drilling activities. However, given the short duration of the borehole survey (8-days), the low susceptibility of common tern to disturbance and their habituation to noisy activities within the harbour, any disturbance will be minimal. Therefore, it has been concluded that the proposed survey works will not adversely affect the breeding common tern population or cause a decline in population, productivity rate or distribution.

Survey works will be temporary and localised and will not effect the availability of prey or effect connectivity to other sites.

No other projects or plans were identified in the area which could act in combination with the proposed survey to cause a significant effect on the Cork Harbour SPA.

Screening Conclusion: No likely significant effects

Figure 4-3 Shipping Density (Figure 10 in ORE application form)

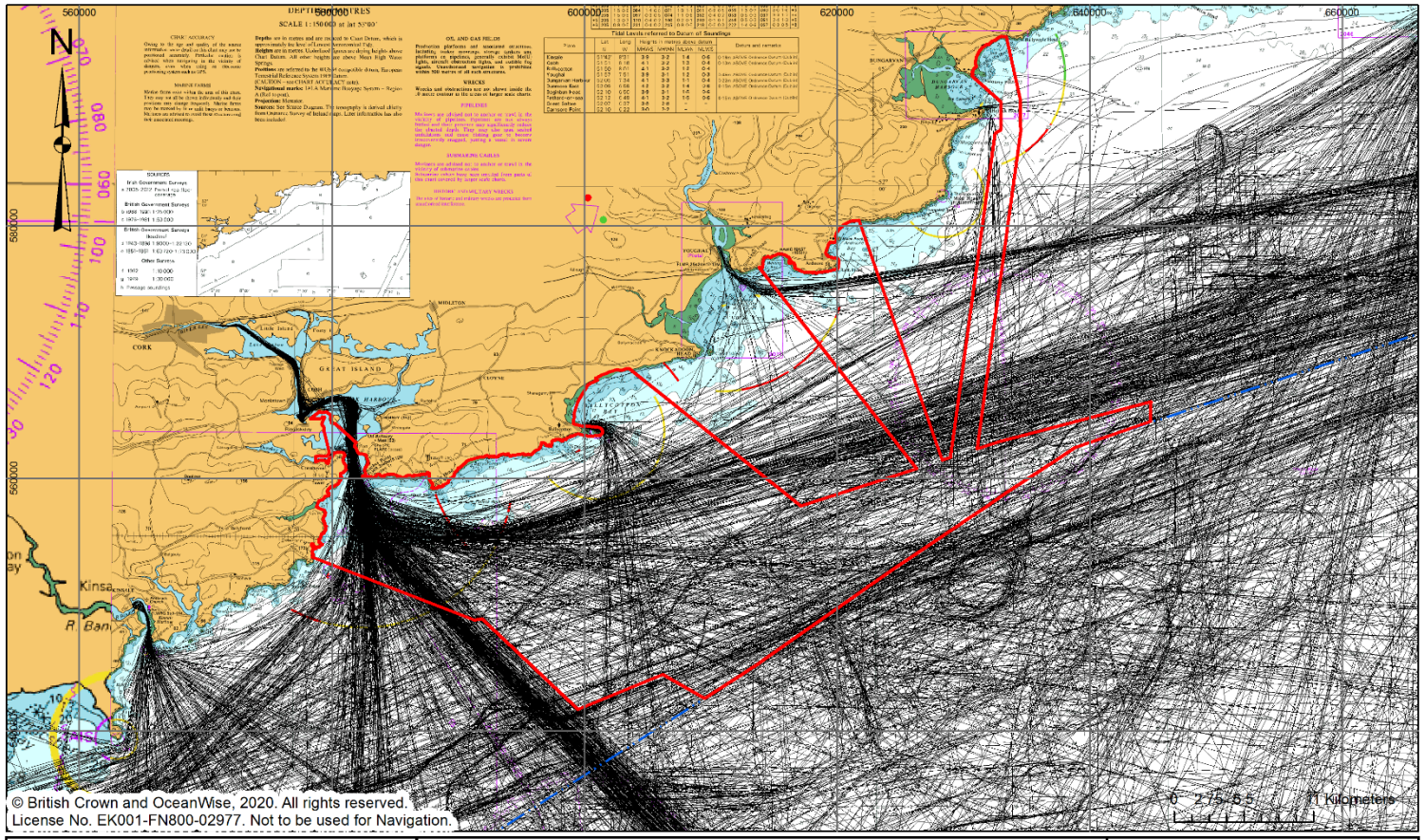


Figure 10

Shipping

File Number: FS006859

Inis Ealga Marine Energy Park

Legend

- Foreshore Licence Area
- Shipping Routes (2014 and 2015)
- Irish Territorial Sea 12nm Limit

Data Source: data.gov.uk, DCCAE

Ver	Date	Drawn by	Checked	Approved
V1	16/01/2020	[redacted]		

Map prepared by: Agnieszka Matysik.
MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDG GIS

Filename: Figure10_Shipping | Size A3

Scale: 1:380,000 Printed @ A3

Coordinate System: IRENET95 Irish Transverse Mercator
Projection: Transverse Mercator

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4.5.1.2 Mid-Waterford Coast SPA

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

The favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Assessment against conservation objectives
The Mid-Waterford Coast SPA has been designated for its internationally important breeding chough (20 pairs recorded in 2002/03 survey). This site is also designated for nationally important peregrine population (10 pairs in 2002), cormorant (79 pairs) and herring gull (147 pairs). Considering the breeding seasons for chough, peregrine, herring gull and cormorant presented in Table 4-4, the combined breeding season for this SPA extends from February through to September.

Table 4-4 Breeding season

Species	Breeding season	Comments
Chough	April - July	Build their nests in caves, crevasses and on rock faces in April. Female chough incubate alone for 17-21 days. Young fly at 6-7 weeks of age (RSPB 2019a).
Cormorant	February - September	Breed on the ground and coastal cliff locations. They lay their nests in trees, islets and cliffs. Start breeding in March and eggs hatch after a month. Young fledge two months after hatching but are dependent on their parents for food for a further three months.
Peregrine	April - September	Nest on grassy areas on cliff edges, quarries or other inaccessible undisturbed locations. Females lay their eggs in late March or April and incubation takes around 29-32 days.
Herring gull	May - September	Likely to build their nests on sea cliffs and sand dunes. Eggs are incubated for 30 days in May and June. Parents look after chicks until they fledge after five or six weeks and for a period afterwards.

Mid-Waterford Coast SPA is located along the coastline 0.3km from the application area (proposed eastern export corridor). As the SPA is located at the coastline, it is possible that temporary visual and noise disturbance from survey works (presence of survey vessels and drilling of boreholes) could disturb nesting birds. The zone of influence of disturbance for nesting birds is considered by NE and JNCC (2012) to be up to 2km from the survey vessels.

As land-based birds, the sensitivity to disturbance of chough and peregrine have not been categorised in the Joint SNCB Interim Displacement Advice Note (2017). However, cormorant is classed as having a moderate habitat specialisation and high susceptibility to disturbance, whilst herring gull has a low disturbance susceptibility (score of 2 out of 5) and a low habitat specialism (score of 2 out of 5). This suggests that breeding herring gull will not be adversely affected by the proposed survey works but there is the potential that breeding cormorant could be disturbed.

In relation to the conservation objectives, the proposed survey will not reduce, other than temporarily, the natural range of the Qualifying Interest species, nor will it have a significant effect on the habitat that the species require to maintain the population. However, given the sensitivity of breeding

cormorant; the unknown sensitivity of peregrine and chough; and that the survey is scheduled during the breeding season; it cannot be ruled out that the survey works would not disturb nesting birds. In addition, there is potential for an in-combination effect if the proposed surveys were to overlap in time and space with the site investigation works associated with the Energia windfarm at Helvick Head.

The screening has returned a conclusion of likely significant effects as there is the potential that disturbance during the breeding season either alone or in-in combination with the Energia Helvick Head project could affect the population dynamic of chough, peregrine and/or cormorant.

Screening Conclusion: No likely significant effects on herring gull.

Screening Conclusion: Potential for Likely Significant Effects on chough, peregrine and cormorant.

4.5.1.3 Helvick Head to Ballyquin SPA

Conservation objectives

To maintain or restore the favourable conservation status of habitats and species of community interest. The favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Assessment against conservation objectives

The Helvick Head to Ballyquin SPA has been designated for its internationally important breeding Cormorant (65 pairs). This site is also designated for nationally important cormorant (65 pairs), peregrine (5 pairs, 2002), herring gull (117 pairs), kittiwake (1,037 pairs) and chough (11 pairs). Considering the breeding seasons for chough, peregrine, kittiwake, herring gull and cormorant presented in Table 4-5, the combined breeding season for this SPA extends from February through to September.

Table 4-5 Breeding season

Species	Breeding season	Comments
Chough	April - July	Build their nests in caves, crevasses and on rock faces in April. Female chough incubate alone for 17-21 days. Young fly at 6-7 weeks of age (RSPB 2019a).
Cormorant	February - September	Breed on the ground and coastal cliff locations. They lay their nests in trees, islets and cliffs. Start breeding in March and eggs hatch after a month. Young fledge two months after hatching but are dependent on their parents for food for a further three months.
Peregrine	April - September	Nest on grassy areas on cliff edges, quarries or other inaccessible undisturbed locations. Females lay their eggs in late March or April and incubation takes around 29-32 days.
Kittiwake	February - August	Build nests on the sides of steep coastal cliffs. Females lay 2 or 3 eggs between May and June and both the male and female take turns to incubate the eggs for approximately 28 days.
Herring gull	May - September	Likely to build their nests on sea cliffs and sand dunes. Eggs are incubated for 30 days in May and June. Parents look after chicks until they fledge after five or six weeks and for a period afterwards.

Helvick Head to Ballyquin SPA is located at the boundary of the application area (proposed middle export corridor). The zone of influence of disturbance for nesting birds is considered by NE and JNCC (2012) to be up to 2km from the survey vessels. As the SPA is located at the coastline, it is possible

that temporary visual and noise disturbance from survey works (presence of survey vessels and drilling of boreholes) could disturb nesting birds.

As land-based birds, the sensitivity to disturbance of chough and peregrine have not been categorised in the Joint SNCB Interim Displacement Advice Note (2017). However, cormorant is classed as having a moderate habitat specialisation and high susceptibility to disturbance, whilst herring gull has a low disturbance susceptibility (score of 2 out of 5) and a low habitat specialism (score of 2 out of 5). This indicates that herring gull breeding would not be affected by the proposed survey works but there is the potential that breeding cormorant could be disturbed. Kittiwake have a low susceptibility to disturbance (score 2 out of 5) as well as a low ranking habitat specialisation (2 out of 5), indicating that it is unlikely that kittiwake will be disturbed by the proposed survey works.

