MARESCONNECT

MaresConnect Electricity Interconnector

Habitats Regulations Assessment Screening

P2578_R6146_Rev2 | 29 August 2023

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Changes in MaresConnect Marine Survey HRA Rev2

Section	Change
2.3.2 Marine European Protected Species (EPS)	Updated screening distance to include MMMU
4.1.4 Identification of potential effects, defined zones of influence and search area	Added additional pressures to benthic habitat list
4.1.4 Identification of potential effects, defined zones of influence and search area	Updated grey seal forgaging distance and relevant MU for screening
4.1.6 Potential pressures scoped in	Scoped unplanned events (accidental oil and chemical spills) and introduction of INNS into the assessment as requested. Added more information on underwater noise potential of survey equipment and which of the equipment types was screened into or out of the assessment on this basis.
5 Step 1: Screening for Likely Significant Effects	Updated number of sites in the assessment. Added additional scoped in pressures and sites to Table 5-1 and Table 5-2
5 Step 1: Screening for Likely Significant Effects	Updated maps to show new sites screened into the assessment
5.3.4 Unplanned events (accidental oil or chemical spills)	Added assessment for unplanned events (spills)
5.3.5 Introduction or spread of INNS	Added assessment for introduction or spread of INNS
5.4.2 North Anglesey Marine	Updated the underwater noise assessment to incorporate geotechnical equipment and vessel noise
5.6.2 Underwater sound changes	Updated the underwater noise assessment to incorporate geotechnical equipment and vessel noise
5.7.2 Underwater sound changes	Updated the underwater noise assessment to incorporate geotechnical equipment and vessel noise
5.8.2 Underwater sound changes	Updated the underwater noise assessment to incorporate geotechnical equipment and vessel noise
5.9 Cardigan Bay / Bae Ceredigion	Screened site into assessment
5.10 Pembrokeshire Marine / Sir Benfro Forol SAC	Screened site into assessment
5.11 Dynesfeydd Môr Hafren / Bristol Channel Approaches SAC	Screened site into assessment
5.22.2 Underwater sound changes	Updated the underwater noise assessment to incorporate geotechnical equipment and vessel noise
5.23.2 Underwater sound changes	Updated the underwater noise assessment to incorporate geotechnical equipment and vessel noise
5.30 Additional harbour porpoise SACs screened in	Added new section to assess all remaining sites in the MU for harbour porpoise
5.30 Additional grey seal SACs screened in	Added new section to assess all remaining sites in the MU for grey seal
5.32 In-combination effects	Added additional survey details for Mona and Morgan offshore wind farm
6 Information to inform Appropriate Assessment	Added mitigation information for site and pressures screened through to AA
7 Conclusion	Updated conclusion on outcome of Stage 1
Table A-1, A-4	Added new sites screened into the assessment
Table B-1	Added USBL to table
B.3.1.1. Cetaceans and pinnipeds	Added information regarding SBP disturbance
B3.2.2.2. Geophysical surveys	Added information regarding SBP and USBL disturbance

DOCUMENT RELEASE FORM

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Habitats Regulations Assessment Screening

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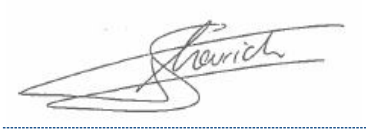	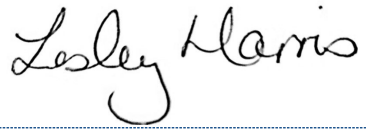
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Rev 0	05/05/2023	Original draft	EK/VF	MP	AP
Rev 1	24/05/2023	Addressed client comments	VF	SLT	LHA
Rev 2	29/08/2023	Addressed MLA consultation responses	VF	JH	LH