In relation to the conservation objectives, the proposed survey will not reduce, other than temporarily the natural range of the Qualifying Interest species, nor will it have a significant effect on the habitat that the species require to maintain the population. It is possible that the middle export route may not be selected for survey, however following the precautionary principle it is assumed that geotechnical borehole locations will be undertaken in the corridor. Given the sensitivity of breeding cormorant; the unknown sensitivity of peregrine and chough; and that the survey is scheduled during the breeding season; it cannot be ruled out that the survey works would not disturb nesting birds. In addition, there is potential for an in-combination effect if the proposed surveys are to overlap in time and space with the site investigation works associated with the Energia windfarm at Helvick Head.

The screening has returned a conclusion of likely significant effects as there is the potential that disturbance during the breeding season either alone or in-in combination with the Energia Helvick Head project could affect the population dynamic of chough, peregrine and/or cormorant.

Screening Conclusion: No likely significant effects on herring gull and kittiwake.

Screening Conclusion: Potential for Likely Significant Effects on chough, peregrine and cormorant.

4.5.2 Underwater sound changes – Annex II fish species

Table 4-3 identified a pressure-receptor pathway for the pressure underwater sound changes between the proposed surveys and two Natura 2000 sites for which the Qualifying Interests are twaite shad. These sites are the River Barrow and River Nore SAC and the Blackwater River (Cork/Waterford) SAC.

It is recognised that fish are mobile species and therefore Annex II listed migratory species have the potential to cross the application area during the survey operations. Twaite shad are sensitive to noise changes and therefore potentially vulnerable to the proposed survey operations.

The zone of influence for the pressure was established through an underwater noise assessment, which is provided in Appendix A.

4.5.2.1 River Barrow and River Nore SAC and Blackwater River (Cork/Waterford) SAC.

The conservation objectives for Twaite shad are the same for each site.

Conservation objectives – twaite shad

To restore the favourable conservation condition of twaite shad in the site, which is defined by the following list of attributes and targets:

- Distribution: extent of anadromy - greater than 75% of main stem length of rivers accessible from estuary,
- Population structure: age classes - more than one age class present,
- Extent and distribution of spawning habitat - No decline in extent and distribution of spawning habitats,

- Water quality: oxygen levels – no lower than 5mg/l, and
- Spawning habitat quality: Filamentous algae; macrophytes; sediment - Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth.

Assessment against conservation objectives – twaite shad

The upper stretches of the River Barrow and River Nore SAC and Blackwater River (Cork/Waterford) SAC are designated for the presence of twaite shad. Twaite shad occur in coastal waters and in estuaries along the southeast coast of Ireland. Twaite shad are anadromous, migrating to freshwater to spawn in early summer (May to July). At maturity (3 years old for males and 5 years old for females), they stop feeding and congregate in the estuaries of suitable rivers in April and May. Upstream migration from the estuaries appears to be triggered by temperature, with peak migratory activity occurring at water temperatures of 10–14°C. Given that twaite shad reach maturity at age 3-5, twaite shad are likely to be found in coastal areas of the application area all year round, with the greatest density likely to be observed during the May-July migration.

The ability of fish to hear noise is dependent on their hearing structures, which indicate their sensitivity to sound. Sound pressure is only detected by those species possessing a swim bladder; the otolith organ acts as a particle motion detector and where linked to the swim bladder, converts sound pressure into particle motion, which is detected by the inner ear. High sensitivity hearing species such as clupeids (twaite shad) have specialisations of the auditory apparatus where the swim bladder and inner ear are intimately connected and are able to detect frequencies to over 3kHz; with optimum sensitivity between 300Hz-1kHz (Nedwell et al. 2007).

To calculate the zone of influence for recoverable and temporary injury to fish an assessment was conducted which combined literature review with underwater sound modelling. Sound propagation modelling, using a geometric spreading calculation, was used to determine the range at which the received sound attenuates to levels below defined thresholds for injury and disturbance. The assessment used thresholds for injury derived from Popper et al (2014). These reflect the current state of scientific knowledge.

The sound levels, injury thresholds, the calculations and the resulting zones of influence are described and provided in full in Appendix A of this NIS; and key information relevant to the assessment is summarised below.

Different fish species react differently to sound. The typical behavioural response to sounds by fish might range from no change in behaviour, to a mild awareness (startle response) to larger movements of temporary displacement for the duration of the sound (Popper and Hastings 2009). Popper et al. (2014) identified that there is no direct evidence of permanent injury to fish species from shipping and other continuous noise (such as the near-continuous noise produced by geophysical equipment).

Most noise from a geophysical survey is generated at frequencies greater than 1kHz, above the auditory capacity of fish (generally between 0.2Hz to 1kHz). In addition, sound from survey equipment is targeted towards the seabed, meaning that effects to fish are only expected if they are within the immediate zone of ensonification below the survey vessel.

Modelling, presented in Appendix A, indicates that the zone of influence for temporary injury for fish is 2.2km from a chirper, pinger or boomer (types of sub-bottom profiling equipment). For all other equipment types the zone of influence is smaller. However, it should be noted that the spreading model assumes that sound is spread geometrically away from the source with an additional frequency-dependent absorption loss; it therefore provides conservative estimates. It does not take into consideration the conditions within the area, such as bathymetry, water depth or sediment type and thickness; all of which reduce the propagation of sound, and reduce the zone of influence.

During the geophysical survey, the continued noise with 24-hour operation means it is likely that the most hearing sensitive fish species e.g. twaite shad will demonstrate temporary avoidance behaviour from early on and remain outside the zone of influence for the duration of the operation. The potential zone of influence is transient as it moves slowly in a constant direction along the principal survey line orientation. It is predicted that fish will avoid the area once operations have started and are extremely unlikely to move towards the sound source.

The works will not lead to any long-term displacements as they are transient and temporary. Individuals are expected to return once the operation has passed through. However, it should be noted that the ability of small fish to take avoiding action may be limited, and temporary displacement may not therefore occur.

Based on the above discussion, any disturbance effects from noise associated with operations will be localised, temporary and transient. There will be no long-term effect on the distribution of the species and migration to and from rivers will not be impeded.

In addition, the proposed geophysical survey is not within the estuaries of any of the important Twaite shad rivers. Given that spawning occurs upstream in the relevant rivers, outside the zone of influence of the survey, the survey will not affect twaite shad spawning habitat, their distribution and population structure, nor will it cause a deterioration in water quality.

There is potential that if the proposed geophysical surveys were to overlap in time with the geophysical survey works for the Energia windfarm at Helvick Head then there is potential for an in-combination effect on twaite shad. However, neither of these surveys will be conducted within the relevant rivers. Therefore, there will be no in-combination effects on the conservation objectives of the SACs.

Screening Conclusion: No likely significant effects

4.5.3 Underwater sound changes - Annex II cetacean and pinniped species

Table 4-3 identified a pressure-receptor pathway for the pressure underwater sound changes between the proposed survey and seven Natura 2000 sites for which the Qualifying Interests are Annex II cetacean or pinniped species.

The geophysical survey includes the use of multi-beam echo-sounders, side scan sonars and sub bottom profilers. One of the most important environmental concerns related to the proposed activities is the potential effects of underwater sound on marine mammals. Both cetaceans and pinnipeds have evolved to use sound as an important aid in navigation, communication and hunting (Richardson et al. 1995). It is generally accepted that exposure to anthropogenic sound can induce a range of effects on marine mammals. These range from insignificant effects to behavioural changes, non-injurious type effects (including masking of biologically relevant sound signals, such as communication signals), and ultimately can lead to physical injury and death if the sound source is sufficiently intense.

The AA screening has used the underwater noise modelling in Appendix A to inform the assessment. The main conclusions relevant to the AA screening were as follows:

- Grey and harbour seal could be exposed to sound levels that exceed the threshold for temporary injury within 40m of the geophysical sound source.
- Harbour porpoise could be exposed to sound levels that exceed the thresholds for temporary injury within 180m of the geophysical sound source.
- Harbour porpoise, grey and harbour seal could be exposed to sound levels that are sufficient to cause disturbance within 2.6km of the geophysical sound source.

The noise assessment presented was worst-case and did not account for the directional quality of the noise or conditions within the application area, such as bathymetry, water depth or sediment type and thickness, which will all reduce the propagation of the sound, decreasing the zone of influence of the geophysical survey.

As part of the survey scope the survey contractor will be required to follow the DAHG 'Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters' (DAHG 2014).

4.5.3.1 Saltee Island SAC

Conservation objectives
To maintain the favourable conservation condition of Grey Seal in Saltee Islands SAC, which is defined by the following lists of attributes and targets:

a. Access to suitable habitat – species range within the site should not be restricted by artificial barriers to site use.
b. Breeding behaviour – The breeding sites should be maintained in a natural condition.
c. Moulting behaviour - The moult haul-out sites should be maintained in a natural condition.
d. Resting behaviour - The resting haul-out sites should be maintained in a natural condition.
e. Population composition - The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually

Assessment against conservation objectives
Saltee Island SAC lies 51km from the application area (eastern export cable corridor) and therefore based on seals foraging ranges of 100km it is possible that grey seal from the site will be present in the waters of the application area, especially during the earlier months of the proposed survey window (May to August). From August through to December animals are likely to be hauled up on beaches for pupping and therefore it's unlikely that many seals will be within zone of influence for underwater noise. As discussed in Appendix A, it is possible that grey seal from this site could be injured if they come within 40m of the sound source. However, seals are likely to flee if vessels approach within 900m; suggesting that they will avoid the area before they encounter sound levels that will harm them.

Seals from Saltee Islands SAC could travel into the zone of influence (2.6km for disturbance). However, the survey will be transient and sound levels generated will not act as an artificial barrier. Therefore, survey activities will not restrict access to suitable grey seal habitat at the site and the surrounding area.

With respect to the conservation objectives, given the zone of influence (2.6km for disturbance) and the distance to Saltee Island SAC (51km), breeding, moulting and resting seals which are onshore on the haul out sites of Saltee Islands SAC will not be affected by the proposed survey. It is therefore unlikely that the survey will have a significant effect on population composition.

Screening Conclusion: No likely significant effects.

4.5.3.2 Roaringwater Bay and Islands SAC

Conservation objectives – grey seal
To maintain the favourable conservation condition of Grey Seal in Roaringwater Bay and Islands SAC, which is defined by the following lists of attributes and targets:

f. Access to suitable habitat – species range within the site should not be restricted by artificial barriers to site use.
g. Breeding behaviour – The breeding sites should be maintained in a natural condition.

h. Moulting behaviour - The moult haul-out sites should be maintained in a natural condition.

i. Resting behaviour - The resting haul-out sites should be maintained in a natural condition.

j. Population composition - The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually

k. Disturbance - Human activities should occur at levels that do not adversely affect the grey seal population at the site

Assessment against conservation objectives – grey seal

Roaringwater Bay and Islands SAC lies 98km from the application area (western export cable corridor) and therefore based on seal foraging ranges of 100km it is possible that grey seal from the site will be present in the waters of the application area, especially during the earlier months of the proposed survey window (May to August). From August through to December animals are likely to be hauled up on beaches for pupping and therefore it's unlikely that many seals will be within zone of influence for underwater noise. As discussed in Appendix A, it is possible that grey seal from this site could be injured if they come within 40m of the sound source. However, seals are likely to flee if vessels approach within 900m; suggesting that they will avoid the area before they encounter sound levels that will harm them.

Seal from Roaringwater Bay and Islands SAC could travel into the zone of influence (2.6km for disturbance). However, the survey will be transient and sound levels generated will not act as an artificial barrier. Therefore, survey activities will not restrict access to suitable grey seal habitat at the site and the surrounding area.

With respect to the conservation objectives, given the zone of influence (2.6km for disturbance) and the distance to Roaringwater Bay and Islands SAC (98km), breeding, moulting and resting seals which are onshore on the haul out sites of Roaringwater Bay and Islands SAC will not be affected by the proposed survey. It is therefore unlikely that the survey will have a significant effect on population composition or cause disturbance to grey seal at the site.

Screening Conclusion: No likely significant effects

Conservation objectives – harbour porpoise

To maintain the favourable conservation condition of Harbour porpoise in Roaringwater Bay and Islands SAC, which is defined by the following list of attributes and targets:

- Access to suitable habitat – species range within the site should not be restricted by artificial barriers to site use.
- Disturbance - Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site

Assessment against conservation objectives – harbour porpoise

It is possible that harbour porpoise from this site may be present within the application area during the surveys given the application area is located in the same management unit as Roaringwater Bay and Islands SAC (Celtic and Irish Sea MU). However, given that the zone of influence of disturbance is small (2.6km) and this site is located 98km from the application area, survey operations will not adversely affect the harbour porpoise community at the site. In addition, the survey will be transient and sound levels generated will not act as an artificial barrier. Therefore, survey activities will not restrict access to suitable harbour porpoise habitat at the site and the surrounding area.

Screening Conclusion: No likely significant effects

A.1.1.1 Rockabill to Dalkey Island SAC

Conservation objectives

To maintain the favourable conservation condition of Harbour porpoise in Rockabill to Dalkey Island SAC, which is defined by the following list of attributes and targets:

- Access to suitable habitat – species range within the site should not be restricted by artificial barriers to site use.
- Disturbance - Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site

Assessment against conservation objectives

It is possible that harbour porpoise from this site may be observed in the area given that the application area is in the same management unit as Rockabill to Dalkey Island SAC (Celtic and Irish Sea MU). However, given that the zone of influence of disturbance is small (2.6km) and this site is located 203km from the seaward extent of the application area, survey operations will not adversely affect the harbour porpoise community at the site. In addition, the survey will be transient and sound levels generated will not act as an artificial barrier. Therefore, survey activities will not restrict access to suitable harbour porpoise habitat at the site and the surrounding area.

Screening Conclusion: No likely significant effects.

4.5.3.3 Cardigan Bay/ Bae Ceredigion SAC

Conservation objectives

The conservation objectives for the bottlenose dolphin is:

"To maintain at favourable conservation status its long-term population viability, natural range and the structure and function of its habitat within the site."

Assessment against conservation objectives

It is possible that bottlenose dolphin from this site maybe observed in the area given that the application area is in the same management unit as the Cardigan Bay/ Bae Ceredigion SAC (i.e. the Offshore Channel and SW England MU). However, given the zone of influence (2.6km for disturbance) and the distance to Cardigan Bay/ Bae Ceredigion SAC (173km), survey operations will not affect the long-term population viability nor the natural range of bottlenose dolphin from this site. Furthermore, survey operations will not affect the structure or the function of bottlenose dolphin habitat.

Screening Conclusion: No likely significant effects.

4.5.3.4 Bristol Channel Approaches/Dynesfeydd Môr Hafren, West Wales Marine/ Gorllewin Cymru Forol, North Anglesey Marine/ Gogledd Môn Forol and North Channel SACs

Conservation objectives

The conservation objectives for the four sites in UK waters are the same:

To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.

To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long term:

1. The species is a viable component of the site.

2. There is no significant disturbance of the species.

3. The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

Assessment against conservation objectives

It is possible that harbour porpoise from these sites may be observed in the area given that the application area is in the same management unit as these sites (Celtic and Irish Sea MU). However, given that the zone of influence of disturbance is small (2.6km) and these sites are located up to 129km from the seaward extent of the application area, survey operations will not result in significant disturbance to harbour porpoise from these sites. In addition, survey operations will not affect harbour porpoise habitat or prey items and harbour porpoise will still be a viable component of these sites.

Screening Conclusion: No likely significant effects.

4.5.4 Screening Statement and Conclusions

To determine whether the proposed survey is likely to have a significant effect on any Natura 2000 sites, either individually or in-combination with other plans or projects, AA screening was carried out.

The screening assessed 19 Natura 2000 sites that were either within the direct zone of influence of the proposed surveys or contain mobile Qualifying Interest features which could potentially travel into the application area.

It was identified that the proposed survey would induce the following pressures on Qualifying Interests:

- Underwater sound changes; and
- Visual disturbance.

Other projects and plans in the area were identified and assessed to determine if they could interact with the proposed survey to have an in-combination effect. It was considered that there existed the potential for in-combination effects between the proposed survey and one project, site investigations for the Energia Helvick Head windfarm. When assessing the potential for a likely significant effect on Natura 2000 sites the effects from the proposed survey alone and in-combination with this project were considered.

Initial screening of the 19 Natura 2000 sites identified there exists a pressure-receptor pathway between the proposed survey and the Qualifying Interests of 13 sites (Table 4-3). Of these thirteen sites, assessment for likely significant effects (Section 4.5) concluded that for two sites it cannot be ruled out that the proposed survey works either alone or in-combination with other plans and projects will not have a likely significant effect and that Stage 2 Appropriate Assessment is required.

Table 4-6 summarises the conclusions of the assessment of likely significant effects.

Screening has concluded that Appropriate Assessment is required for:

- Helvick Head to Ballyquin SPA (site code IE004192)
- Mid-Waterford Coast SPA (site code IE004193)

Table 4-6 Summary - Potential for likely significant effects

Site Code & Name	Qualifying Interest Screened In for LSE	Potential pressure	Potential in-combination effect	Conclusion
IE002170 Blackwater River (Cork/Waterford) SAC	Twaite shad	Underwater sounds changes	No	**No LSE**
IE004030 Cork Harbour SPA	Common tern	Visual disturbance	No	**No LSE**
IE004192 Helvick Head to Ballyquin SPA	Cormorant, peregrine and chough	Visual disturbance	Yes	**LSE cannot be ruled out / AA is required**
IE004193 Mid-Waterford Coast SPA	Breeding cormorant, peregrine, and chough	Visual disturbance	Yes	**LSE cannot be ruled out / AA is required**

Site Code & Name	Qualifying Interest Screened In for LSE	Potential pressure	Potential in-combination effect	Conclusion
UK0030396 Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC	Harbour porpoise	Underwater sounds changes	No	**No LSE**
UK0012712 Cardigan Bay/ Bae Ceredigion SAC	Bottlenose dolphin	Underwater sounds changes	No	**No LSE**
UK0030398 North Anglesey Marine / Gogledd Môn Forol SAC	Harbour porpoise	Underwater sounds changes	No	**No LSE**
UK0030399 North Channel SAC	Harbour porpoise	Underwater sounds changes	No	**No LSE**
IE002162 River Barrow and River Nore SAC	Twaite shad	Underwater sounds changes	No	**No LSE**
IE002162 Roaringwater Bay & Islands SAC	Harbour porpoise	Underwater sounds changes	No	**No LSE**
IE003000 Rockabill to Dalkey Island SAC	Harbour porpoise	Underwater sounds changes	No	**No LSE**
IE003000 Saltee Islands SAC	Grey seal	Underwater sounds changes	No	**No LSE**
UK0030397 West Wales Marine / West Gorllewin Cymru Forol SAC	Harbour porpoise	Underwater sounds changes	No	**No LSE**

5. STAGE 2 – NATURA IMPACT STATEMENT

5.1 Introduction

The Stage 1 screening provided in Section 4 concluded that there is the potential for likely significant adverse effects on the following sites and that an AA is required:

- Mid-Waterford Coast SPA (site code IE004193)
- Helvick Head to Ballyquin SPA (site code IE004192)

The AA is a focused and detailed impact assessment of the implications of the plan or project (alone and in combination with other plans and projects), on the integrity of a Natura 2000 site. The assessment considers the conservation objectives of the Natura 2000 site. It is undertaken by the competent authority, which for Foreshore Licence applications is the Department of Housing, Planning and Local Government. To inform the AA, the proponent of the plan (i.e. DP Energy) must provide a Natura Impact Statement (NIS) which provides data and information on the project and an analysis of potential effects on the Natura 2000 site.

NPWS guidance (2012) on the content of the NIS states:

"The more detailed ecological assessment of proposed activities requires that two key questions be addressed: 'What are the likely impacts of the proposed activity?' and 'How quickly could the qualifying interest recover from the impact, if at all?'".

The guidance identifies specific questions which should be considered when providing information to support the AA. The questions relevant to Annex II species have been used to guide the assessment presented below.

This Stage 2 - Natura Impact Statement draws on information provided in Section 4 – Stage 1 AA Screening above; Table 5-1 provides cross-references for where specific information on the two Natura 2000 sites can be found. This NIS focuses on the two Natura 2000 sites for which the potential for a likely significant effect has been identified and provides further assessment of the significant effects on the conservation features of these sites. Where appropriate, it proposes mitigation measures which will be taken by DP Energy to reduce the significance of effects.

Table 5-1 Cross-reference to other supporting information

Relevant information	Mid-Waterford Coast SPA	Helvick Head to Ballyquin SPA
Description of works	Section 2	Section 2
Conservation objectives of the Natura 2000 site	4.5.1.2	4.5.1.3
Assessment of aspects of the proposed project which could negatively affect the conservation objectives of the Natura 2000 site	4.5.1.2	4.5.1.3

5.2 Mid-Waterford Coast SPA

5.2.1 Screening conclusion

The Mid-Waterford Coast SPA is designated to protect the Annex II listed species cormorant, peregrine, herring gull and chough.

The conservation objective for the Mid-Waterford Coast SPA is to maintain or restore the favourable conservation status of the Annex II species. This is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The AA screening concluded that in relation to the conservation objectives, the proposed survey will not reduce, other than temporarily, the natural range of the Annex II species within the SPA nor will it have a significant effect on the habitat that these species require to maintain the population. However, given that the survey is scheduled for summer months when cormorant, peregrine and chough are breeding; and that the location of boreholes and the survey line plan within the application area is not yet known, it cannot be ruled out that the survey works would not disturb nesting birds in the SPA. There is therefore the potential that there could be a likely significant effect on the population dynamics conservation objective of the SPA.