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GLOSSARY

AA
Appropriate Assessment

AOS
Area of Search

BEIS
Department for Business, Energy and Industrial Strategy

CCW
Countryside Council for Wales

CPT
Cone Penetrometer Test

DAERA
Department of Agriculture, Environment and Rural Affairs

DAHG
Department of Arts, Heritage and the Gaeltacht

DDC
Drop-down camera

EC
European Commission

EEZ
Exclusive Economic Zone

EPS
European Protected Species

ESAS
European Seabirds at Sea

EU
European Union

GIS
Geographic Information System

HDD
Horizontal Directional Drilling

HRA
Habitats Regulations Assessment

JNCC
Joint Nature Conservation Committee

LSE
Likely Significant Effect

MarESA
Marine Evidence-based Sensitivity Assessment

MARPOL
International Convention for the Prevention of Pollution from Ships

MBES
Multibeam Echosounder

MCL
MaresConnect Limited

MDAC
Methane-derived authigenic carbonate

MHWS
Mean High Water Sprigs

MMO
Marine Management Organisation

MU
Management Unit

MW
Megawatt

NCA
National Character Area

NPWS
National Parks and Wildlife Service

pSPA
Potential Special Protection Area

PTS
Permanent Threshold Shift

ROI
Republic of Ireland

RSPB
Royal Society for the Protection of Birds

RTK
Real time kinetic

SAC
Special Area of Conservation

SBP
Sub-bottom Profiler

SCI
Site of Community Importance

SOPEP
Shipboard Oil Pollution Emergency Plan

SPA
Special Protection Area

SSS
Side Scan Sonar

UAV
Unmanned Aerial Vehicle

UK
United Kingdom

VC
Vibrocore

ZOI
Zone of Influence

1. INTRODUCTION

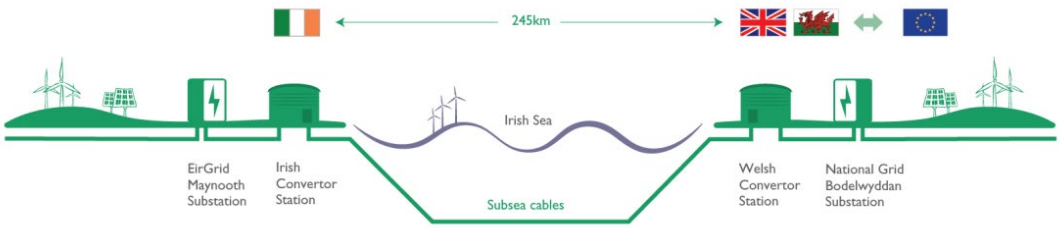
1.1 Project Background

Intertek Energy & Water Consultancy Services have been appointed by MaresConnect Ltd. (MCL) to undertake a Habitats Regulations Assessment (HRA) screening exercise for the geophysical, geotechnical and environmental survey works along the proposed MaresConnect Interconnector (MaresConnect); which will operate between north Wales, United Kingdom (UK) and Co. Dublin, Republic of Ireland (ROI).

MCL are developing a high voltage direct current (HVDC) interconnector between the UK and the ROI called 'MaresConnect'. The UK grid connection point will be established at the Bodelwyddan substation in north Wales. The Irish grid connection point will be established at an existing substation (Woodland, Belcamp or Maynooth) in the vicinity of Co. Dublin (Figure 1-1). The interconnector will have a nominal capacity of 750 megawatt (MW), equivalent to the power of 570,000 homes.

MaresConnect will strengthen the existing connection between the UK and ROI by adding additional capacity alongside existing interconnectors and contributing to each country's strategic interconnection objectives.

Figure 1-1 MaresConnect overview



This report covers the Welsh marine component of the proposed route from mean high water springs (MHWS) along the north Wales coast between Colwyn Bay and Abergele to the Wales/ROI median line. A separate report has been prepared which covers the remainder of the route from the median line to north Co. Dublin, and has been submitted to the Foreshore Unit as part of the Investigative Foreshore Licence Application. The route selection process is ongoing, presently there are 15 core routes and three landfall zones included in the assessment. Only one of these routes (or a combination of sections of several route options) and a maximum of two landfall zones will be selected for survey.

1.2 The Developer

The MaresConnect Interconnector project is being developed by MaresConnect Limited (referred to as MCL throughout this report), an Irish project specific company established to develop, construct and operate the interconnector. MCL is a subsidiary of Mares Interconnector Holdings Limited, an Irish limited company, funded by private capital.

1.3 Purpose of the HRA

HRA screening is required for any plan or project which has the potential to affect a European site of nature conservation interest, no matter how far away from that site, to determine whether an Appropriate Assessment (AA) is required.

The purpose of this HRA screening report, specifically, is to determine if there is any connectivity between the proposed marine survey works and any European sites; whether there is potential for

significant effect on these sites from the different phases of the survey; and whether further assessment is required.

If significant effects are considered likely, then an AA would need to be undertaken to consider the extent and significance of the effects of the project to the conservation objectives of the designated areas.

When making a marine licensing decision, Natural Resources Wales (NRW) is required to consider the effects of the proposed Project alone and in-combination with other relevant plans or projects on designated sites. To inform this decision-making process the Applicant is required to provide assessments in accordance with specific legislation and guidance.

This report has been prepared to present the findings of a protected sites assessment to include the following components:

- Identification of Relevant Protected Sites
- Habitats Regulations Assessment (HRA) Stage 1 Screening

The assessments determine whether the Project, either alone or in-combination with other plans or projects, is likely to have a significant effect on any European sites.

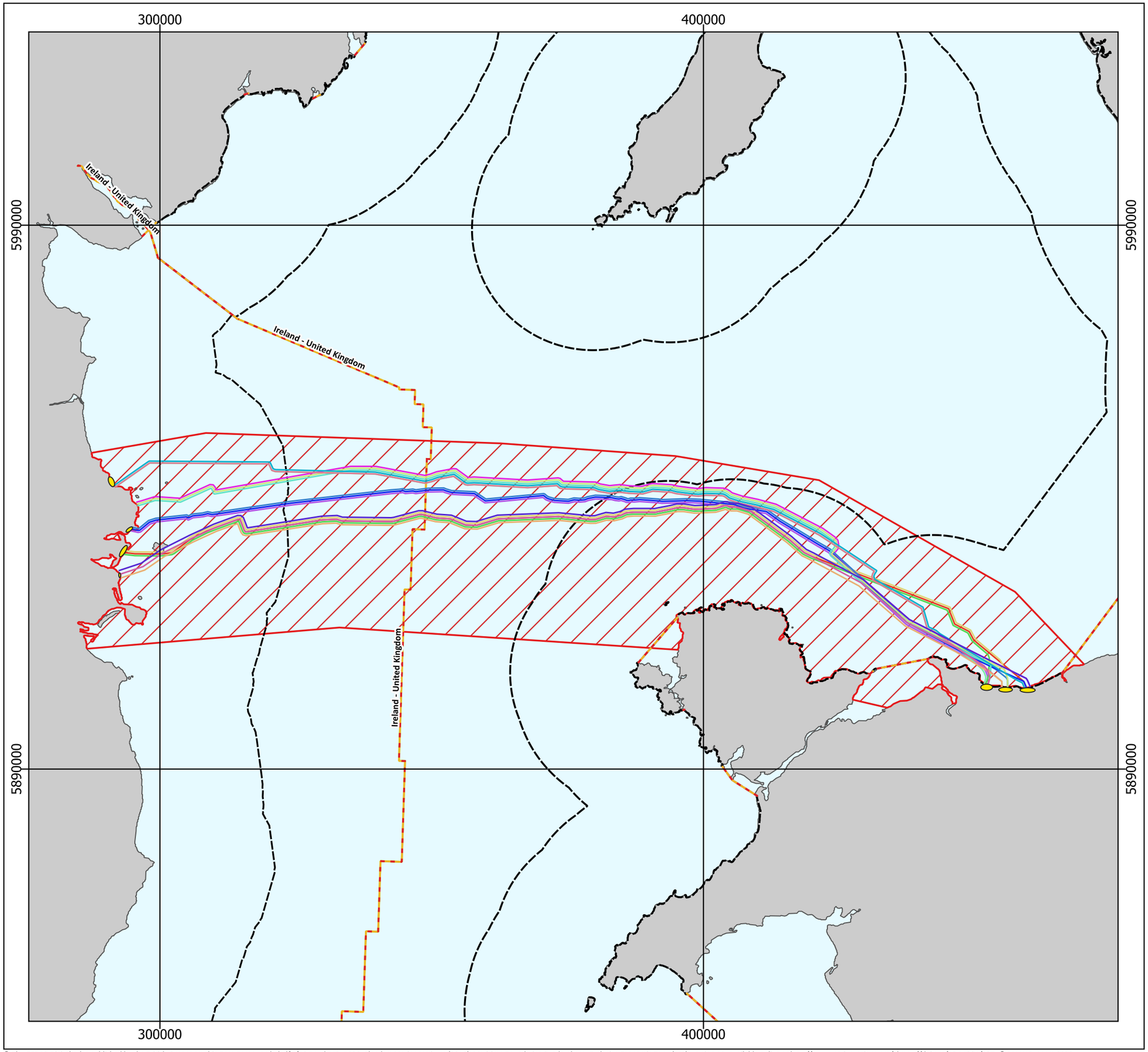
The protected sites included in this report are all European sites, a collective term for Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites, including any sites which have not been formerly designated such as proposed Special Protection Areas (pSPA).