The Joint SNCB Interim Displacement Advice Note (2017) categorised herring gull as having a low disturbance susceptibility (score of 2 out of 5) and a low habitat specialism (score of 2 out of 5). This indicates that breeding herring gull would not be disturbed by the proposed survey works. Therefore, it was concluded that there will be no likely significant effect on herring gull in the SPA, and that an AA was not required for this species. The assessment of effects (Section 5.2.2) therefore focuses on cormorant, peregrine and chough.

5.2.2 Assessment of effects

Given the potential for significant effects on breeding cormorant, peregrine and chough from visual disturbance (i.e. from the presence of survey vessels and borehole drilling), further assessment is required in order to firstly understand the nature and extent of these effects and to then identify suitable mitigation measures to avoid or reduce effects, such that adverse effects on the integrity of the SPA will not arise.

Table 5-2 outlines the specific questions detailed in the NPWS (2012) guidance on Marine Natura Impact Statements that need to be considered by the assessment.

Table 5-2 Assessment of potential effects

Questions	Response
Will the proposed operation or activity result in death, injury or disturbance of individuals?	**Survey vessels:** Yes - The geophysical survey vessel will be within 2km of the SPA for approximately one week as it transits back and forth acquiring data across a 1km wide corridor. In addition, if the eastern export cable corridor is selected for geotechnical investigations, then up to two vessels will undertake brief (less than ½ day) geotechnical and environmental work within 2km of the SPA. Survey activity will be brief and localised, but it is scheduled to overlap with the breeding season of cormorant, peregrine and chough. Marine traffic in the area is of low density. Therefore, it is unlikely that birds will be habituated to marine traffic. As such, the presence of the survey vessels close to the site could cause disturbance to breeding birds. The magnitude of the effect on the SPA will depend on the degree of disturbance. The most disruptive activities to birds are those that are sudden, noisy or fast moving. As such, helicopters and speedboats usually cause the greatest disturbance (Natural England and Suffolk Coast and Heaths 2012). Vessels travelling at faster speeds cause a greater level of disturbance in terms of the proportion of birds flushing and at further distances. Survey vessels will be slow moving, only between 3.6km/h to 5km/h which is slower or the same as walking speed, and at times stationary. At such slow speeds, the

Questions	Response
	vessels are effectively stationary in terms of bird displacement. Studies have shown that slow moving vessels cause little disturbance to birds and birds may habituate to frequent and relatively benign events and noises (Hill et al 1997 in Natural England and Suffolk Coast and Heaths 2012). It is therefore likely that any disturbance to breeding cormorant, peregrine and chough will be temporary.
	Borehole drilling: No –As discussed in Section 4.5.1.1, the zone of disturbance from boreholes works is within 100m. Therefore, given the application area is located 0.3km (300m) from the SPA, there will be no death, injury or disturbance to nesting birds within the SPA.
Is it possible to estimate the number of individuals that are likely to be affected	**No** - Only breeding birds within 100m of the borehole location will experience noise levels sufficient to cause a likely significant effect. As the borehole locations are not known it is uncertain as to how many nests could be affected. However, the application area lies just 0.3km from the border to the west of Mid-Waterford Coast SPA, its therefore unlikely that activities will take place within the SPA. **Cormorant:** The site synopsis indicates that in 1999-2000 the SPA supported a nationally important population of cormorant (79 pairs). The Waterford Birds Atlas (2013) indicates that there are confirmed locations of breeding cormorant within the application area and records indicate that between 1-43 birds were observed as breeding in 2008. **Peregrine:** The site synopsis indicates that in 2002 the SPA supported a nationally important population of cormorant (10 pairs). **Chough:** The site synopsis indicates 24 breeding pairs were recorded from the site in the 1992 survey and 20 pairs in the 2002/03 survey. In addition, five flocks totalling 59 birds were noted in the 1992 survey and a flock of 24 birds in the 2002/03 survey. The Waterford Birds Atlas (2008) indicates that there are confirmed locations of breeding chough within the application area, however there is no information on breeding numbers. Therefore, it is not possible determine how many birds could be affected.
Will individuals be disturbed at a sensitive time or location during their life cycle	**Yes,** the survey is scheduled to be conducted between April and October and will therefore overlap with the breeding season which runs from February through to September.
Are the impacts likely to focus on a particular section of the population, e.g., adults vs. juveniles, males vs. females	There is very limited information available on the reaction of cormorant, peregrine and chough to disturbance by boats. Cormorant is classed (by the Joint SNCB Interim Displacement Advice Note 2017) as highly susceptible to disturbance (score 4 out of 5). Two studies have looked into responses of cormorant to marine traffic. The first study conducted in Barkley Island, British Columbia (Clyde et al 2012) found that cormorant visited their nests less when there was vessel activity in the area. On the contrary, a study in the Strait of Georgia (Giesbrecht 2001) found that nesting cormorant did not respond to marine traffic, even when within 10m of the colony. The difference in findings is believed to be down to the fact that birds in the Strait of Georgia are more habituated to vessel noise given that it is in an area with higher levels of marine traffic than Barkley Island. The Mid Waterford Coast SPA is in an area of low vessel density, it is therefore unlikely that cormorant will be habituated to marine traffic, suggesting that the first study may be of more relevance. A study by Ruddock and Whitfield (2007) looking at the disturbance of peregrine, suggested flushing of peregrine in the presence of humans did not occur “until at close range” but could attribute to possible nest failure. This study also found that breeding peregrines are most likely to be disturbed by activities taking place above their nests. Therefore, given that borehole and survey works will take place in the intertidal area below nesting site, the works are unlikely to result in the flushing of peregrine from their nest sites.

Questions	Response
	A study by Bullock et al (1983) noted that chough were tolerant to human disturbance and are found to breed in busy tourist spots. It therefore can be implied that chough might be tolerant to borehole and survey works. Given that lack of information, it is considered prudent to assume that the presence of the survey vessel could cause adults to startle or change their behaviour, which indirectly may leave eggs or juveniles exposed to predation.
Will the operation/activity cause displacement from key functional areas	Survey vessels could cause brief displacement from the surrounding marine waters as the vessel(s) pass the coastline and SPA. However, the survey will not act as a barrier and birds will be able to quickly return to foraging grounds once the vessel has passed by. For borehole works birds within 100m of the works may be temporarily displaced by again will be able to return to the area once borehole works have ceased (i.e. within 8 days). It is therefore concluded that birds will not be significantly displaced from key functional areas.
Is the habitat of the species likely to deteriorate causing disturbance to individuals or populations	No – the marine survey and borehole works will not affect the habitat of breeding cormorant, peregrine and chough.
How quickly is the affected population in the SPA likely to recover once the operation/activity has ceased	The geophysical vessel will pass backwards and forwards past the SPA as it acquires each line of data. In addition, breeding birds within 100m of borehole works will be disturbed. Each disturbance episode will be brief, but the vessel could be present near the SPA for up to one week and borehole works will take approximately 8 days. Therefore, breeding cormorant, peregrine and chough will experience multiple disturbance events. The worst case is that disturbance at the wrong time in the breeding season could open the nests up to predation reducing the number of chicks reared for the year. Female cormorants lay 3-5 eggs, and survival for the fledgling can be as high as 90%. However, it is usually less, with 2.0 to 2.5 birds per nest common. Under unfavourable conditions this can be further reduced to 0.5 birds per nest. It is estimated that 40% of juveniles die each year (European Commission 2011). Temporary disturbance at the wrong time of the breeding season could be likened to the colonies experiencing a bad year. Against the natural annual fluctuations, effects related to brief disturbance will not be noticeable and recovery will be quick.
In the absence of mitigation, are the effects of the proposed operation/activity on Annex II species likely to have a significant effect on the favourable conservation condition of the Annex II species at the site	In the absence of mitigation, it is uncertain as to whether temporary disturbance of nesting cormorant, peregrine and chough would lead to a significant effect on the favourable conservation objective of the Annex II species at the site. Repeated disturbance over a period of up to one week for nearshore survey works and up to 8 days for boreholes works at the wrong time of year, could lead to a delay in breeding for individuals or nest abandonments.
What measures can be implemented to mitigate the significance of the likely adverse impact into insignificance?	**Survey vessels:** It is recommended that the survey of the application area from the coast to 2km offshore occurs during the period August through to October to avoid disturbance of incubating or chick-rearing adults.

5.2.3 Mitigation/Recommendation

Mitigation measures in this section are proposed to inform the appropriate assessment.

- It is recommended that the survey of the application area from the coast to 2km offshore occurs during the period August through to October to avoid disturbance of incubating or chick-rearing adults.

5.2.4 Conclusion

Disturbance (visual and noise) caused by the survey vessels and borehole drilling could temporarily disturb breeding birds within the Mid-Waterford Coast SPA and could therefore result in a short-term significant effect to the breeding populations. Given the uncertainties in the assessment, e.g. lack of

knowledge on nest locations, mitigation measures have been proposed to ensure that breeding cormorant, peregrine and chough will not be significantly disturbed and that the conservation objectives of the SPA will not be adversely affected.

As highlighted in Table 4-3, there is potential temporal and spatial overlap with surveys for the Energia windfarm at Helvick Head. However, providing that the mitigation measures in Section 6.2.3 are implemented, there will be **no adverse effect on the integrity of the site, either alone or in combination with other plans or projects.**

5.3 Helvick Head to Ballyquin SPA

5.3.1 Screening conclusion

Helvick Head to Ballyquin SPA is designated to protect the Annex II listed species cormorant, peregrine, herring gull, chough and kittiwake.

The conservation objective for the Helvick Head to Ballyquin SPA is to maintain or restore the favourable conservation status of the Annex II species. This is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The AA screening concluded that in relation to the conservation objectives, the proposed survey will not reduce, other than temporarily, the natural range of the Annex II species within the SPA nor will it have a significant effect on the habitat that these species require to maintain the population. However, given that the survey is scheduled for summer months when cormorant, peregrine and chough are breeding; and that the location of boreholes and the survey line plan within the application area is not yet known, it cannot be ruled out that the survey works would not disturb nesting birds in the SPA. There is therefore the potential that there could be a likely significant effect on the population dynamics conservation objective of the SPA.

The Joint SNCB Interim Displacement Advice Note (2017) categorised both herring gull and kittiwake as having a low disturbance susceptibility (score of 2 out of 5) and a low habitat specialism (score of 2 out of 5). This indicates that breeding herring gull and kittiwake would not be disturbed by the proposed survey works. Therefore, it was concluded that there will be no likely significant effect on herring gull and kittiwake at the Helvick Head to Ballyquin SPA, and that an AA was not required for these species. The assessment of effects (Section 5.3.2) therefore focuses on cormorant, peregrine and chough.