MARES CONNECT INTERCONNECTOR

LOCATION OVERVIEW

MaresConnect Interconnector Route Options

Drawing No: P2578-LOC-010	A



Legend

- Study Area
- 12nm Territorial Sea Limit
- Economic Exclusive Zone (EEZ) Boundary
- Potential Landfall Zones

Cable Routes

- W1I1
- W1I2
- W1I3
- W1I4
- W1I5
- W2I1
- W2I2
- W2I3
- W2I4
- W2I5
- W3I1
- W3I2
- W3I3
- W3I4
- W3I5

NOT TO BE USED FOR NAVIGATION

Date	2023-02-09 17:13:09
Coordinate System	WGS 84 / UTM zone 30N
WKID	EPSG:32630
Scale @A3	1:700,000
Data Sources	GEBCO; MarineRegions; MaresConnect
File Reference	J:\P2578\Mxd_QGZ\01_LOC \P2578-LOC-008.qgz
Created By	Oliver Bula
Reviewed By	Emma Kilbane
Approved By	Stephane Theurich

0 10 20 30 40 km

2. LEGISLATIVE BACKGROUND

2.1 The 'Habitats Regulations'

In England and Wales, the obligations under the Habitats and Birds Directives are transposed into UK law through The Conservation of Habitats and Species Regulations 2017 (as amended) for inshore waters up to the 12 nautical mile (nm) and The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) from 12 nm to the extent of the UK's Exclusive Economic Zone (EEZ). Collectively this legislation is known as the Habitats Regulations.

The Habitats Regulations transpose into UK law Article 6(3) of the European Commission (EC) Habitats Directive. This requires project-related activities within European sites to be assessed with regard to their implications for the site conservation objectives.

Under the Habitats Regulations, a person applying for consent, permission or other authorisation must provide such information as the competent authority may reasonably require for the purposes of assessment or to enable them to determine whether an AA is required.

The three tests set out to determine if a proposal will affect a European site are:

- Is the proposal directly connected with or necessary for site management for nature conservation?;
- Is the proposal likely to have a significant effect on the site? (this is the Screening Stage);
- Can it be ascertained that the proposal will not adversely affect the integrity of the site? (this is the Appropriate Assessment stage).

The tests are known as the HRA process.

2.2 Protected Sites

The Habitats and Birds Directives established the creation of the Natura 2000 network through European Union (EU) member states. The aim of the Natura 2000 network is to ensure the long-term survival of European threatened species and habitats. The network comprises SACs and SCIs (Sites of Community Importance) designated originally under the Habitats Directive, and SPAs designated originally under the Birds Directive. SPAs, SACs and SCIs are designated by the individual member states.

After the UK's exit from the EU, the national legislation was updated by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 and the Conservation of Offshore Habitats and Species (Amendment) (EU Exit) Regulations 2019 to create a national site network within UK territory (replacing the Natura 2000 network within England and Wales). This includes all sites designated under the Habitats and Birds Directives and will incorporate any future site designated under the new legislation.

In addition, UK Government policy (Office of the Deputy Prime Minister (ODPM) Circular 06/2005) states that sites designated under the Convention on `Wetlands (Ramsar, Iran 1971) known as the "Ramsar Convention" are also included under the definition European sites. The Ramsar Convention is an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories" (Ramsar, 2011). The vast majority of Ramsar sites are also classified as SPAs.

SPAs, SACs, SCIs and Ramsar sites are collectively referred to as European sites, both in the legislation and in this document.

2.3 Protected Species

2.3.1 Marine Species

Certain species are protected by international, European and national wildlife legislation throughout the UK. This includes protection from intentional or reckless disturbance, taking, harming and killing, and in some cases possession or sale of the species.

There is no intention to take, trade or sell protected species during the proposed survey; therefore, this section focuses on the legislation for which it is an offence to recklessly disturb, harm or kill a protected species.

The legislation that applies is:

- The Conservation of Habitats and Species Regulations 2017 (as amended);
- The Conservation of Offshore Habitats and Species Regulations 2017 (as amended); and
- The Wildlife and Countryside Act 1981 (as amended).