5.3.2 Assessment of effects

Given the potential for significant effects on breeding cormorant, peregrine and chough from visual disturbance (i.e. from the presence of survey vessels and borehole drilling), further assessment is required in order to firstly understand the nature and extent of these effects and to then identify suitable mitigation measures to avoid or reduce effects, such that adverse effects on the integrity of the SPA will not arise.

Table 5-3 outlines the specific questions detailed in the NPWS (2012) guidance on Marine Natura Impact Statements that need to be considered by the assessment.

Table 5-3 Assessment of potential effects

Questions	Response
Will the proposed operation or activity result in death, injury or disturbance of individuals?	**Survey vessels:** Yes - The geophysical survey vessel will be within 2km of the SPA for approximately one week as it transits back and forth acquiring data across a 1km wide corridor. In addition, if the eastern export cable corridor is selected for geotechnical investigations, then up to two vessels will undertake brief (less than 1 hour) geotechnical and environmental work within 2km of the SPA's. Survey activity will be temporary and localised, but it is scheduled to overlap with the breeding season of cormorant, peregrine and chough. Marine traffic in the area is of low density. Therefore, it is unlikely that birds will be habituated to marine traffic. As such, the presence of the survey vessels close to the site could cause disturbance to breeding birds. The magnitude of the impact on the SPAs will depend on the degree of disturbance. The most disruptive activities to birds are those that are sudden, noisy or fast moving. As such, helicopters and speedboats usually cause the greatest disturbance (Natural England and Suffolk Coast and Heaths 2012). Vessels travelling at faster speeds cause a greater level of disturbance in terms of the proportion of birds flushing and at further distances. Survey vessels will be slow moving, only between 3.6km/h to 5km/h which is slower or the same as walking speed, and at times stationary. At such slow speeds, the vessels are effectively stationary in terms of bird displacement. Studies have shown that slow moving vessels cause little disturbance to birds and birds may habituate to frequent and relatively benign events and noises (Hill et al 1997 in Natural England and Suffolk Coast and Heaths 2012). It is therefore likely that any disturbance to breeding cormorant, peregrine and chough will be temporary.
	Borehole drilling: Yes – Drilling the geotechnical boreholes will take approximately eight days. During this time there is the potential that breeding cormorant, peregrine and chough could be disturbed. Jackson (2012) provide thresholds for a likely significant effect on bird populations as 70dB for continuous noise and 50dB for impulsive noise, based on a review of relevant research and literature. These figures take into account more sensitive species reactions to concur with the requirements of the Habitats Directive to adopt a 'precautionary principle'. For the proposed borehole drilling, the avoidance of 'complete flight' startling effects is desirable to ensure there will be no significant effects on breeding species. The Wilson Report (HMSO 1963) indicates that a noise level of approximately 85dB is required to scare a bird; which has been assumed to result in 'complete flight'. However, the use of this level as a limit to avoid 'complete flight' has limitations because it is based on specific species (RSK 2011). RSK (2011) conducted a review of published research for the UK Environment Agency, which concluded that due to: the inter and intra-species variability, seasonal effects and difficulties of conducting research which distinguishes the effect of noise from other disturbance; there is considerable uncertainty in identifying thresholds that clearly demonstrate that noise has no adverse effect on the integrity of a protected site. Noise outputs for the proposed borehole survey are not available however below are two examples of noise assessments for similar drilling-based activity: 1. A borehole survey in the Ribble Estuary (RSK 2011) provides noise data for a comparable geotechnical drilling rig albeit on marshland. The noise output for the cable percussive rig had a sound pressure level (SPL) of 68dB at 25m. This information was used to model the impact of the drilling on the surrounding marsh environment, in this case a UK Site of Special Scientific Interest (SSSI). The model results indicated that drilling boreholes on the marsh would result in a noise level of 55dB(A) or greater at a maximum radius of 93m, and a noise level of 76dB(A) occurred at approximately 10 – 11m from the rig.

Questions	Response
	2. The noise associated with drilling an exploratory shale-gas well from a 7.2 metre rig on land was calculated to be 75dB(A) at 10m, falling to 62dB(A) over 50m (Ecology Services 2013). Based on the examples provided above it would suggest that noise from the proposed borehole drilling activity is potentially below the suggested threshold of 85dB which would cause a 'complete flight' startle reaction, but sufficient to cause a likely significant disturbance (i.e. above 55dB) within 100m of borehole drilling activities.
Is it possible to estimate the number of individuals that are likely to be affected	**No** - Only breeding birds within 100m of the borehole location will experience noise levels sufficient to cause a likely significant effect. As the borehole locations are not known it is uncertain as to how many nests could be affected. However, the application area lies just on the border to the west of Helvick Head to Ballyquin SPA, its therefore unlikely that activities will take place within the SPA. **Cormorant** The site synopsis indicates that in 2002-2003 the SPA supported a nationally important population of cormorant (65 pairs). **Peregrine** The site synopsis indicates that in 2002 the SPA supported a nationally important population of cormorant (5 pairs). **Chough** There is no disclosed number of breeding pairs for the Helvick to Ballyquin SPA, however, the NPWS do report that the area is important for Chough.
Will individuals be disturbed at a sensitive time or location during their life cycle	Yes, the survey is scheduled to be conducted between April and October and will therefore overlap with the breeding season which runs from February through to September.
Are the impacts likely to focus on a particular section of the population, e.g., adults vs. juveniles, males vs. females	There is very limited information available on the reaction of cormorant, peregrine and chough to disturbance by boats. Cormorant is classed (by the Joint SNCB Interim Displacement Advice Note 2017) as highly susceptible to disturbance (score 4 out of 5). Two studies have looked into responses of cormorant to marine traffic. The first study conducted in Barkley Island, British Columbia (Clyde et al 2012) found that cormorant visited their nests less when there was vessel activity in the area. On the contrary, a study in the Strait of Georgia (Giesbrecht 2001) found that nesting cormorant did not respond to marine traffic, even when within 10m of the colony. The difference in findings is believed to be down to the fact that birds in the Strait of Georgia are more habituated to vessel noise given that it is in an area with higher levels of marine traffic than Barkley Island. The Helvick Head to Ballyquin Spa is within an area of low vessel density, it is therefore unlikely that cormorant will be habituated to marine traffic, suggesting that the first study may be of more relevance. A study by Ruddock and Whitfield (2007) looking at the disturbance of peregrine, suggested flushing of peregrine in the presence of humans did not occur "until at close range" but could attribute to possible nest failure. This study also found that breeding peregrines are most likely disturbed by activities taking place above their nests. Therefore, given that borehole and survey works will take place in the intertidal area below nesting site, the works are unlikely to result in the flushing of peregrine from their nest sites A study by Bullock et al (1983) noted that chough was tolerant to human disturbance and are found to breed in busy tourist spots. It therefore could be implied that chough might be tolerant to borehole and survey works. Given that lack of information, it is considered prudent to assume that the presence of the survey vessel could cause adults to startle or change their behaviour, which indirectly may leave eggs or juveniles exposed to predation.
Will the operation/activity cause displacement from key functional areas	Survey vessels could cause brief displacement from the surrounding marine waters as the vessel(s) pass the coastline and SPA. However, the survey will not act as a

Questions	Response
	barrier and birds will be able to quickly return to foraging grounds once the vessel has passed by. For borehole works birds within 100m of the works may be temporarily displaced by again will be able to return to the area once borehole works have ceased (i.e. within 8 days).
Is the habitat of the species likely to deteriorate causing disturbance to individuals or populations	No – the marine survey and borehole works will not affect the habitat of breeding cormorant, peregrine and chough.
How quickly is the affected population in the SPA likely to recover once the operation/activity has ceased	The geophysical vessel will pass backwards and forwards past the SPAs as it acquires each line of data. In addition, breeding birds within 100m of borehole works will disturbed. Each disturbance episode will be brief, but the vessel could be present near the SPAs for up to one week and borehole works will take approximately 8 days. Therefore, breeding cormorant, peregrine and chough will experience multiple disturbance events. The worst case is that disturbance at the wrong time in the breeding season could open the nests up to predation reducing the number of chicks reared for the year. Female cormorants lay 3-5 eggs, and survival for the fledgling can be as high as 90%. However, it is usually less with 2.0 to 2.5 birds per nest common. Under unfavourable conditions this can be further reduced to 0.5 birds per nest. It is estimated that 40% of juveniles die each year (European Commission 2011). Temporary disturbance at the wrong time of the breeding season could be likened to the colonies experiencing a bad year. It is likely that against the natural annual fluctuations, effects related to temporary disturbance will not be noticeable and recovery will be quick.
In the absence of mitigation, are the effects of the proposed operation/activity on Annex II species likely to have a significant effect on the favourable conservation condition of the Annex II species at the site	In the absence of mitigation, it is uncertain as to whether temporary disturbance of nesting cormorant, peregrine and chough would lead to a significant effect on the favourable conservation objective of the Annex II species at the site. Repeated disturbance over a period of up to one week for nearshore survey works and up to 8 days for boreholes works at the wrong time of year, could lead to a delay in breeding for individuals or nest abandonments.
What measures can be implemented to mitigate the significance of the likely adverse impact into insignificance?	**Survey vessels:** It is recommended that the survey of the application area from the coast to 2km offshore occurs during the period August through to February to avoid disturbance of incubating or chick-rearing adults.
	Borehole works: Geotechnical boreholes should be located a minimum of 100m from known breeding habitat e.g. caves, rock crevasses and sea cliffs.

5.3.3 Mitigation/Recommendation

Mitigation measures in this section are proposed to inform the appropriate assessment.

- It is recommended that the survey of the application area from the coast to 2km offshore occurs during the period August through to October to avoid disturbance of incubating or chick-rearing adults.

Borehole works:

- Geotechnical boreholes should be located a minimum of 100m from known breeding habitat e.g. caves, rock crevasses and sea cliffs.

5.3.4 Conclusion

Visual disturbance caused by the survey vessels and borehole drilling could temporarily disturb breeding birds within the Helvick Head to Ballyquin SPA and could therefore result in a short-term significant effect to the breeding populations. Given the uncertainties in the assessment, e.g. lack of knowledge on nest locations, mitigation measures have been proposed to ensure that breeding

cormorant, peregrine, kittiwake and chough will not be significantly disturbed and that the conservation objectives of the SPA will not be adversely affected.

As highlighted in Table 4-3, there is potential temporal and spatial overlap with surveys for the Energia windfarm at Helvick Head. However, providing that the mitigation measures in Section 5.2.3 are adhered to, there will be **no adverse effect on integrity of site, either alone or in combination with other plans or projects.**

REFERENCES

1 BEIS (2018). Offshore Oil & Gas Licensing 30th Seaward Round. Habitat Regulations Assessment. Draft Appropriate Assessment: Southern North Sea. February 2018. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/681627/30th_Round_Draft_AA_-_Southern_North_Sea_Blocks.pdf [Accessed November 2019]

2 Brandt T,M.J., Dragon A.C., Diederichs A., Schubert A., Kosarev V., Nehl, G., Wahl, V., Michalik, A., Braasch, A., Hinz C., Ketzer, C., Todeskino, D., Gauger, M., Laczny, M. & Piper, W. (2016). Effects of offshore pile driving on harbour porpoise abundance in the German Bight 2009-2013. Assessment of Noise Effects. Work package 2-5, Revision 3. Final report. Prepared for Offshore Forum Windenergie. P. 247. IBL Umweltplanung GmbH, Institut für angewandte Ökosystemforschung GmbH, BioConsult SH GmbH & Co. KG, Oldenburg, Neu Broderstorf, Husum.

3 BOEM (2017). BOEM: Best Management Practices Workshop for Atlantic Offshore Wind Facilities. Overview of NMFS 2016 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing. [online] Available at: https://www.boem.gov/sites/default/files/renewable-energy-program/Day-1_Afternoon_Scholik_Overview_of_Guidance.pdf [Accessed November 2019]

4 Bullock, I.D., Drewett, D.R and Mickleburgh, S.P (1983). The Chough in Britain and Ireland [online] Available at: https://britishbirds.co.uk/wp-content/uploads/article_files/V76/V76_N09/V76_N09_P377_401_A108.pdf (Accessed January 2019)

5 Clyde, M.T.N., Provencher, J.F and Heath, J.P. (2012). responses of pelagic cormorants (Phalacrocorax pelagicus) to marine traffic and bald eagles (Haliaeetus leucocephalus) in Barkley sound, British Columbia. Northwestern Naturalist 93:237–240. [online] Available online: https://www.researchgate.net/publication/236335610_Responses_of_Pelagic_Cormorants_Phalacrocorax_pelagicus_to_Marine_Traffic_and_Bald_Eagles_Haliaetus_leucocephalus_in_Barkley_Sound_British_Columbia (Accessed February 2019)

6 Crowe, O. (2005). Ireland's Wetlands and their Waterbirds: Status and Distribution. BirdWatch Ireland. Newcastle.

7 Coull, K.A., Johnstone, R., and Rogers, S.I. (1998). Fisheries Sensitivity Maps for British Waters. Published and distributed by UK Oil and Gas.

8 DAHG (2012). Marine Natura Impact Statements in Irish Special Areas of Conservation: A Working Document. [online] Available at: https://www.npws.ie/sites/default/files/general/Marine%20Assessment%20Working%20Document.pdf [Accessed November2019]

9 DAHG (2014). Guidance to manage the risk to marine mammals from man-made sound sources in Irish Waters. [online] Available at: https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance_Jan%202014.pdf [Accessed November2019]

10 DCENR (2011). Shellfish Stocks and Fisheries Review 2011 An assessment of selected stocks. [online] Available at: https://oar.marine.ie/bitstream/handle/10793/751/Shellfish%20Stocks%20and%20Fisheries%20Review%202011.pdf?sequence=1. (Accessed February 2019)

11 DCCAE (2015). Irish Offshore Strategic Environmental Assessment (IOSEA) 5 Environmental Report. [online] Available at: https://oar.marine.ie/bitstream/handle/10793/751/Shellfish%20Stocks%20and%20Fisheries%20Review%202011.pdf?sequence=1. [Accessed February 2019]

12 DEHLG (2010). Guidance “Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. [online] Available at: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf [Accessed December 2019]

13 Department of Energy and Climate Change (DECC) (2016). Offshore Energy Strategic Environmental

Assessment. Department of Energy and Climate Change. March 2016.

14 Ecology Services (2013). Impact Assessment and Method Statement. Site at Anna's Road. [online] Available at: http://planningregister.lancashire.gov.uk/DisplayImage.aspx?doc=cmVjb3JkX251bWJlcj02MTkzJmZpbGVuYW1lPVxcYWQubGFuY3NjYy5uZXRcQ29ycG9yYXRlXERhdGF3cmlnaHRcUGxhbm5pbmdcMDUtMTItMDcyOVxBbm5hc19SZF9NU18xMC0yLTEzX2ZpbmFsX2NvbXAucGRmJmltYWdlX251bWJlcj01OSZpbWFnZV90eXBlPXBsYW5uaW5nJmxhc3RfbW9kaWZpZWRfZnJvbV9kaXNrPTEyLzAyLzIwMTMgMTU6NTQ6MTQ= (Accessed March 2019)

15 Ellis, J., Milligan, S. Readdy, L., Taylor, N and Brown, M. (2012). Spawning and Nursery Grounds of Selected Fish Species in UK Waters. Science Series Technical Report No. 147. CEFAS, Lowestoft.

16 European Commission (2001). Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC [online] Available at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf [Accessed November 2019]

17 European Commission (2018). Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC [online] .Available at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_6_nov_2018_en.pdf [Accessed November 2019]

18 Department of Communications, Energy and Natural Resources (DCENR) (2015). Irish Offshore Strategic Environmental Assessment (IOSEA) 5 Environmental Report. [online] Available at: https://www.dccae.gov.ie/en-ie/natural-resources/publications/Documents/6/IOSEA5EnvironmentalReport.pdf [Accessed November 2019]

19 European Marine Observation Data Network (EMODnet) (2019) "Seabeds Habitat Project" [online] Available at: https://www.emodnet-seabedhabitats.eu/ [Accessed November 2019]

20 Greenlink Interconnector (2019) "Greenlink Interconnector Project". [online] Available at: https://www.greenlink.ie/ [Accessed November 2019]

21 Genesis Oil and Gas Consultants. (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 for the Department of Energy and Climate Change. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/50017/finreport-sound.pdf (Accessed February 2018)

22 Giesbrecht, T. (2001). The Effect of Bald Eagles and Boat Traffic on Nesting Double-crested Cormorants (Phalacrocorax auratus) In the Strait of Georgia. [online] Available at http://a100.gov.bc.ca/appsdata/acat/documents/r32412/CormorantDisturbanceStudy_map__1350659194360_cc11cb6b3a6a5548e044cb3372873059ef8329f318d6f7ce770097595516c6be.pdf (Accessed February 2019)

23 Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Borjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J. and Øien, N. (2017) Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. [online] Available at: https://synergy.st-andrews.ac.uk/scans3/files/2017/04/SCANS-III-design-based-estimates-2017-04-28-final.pdf (Accessed February 2019).

24 HMSO (1963). Wilson Committee Report on Noise: A Synopsis of the Contents of the Final Report by the Committee on the Problem of Noise, which relate to Aircraft Noise, Aircraft Engineering and Aerospace Technology, Vol. 35 Issue: 8, pp.218-219.

25 Her Majesty's Stationery Office (1963) The Wilson Report, Chapters 5, 10 & 12. [online] Available at: https://discovery.nationalarchives.gov.uk/details/r/C11243865 [Accessed November 2019]

26 ICES (2009). Review of the Biologically Sensitive Area/Irish Box. [online] Available at http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2009/Special%20Requests/EC%20Irish%20box.pdf#search=%22Irish%20Box%22%20in%20the%20context%20of%20the%20Western%20Waters%20Regime . [Accessed February 2019].

27 IWDG (2019). Sightings. [online] Available at: http://www.iwdg.ie/ (Accessed December2019).

28 Jackson, P. (2012). Noise Impact Assessment on Wintering Birds Anna's Road Exploration Well Site, Westby, Blackpool. Spectrum Acoustic Consultants.

Report ref. PJ3056/12320. Issued to Cuadrilla Resources Limited. October 2012.

29 Joint Nature Conservation Committee (JNCC) (2019a) "Bristol Channel Approaches/Dynesfeydd Mor Hafren" Available at: https://sac.jncc.gov.uk/site/UK0030396 [Accessed November 2019]

30 Joint Nature Conservation Committee (JNCC) (2019b) "Cardigan Bay/ Bae Ceredigion" [online] Available at: https://sac.jncc.gov.uk/site/UK0012712 [Accessed November 2019]

31 Joint Nature Conservation Committee (JNCC) (2019c) "North Anglesey Marine/ Gobledd Mon Forol" [online] Available at: https://sac.jncc.gov.uk/site/UK0030398 [Accessed November 2019]

32 Joint Nature Conservation Committee (JNCC) (2019d) "North Channel" [online] Available at: https://sac.jncc.gov.uk/site/UK0030399 [Accessed November 2019]

33 Joint Nature Conservation Committee (JNCC) (2019e) "Pembrokeshire Marine". [online] Available at: https://sac.jncc.gov.uk/site/UK0013116 [Accessed November 2019]

34 JNCC (2017). Joint SNCB Interim Displacement Advice Note (2017). [online] Available at: http://archive.jncc.gov.uk/pdf/Joint_SNCB_Interim_Displacement_AdviceNote_2017.pdf (Accessed November 2019)

35 Joint Nature Conservation Committee (JNCC) (2019f) "West of Wales Marine? West Gorllewin Crymru Forol SAC" [online] Available at: https://sac.jncc.gov.uk/site/UK0030397 [Accessed November 2019]

36 Mackey, M., Ó Cadhla, O., Kelly, T.C., Aguilar, A., de Soto, N. and Connolly, N. (2004). Cetaceans and Seabirds of Ireland's Atlantic Margin. Volume I – Seabird distribution, density & abundance.

37 Marine Institute (2019a) Ireland's Marine Atlas. [online] Available at: http://atlas.marine.ie/ (Accessed February 2019).

38 Marine Institute (2019b). Salmon life cycle. [online] Available at: https://www.marine.ie/Home/site-area/areas-activity/fisheries-ecosystems/salmon-life-cycle (Accessed January 2019)

39 MMO (Marine Management Organisation) (2018). Fisheries statistics. [online] Available at: https://www.gov.uk/government/statistical-data-sets [Accessed February 2018]

40 National Parks & Wildlife Services (NPWS) (2011a) "Conservation Objective Series: Roaringwater Bay and Islands SAC 000101" Available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000101.pdf [Accessed November 2019]

41 National Parks & Wildlife Services (NPWS) (2012a) "Conservation Objective Series: Blackwater Estuary SPA 004028" available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004028.pdf [Accessed November 2019]

42 National Parks & Wildlife Services (NPWS) (2012b) Blackwater river SAC 002170" available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf [Accessed November 2019]

43 National Parks & Wildlife Services (NPWS) (2012c) "Conservation Objective Series: Dungarvan Harbour 004032" available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004032.pdf [Accessed November 2019]

44 National Parks & Wildlife Services (NPWS) (2013a) "Conservation Objective Series: Rockabill to Dalkey Island SAC 003000" Available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO003000.pdf [Accessed November 2019]

45 National Parks & Wildlife Services (NPWS) (2013b) "Conservation Objective Series: Saltee Islands SAC 0000707" Available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000707.pdf [Accessed November 2019]

46 National Parks & Wildlife Services (NPWS) (2014a) "Conservation Objective Series: Ballycotton Bay SPA 004022" available at https://www.npws.ie/sites/default/files/protected-

sites/conservation_objectives/CO004022.pdf [Accessed November 2019]

47 National Parks & Wildlife Services (NPWS) (2014b) "Conservation Objective Series: Cork Harbour SPA 004030" available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004030.pdf [Accessed November 2019]

48 National Parks & Wildlife Services (NPWS) (2015a) "Conservation Objective Series: Ballymacoda Bay SPA 004023" available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004023.pdf [Accessed November 2019]

49 National Parks & Wildlife Services (NPWS) (2016a) "Conservation Objective Series: Ardmore Head SAC 002123" available online at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002123.pdf [Accessed November 2019]

50 National Parks & Wildlife Services (NPWS) (2016b) "Conservation Objective Series: River Barrow and RiverNore SAC 002162" Available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002162.pdf [Accessed November 2019]

51 National Parks & Wildlife Services (NPWS) (2018a) "Conservation Objective Series: Helvick Head to Ballyquin SPA 004192" available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004192.pdf [Accessed November 2019]

52 National Parks & Wildlife Services (NPWS) (2018b) "Conservation Objective Series: Mid-Waterford Coast SPA 004193" available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004193.pdf [Accessed November 2019]

53 National Parks & Wildlife Services (NPWS) (2018c) "Conservation Objective Series: Sovereign Islands SPA 004124" available online at: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004124.pdf [Accessed November 2019]

54 Natural England and JNCC (2012) Joint Natural England and JNCC Interim Advice Note: Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation of Offshore Windfarm Developments.

55 Natural England and Suffolk Coast and Heaths (2012). A simple method for assessing the risk of disturbance to birds at coastal sites. November 2012. [online] Available at: http://www.suffolkcoastandheaths.org/assets/Projects--Partnerships/Stour--Orwell/disturbance/A-simple-method-for-assessing-the-risk-of-disturbance-to-birds-at-coastal-sites.pdf (Accessed February 2019).

56 Nedwell, J.R., Edwards, B., Turnpenny, A.W.H., and Gordon, J (2004) Fish and Marine Mammal Audiograms: A summary of available information. [online] Available online: https://www.jstor.org/stable/41811925?seq=3#metadata_info_tab_contents (Accessed February 2019).

57 Nedwell, J., Mason, T., Barham, R. and Chessman, S (2012). Assessing the environmental impact of underwater noise during offshore windfarm construction and operation. Proceedings of Acoustics 2012, Fremantle, Australia [online] Available at: http://www.acoustics.asn.au/conference_proceedings/AAS2012/papers/p116.pdf (Accessed March 2018)

58 National Marine Fisheries Service (NMFS) (2018). 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p.

59 Pollock, C. and Barton, C. (2008). A Gap Analysis of Irish Waters using the European Seabirds at Sea (ESAS) database. Irish Wildlife Manuals. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

60 Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D. A., Bartol, S., Carlson, T. J., Coombs, S., Ellison, W. T., Gentry, R. L., Halvorsen, M. B., Løkkebog, S., Rogers, P. H., Southall, B. L., Zeddies, D. G., and Tavolga, W. N. (2014). Sound Exposure Guidelines for Fishes and Sea Turles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI.

61 Popper, E.N. and Hastings, M.C. (2009). The effects of human-generated sound on fish. Integrative Zoology. Volume 4. Pg 43-52.

62 Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. & Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

63 Richardson, W.J., Greene, C.R. Jr., Malme, C.I., and Thomson, D.H. (1995). Marine Mammals and Noise. Academic Press, San Diego, CA, USA.576p.

64 RSK (2011). Ribble Estuary Drilling Noise Assessment. Acoustic Report for KMI Water. Ref no. 296021-01(00). November 2011.

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

66 Ruddock, M and Whitfield (2007). A report from Natural Research (Projects) Ltd to Scottish Natural Heritage. [online] Available online: https://www.rspb.org.uk/birds-and-wildlife/advice/gardening-for-wildlife/animal-deterrents/gulls/gull-breeding-habitats-and-nest-sites/ (Accessed March 2019)

67 Showler, D.A., Stewart, G.B., Sutherland, W.J., and Pullin, A.S. (2010). What is the impact of public access on the breeding success of ground-nesting and cliff-nesting birds? CEE review 05-010 (SR16).

68 Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr, C.R., Kastak, Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A. and Tyack, P.L. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, 33: Number 4. [online] Available at: http://sea-inc.net/assets/pdf/mmnoise_aquaticmammals.pdf (Accessed November 2019)

69 Thomsen, F., Ludemann, K., Kafemann, R. and Piper, W. (2006) Effects of Offshore Windfarm Noise on Marine Mammals and Fish. Report prepared by Biola for COWRIE Ltd. Hamberg, Germany. 62pp.

70 Valente, J.J. and Fischer, R.A (2011). Reducing human disturbance to waterbird communities near corps of engineers projects. Report reference ERDC TN-DOER-E29. [online] Available at: http://el.erdc.usace.army.mil/elpubs/pdf/doere29.pdf [Accessed November 2019]

71 Waterford Birds (2013). The Waterford Bird Atlas 2006-2013. [Online] Available at: http://www.waterfordbirds.com/atlas_specieslist.html (accessed March 2019)

Appendix A

Underwater Noise Assessment

A.1 INTRODUCTION

The survey operations will generate noise from a variety of sources, including: vessel activity; side scan sonar; multi-beam echosounder; sub bottom profiler; geotechnical borehole sampling; and VC and CPT sampling.

Sound attenuates as it propagates through water and the local oceanographic conditions will affect both the path of the sound into the water column and how much sound is transmitted. An in-house geometric spreading calculation was used to determine the propagation of underwater sound from the proposed survey works. The spreading model assumes that sound is spread geometrically away from the source with an additional frequency-dependent absorption loss; it therefore provides conservative estimates. It also does not take into consideration the conditions within the area, such as bathymetry, water depth or sediment type and thickness.

Attenuation used in the geometric spreading calculation can be calculated using the equation below:

SPL = SL – 15log (R). In this equation:

SPL = sound pressure level

SL = source level

R = the distance from a source level (SL)

15 = attenuation value associated with spreading in shallow water, allowing for losses to the seabed.

This equation does not include any terms relating to frequency (MMO 2015).

A literature review was performed to obtain the source levels to inform this assessment and modelling. No project-specific data was available, and the literature review identified appropriate sound sources to use.

Genesis Oil and Gas Consultants (2011) listed the sound levels of DP vessels; a worst-case 184dB re 1 µPa @ 1m was used for the assessment below.

Received sound from the geophysical survey are considered as near-continuous, rather than impulsive. However, there are no publicly available data on sound exposure levels (SEL) for the geophysical equipment. For the purpose of this assessment, sound pressure levels (SPL), which are more readily available, have been used instead to compare the sound levels of the geophysical equipment and borehole drilling against injury and disturbance thresholds (for near-continuous noise the thresholds are provided in SEL as this accounts for the time element as well as the noise level whereas impulsive just considers the noise).

A.2 FISH

Potential effects on fish from anthropogenic sounds ranges from: behavioural changes, such as moving towards or away from a sound source or leaving a feeding or breeding site and increased stress; through to temporary impacts such as temporary hearing loss and the masking of biologically relevant sounds; and in extreme cases (where intense sound sources are used such as explosives and 3D seismic surveys) injuries that might either directly result in death or make the fish vulnerable in the short term.

Longer lasting sounds, such as those associated with shipping noise, cause a general increase in low frequency background noise (<1kHz). Some marine fish can produce and detect noise, and while not fully understood, this is thought to be associated with alarm calls and social behaviour, and studies have found that an increase in background noise can cause an avoidance or attraction reaction in fish (Thomsen et al. 2006).

Fish ability to hear noise is dependent on their hearing structures, which indicate their sensitivity to sound. High sensitivity hearing species (including herring, shad and sprat) have specialisations of the auditory apparatus; medium sensitivity species (including salmon and cod) have a swim bladder; and low sensitivity species with no swim bladder include flat fish such as plaice and dab (Nedwell et al 2004). There is also potential for some fish and shellfish species to be vulnerable to acoustic survey activities during sensitive life stages, for example during the egg and larvae development stages.

Twaite shad, as a member of the herring family, is a hearing specialist fish. There is no information on the hearing sensitivity of shad, so information on herring has been used to infer sensitivity. The swim bladder and inner ear in herring are connected, allowing fish to detect frequencies to over 5kHZ; with optimum sensitivity between 30Hz-1kHz (Nedwell et al. 2004). The frequencies at which the peak sound pressure levels of the geophysical survey techniques proposed are at the upper limit of the audible range for herring. However, disturbance and injurious effects can occur from the sudden change in pressure generated by activities. The greater the sound pulse the greater the likely effects to herring.

Popper et al. (2014) provide sound exposure guidelines for injury to fish, which have been used to determine the zone of influence for the proposed works. Modelling results, i.e. the distances from the source at which sound levels will diminish to below the injury and disturbance thresholds, are summarised in Table A-1.

Table A-1 Summary of continuous sound results - fish

		Threshold	**Recoverable injury**	**TTS**
			173dB re 1 µPa†	**161dB re 1 µPa†**
Activity	**Source**	**Frequency**	**Distance in metres at which threshold is exceeded**	
DP vessel *	SPL: 184dB dB re 1 µPa @ 1m	Frequency: 63Hz	7	50
MBES*	SPL: 232dB(rms)re 1µPa @1m (converted to 235 dB0-peak re 1µPa2-s) *	Frequency: 95kHz	630	910
SSS*	SPL: 226dB(rms) re 1µPa @1m (converted to 229 dB0-peak re 1µPa2-s) *	Frequency: 114kHz	450	700
Chirper / pinger*	SPL: 208dB(rms) re 1µPa @1m (converted to 211 dB0-peak re 1µPa2-s) *	Frequency: 1.5kHz	350	2,200
Boomer *	SPL: 208dB(rms) re 1µPa @1m (converted to 211 dB0-peak re 1µPa2-s) *	Frequency: 2.5kHz	350	2,200

Note: † Popper *et al.* (2014) provide thresholds in dB (rms) for recoverable injury and TTS. These have been derived in 0-peak. Recoverable injury threshold is 170dB rms for exposure of 48hrs and TTS threshold is 158dB rms for exposure of 14hrs.

The geometric spreading model results indicate for activities which generate continuous (dynamically positioned vessels) or near-continuous (geophysical survey) sound:

Dynamically positioned vessels

- The zone of influence for fish recoverable injury is 17m.
- The zone of influence for temporary injury for fish is 110m.

Geophysical survey (multi-bean echosounder, side-scan sonar, sub-bottom profiler)

- The zone of influence for fish recoverable injury is 630m.
- The zone of influence for temporary injury for fish is 2,200m.

Fish will avoid the immediate area around the survey vessel (for approximately 2.2km radius) once operations have started and are unlikely to return to the area until the sound source has passed. Therefore, it is extremely unlikely that fish will experience significant impact other than temporary displacement from the immediate area surrounding the geophysical survey activity. Geophysical surveys progress relatively quickly, typically 1m/s (approximately 2 knots) and the maximum time that any point within a 2.2km radius of the survey vessel would experience noise levels above the thresholds is approximately 2.5 hours.

It should be noted that the noise source and potential impact zone that is present during the proposed survey as well as being limited in range is also moving slowly in a constant direction (in the order of 1 m/s) along the principal survey line orientation. It is also expected that any fish species susceptible to stress and within range of the potential noise impact would be able to maintain adequate separation.

Drilling operations are not continuous, and studies indicate that if pelagic fish are within 7.5m of the geotechnical drill site (drilled through rock) when operations begin, may experience barotraumas to the swim bladder. This would reduce the fish's ability to survive in the environment (ICOE 2010). However, the likelihood of pelagic fish being within the zone of ensonification of the drill site (due to the increase in localised disturbance from support and survey vessels prior to drilling) is extremely low.

Fish will avoid the survey area once operations have started and are extremely unlikely to move towards the sound source.

A.3 MARINE MAMMALS

A.3.1 Underwater sound changes

One of the most important environmental concerns related to the proposed activities is the potential effects of underwater sound. This section considers the potential for marine mammals to be affected by sound associated with the geophysical survey (MBES, pinger/chirper, SSS) and borehole drilling.

Both cetaceans and pinnipeds have evolved to use sound as an important aid in navigation, communication and hunting (Richardson *et al.* 1995). It is generally accepted that exposure to anthropogenic sound can induce a range of behaviour effects to permanent injury in marine mammals. Loud and prolonged noise may mask communicative or hunting vocalisations, preventing social interactions and effective hunting. High intensity noises such as from seismic survey, explosions and pile driving can cause temporary or permanent changes to animals' hearing if the animal is exposed to the sound in close proximity and, in some circumstances, can lead to the death of the animal (Richardson *et al.* 1995). Where the threshold of hearing is temporarily damaged, it is considered a temporary threshold shift (TTS), and the animal is expected to recover. If there is permanent damage (permanent threshold shift (PTS)) where the animal does not recover, social isolation and a restricted ability to locate food may occur, potentially leading to the death of the animal (Southall *et al.* 2007).

The assessment below considers the potential for the proposed geophysical survey and borehole drilling to generate sound at a level that exceeds the thresholds at which the onset of injury (PTS) or disturbance (TTS) effects may occur. The thresholds to define PTS and TTS are described below.

A.3.1.1 Injury thresholds

In order to evaluate the potential of the geophysical survey and borehole drilling to cause harm to marine mammals, an assessment has been conducted using the American National Marine Fisheries Service (NMFS) (2018) thresholds for the onset of PTS and TTS. The approach separates marine mammals into five groups based on their functional hearing, namely: low-frequency cetaceans; mid frequency cetaceans; high frequency cetaceans; pinnipeds (Phocid) in water; and pinnipeds (Otariid) in water. Table A-2 presents the species identified as present in the survey area according to their functional hearing category.

Table A-2 Marine mammal auditory bandwidth

Group	Low-frequency cetaceans	Mid-frequency cetaceans	High-frequency cetaceans	Pinnipeds (Phocid) in water
Generalised hearing range (NMFS 2018)	7Hz – 35kHz	150hz – 160kHz	275Hz – 160kHz	50Hz – 86kHz
Species	Baleen whales	Most toothed whales, dolphins	Certain toothed whales, porpoises	True seals
Species potentially in application area during April to October	Minke whale Humpback whale Fin whale	Short-beaked common dolphin Bottlenose dolphin Striped dolphin Risso's dolphin White-beaked dolphin Long-finned pilot whale Killer whale	Harbour porpoise	Grey seal Harbour seal

Source: NFMS (2018)

The thresholds for the onset of PTS and TTS, as published in NMFS (2018) are provided in Table A-3. These reflect the current peer-reviewed published state of scientific knowledge. The threshold levels (Table A-3) have been used to determine the range at which sound levels from the proposed marine survey dissipate to below the thresholds i.e. the range within which there is the potential for injury to marine mammals.

Received sound by marine mammals from the geophysical survey and the borehole drilling are considered as near-continuous, rather than impulsive. However, there are no publicly available data on sound exposure levels (SEL) for the geophysical equipment and borehole drilling. For the purpose of this assessment, sound pressure levels (SPL), which are more readily available, have been used instead to compare the sound levels of the geophysical equipment and borehole drilling against PTS and TTS thresholds (for near-continuous noise the thresholds are provided in SEL as this accounts for the time element as well as the noise level whereas impulsive just considers the noise).

Table A-3 Injury criteria for marine mammals (impulse) - SPL (unweighted)

Group	NFMS (2018)	
	PTS **Peak SPL ($SPL_{0\text{-}peak}$ dB re 1 µPa²s) (unweighted)**	**TTS** **Peak SPL ($SPL_{0\text{-}peak}$ dB re 1 µPa²s) (unweighted)**
Low-frequency cetaceans	219	213
Mid-frequency cetaceans	230	224
High-frequency cetaceans	202	196
Pinnipeds (Phocid) in water	218	212
Pinnipeds (Otariid) in water	232	226

Source: Southall *et al.* (2007); NFMS (2018)

A.3.1.2 Disturbance thresholds

Behavioural disturbance from underwater sound sources is more difficult to assess than injury and is dependent upon many factors related to the circumstances of the exposure (NFMS 2018). An animal's ability to detect sounds produced by anthropogenic activities depends on its hearing sensitivity and the magnitude of the noise compared to the amount of natural ambient and background anthropogenic sound. In simple terms for a sound to be detected it must be louder than background and above the animal's hearing sensitivity at the relevant sound frequency.

Behavioural responses caused by disturbance may include animals changing or masking their communication signals, which may affect foraging and reproductive opportunities or restrict foraging, migratory or breeding behaviours; and factors that significantly affect the local distribution or abundance of the species. An animal may swim away from the zone of disturbance and remain at a distance until the activities have passed. Behavioural disturbance to a marine mammal is hereafter considered as the disruption of behavioural patterns, for example: migration, breeding and nursing. NMFS has not yet published guidelines on behaviour thresholds due to the complexity and variability of the responses of marine mammals to anthropogenic disturbance.

For the purposes of this assessment the threshold for behavioural disturbance has been assessed as 160 dB rms for all cetacean species (BOEM 2017, NMFS 2018).

A.3.1.3 Noise modelling

Modelling results, i.e. the distances from the source at which sound levels will diminish to below the NMFS (2018) criteria thresholds, for each location are summarised in Table A-4 below. The distance from the sound source ('range') at which disturbance effects may be observed is also presented in Table A-4 below.

There is limited sound source information available for sound produced by borehole drilling (rotary coring). An investigation into the effects of noise from near-shore marine drilling activity taken from hydrophone readings in the water column (ICOE 2010) compared sound propagation from rotary coring in to different seabed types. The study identified that during soft sediment coring the highest sound pressure level recorded (at 23m from the JUB) was 107db re 1 1µPa (Peak) at 10Hz. For hard rock drilling the highest sound pressure level recorded was also at 107db re 1µPa (Peak)) at 7.5m from the JUB. Therefore, borehole drilling within soft sediments is below the threshold for injury for all cetacean species groups.

Table A-4 Summary of Results

Auditory group	Threshold		Distance in metres at which threshold is exceeded				
			MBES	**SSS**	**Chirp & Pinger**	**DP Vessel**	**Boomer**
			SPL: 232dB(rms)re 1µPa @1m (converted to 235 $dB_{0\text{-}peak}$ re 1µPa^2-s) * Frequency: 95kHz	**SPL: 226dB(rms) re 1µPa @1m (converted to 229 $dB_{0\text{-}peak}$ re 1µPa^2-s) * Frequency: 114kHz**	**SPL: 208dB(rms) re 1µPa @1m (converted to 211 $dB_{0\text{-}peak}$ re 1µPa^2-s) * Frequency: 1.5kHz**	**SPL: 184dB dB re 1 µPa @ 1m Frequency: 63Hz**	**SPL: 208dB(rms) re 1µPa @1m (converted to 211 dB0-peak re 1µPa2-s) * Frequency: 2.5kHz**
Low-frequency cetaceans	PTS	219	15	5	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
	TTS	213	40	13	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
Mid-frequency cetaceans	PTS	230	2.6	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
	TTS	224	7	2.6	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
High-frequency cetaceans	PTS	202	110	60	4.6	Threshold not exceeded	4.6
	TTS	196	180	110	11	Threshold not exceeded	11
Pinnipeds (Phocid) in water	PTS	218	15	7	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
	TTS	212	40	15	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
All species	Disturbance**	160	940	720	2,600	50	2,500

Note: *derived from Genesis Oil and Gas Consultants (2011) ** BOEM (2017), NMFS (2018)

A.3.1.4 Conclusion

The geometric spreading modelling results (Table A-4) indicate that all cetaceans and pinnipeds species are at risk of injury or disturbance from the geophysical survey.

Section 3.5 and Table 3-4 identified a total of 11 species that have been observed in waters within-the application area. Of these, minke whale, bottlenose dolphin, Risso's dolphin, harbour porpoise, grey and harbour seals are likely to be found in the survey area during the April to October period. Short beaked dolphin may also be found in October to January, when there is a winter peak in numbers. The remaining 8 species are unlikely to be present in the application area during this period or are rare visitor of the east coast of Ireland.

Table A-4 above has identified that sound levels from the MBES equipment represent a worst-case impact to marine mammals. The assessment concluded:

- Injury - Minke whale are the only low frequency cetacean species likely to be found in the survey area during April to October. Both the MBES and the SSS could result in injury to this species, with permanent injury (PTS) within 15m of the source and temporary injury within 40m (Table A-4).
- Injury -Mid-frequency cetaceans, such as bottlenose dolphin, common dolphin and Risso's dolphin, are expected to be impacted by the MBES within up to 2.6m of the source. TTS is however likely to occur from both MBES and SSS, respectively within 7m and 2.6m.
- Injury -Harbour porpoise is classified as a high frequency cetacean. All geophysical survey equipment has the capacity to produce noise capable of causing PTS, up to 110m (MBES), 60m (SSS) and 4.6m (chirp/pinger and boomer). TTS may occur up to 180m from MBES, 110m (SSS) and 11m (chirp/pinger and boomer).
- Injury -Grey and harbour seal (Phoceid) in water have the potential to be permanently injured by the MBES and SSS within up to 15m and 7m respectively. Temporary injury (TTS) could occur within 40m and 15m of the sound source.
- Disturbance – for all species disturbance could occur within 2,600m of a chirp/pinger, 2500m of a boomer, 940m of a MBES, 720m of a SSS and 50m of a DP vessel.