Table 2-1 provides details of the marine species which are currently protected in Wales under this legislation. The schedules to the legislation are regularly reviewed and updated considering scientific evidence.

Table 2-1 Protected marine species in Wales

Conservation of Habitats and Species Regulations 2017	**Conservation of Offshore Habitats and Species Regulations 2017**	**Wildlife & Countryside Act**
Schedule 2 (European Protected Species)	**Schedule 1 (European Protected Species)**	**Schedule 5**
Whales, Dolphins and Porpoises (all species)	Whales, Dolphins and Porpoises (all species)	Whales, Dolphins and Porpoises (all species)
Loggerhead turtle (*Caretta caretta*)	Loggerhead turtle (*Caretta caretta*)	Allis shad (*Alosa alosa*)
Green turtle (*Chelonia mydas*)	Green turtle (*Chelonia mydas*)	Angel shark (*Squatina squatina*)
Kemp's Ridley turtle (*Lepidochelys kempii*)	Kemp's Ridley turtle (*Lepidochelys kempii*)	Basking shark (*Cetorhinus maximus*)
Hawksbill turtle (*Eretmochelys imbricata*)	Hawksbill turtle (*Eretmochelys imbricata*)	Common Sturgeon (*Acipenser sturio*)
Leatherback turtle (*Dermochelys coriacea*)	Leatherback turtle (*Dermochelys coriacea*)	Couch's goby (*Gobius couchii*)
Sturgeon (*Acipenser sturio*)	Sturgeon (*Acipenser sturio*)	DeFolin's lagoon snail (*Caecum armoricum*)
Otter (*Lutra lutra*)		Fan Mussel (Atrina fragilis) and
		Freshwater Pearl Mussel (Margaritifera margaritifera)
		Giant goby (*Gobius cobitis*)
		Ivell's Sea anemone (*Edwardsia ivelli*)
		Lagoon sand shrimp (*Gammarus insensibilis*)
		Lagoon sandworm (*Armandia cirrhosa*)
		Lagoon sea slug (*Tenellia adspersa*)
		Marine hydroid (*Clavopsella navis*)
		Northern hatchet shell (*Thyasira gouldii*)
		Otter (*Lutra lutra*)
		Pink sea fan (*Eunicella verrucosa*)

Conservation of Habitats and Species Regulations 2017	Conservation of Offshore Habitats and Species Regulations 2017	Wildlife & Countryside Act
		Short Snouted Seahorse (*Hippocampus hippocampus*) and Spiny Seahorse (*Hippocampus guttulatus*) Starlet sea anemone (*Nematosella vectensis)* Tentacled lagoon worm (*Alkmaria romijni*) Trembling Sea-Mat (*Victorella pavida*) Twaite shad (*Alosa fallax*) Walrus (*Odebenus rosmarus*) White skate (*Rostroraja alba*)

2.3.2 Marine European Protected Species (EPS)

The Habitats Regulations establishes a system of strict protection for European Protected Species (EPS), as listed in Annex IV, across their entire range within the EU, both within and outside European Sites. EPS species include all cetaceans, otters, sturgeon and marine turtles.

It is an offence to deliberately capture, kill, injure or disturb animals classed as EPS. When considering activities that could affect EPS, the primary aim is to avoid any effect on them at all, including any activity that could otherwise constitute an offence. An assessment of the risk to EPS posed by the survey is included in Appendix B of this document.

The risk to EPS the project poses has been assessed by identifying European sites within either 100 km of the project area (by applying a buffer to the survey corridors) or the relevant marine mammal Management Unit (MU) for mobile species and identifying which EPS are qualifying features. This screening concluded that there is only the potential to impact marine mammals, so these species have been included in the assessment.

In Wales, a Marine European Protected Species Licence can be issued to authorise what would otherwise be an offence under the Habitats Regulations. A licence may only be issued where the activity meets certain purposes and where there is no satisfactory alternative. Licences are granted subject to conditions and licence holders are responsible for ensuring compliance with conditions. Failure to comply with conditions is an offence. NRW are responsible for species licensing in Welsh territorial and offshore waters. The Risk Assessment contained within Appendix B concluded that a Marine EPS is not considered to be required and will not be applied for.

2.3.3 Terrestrial species

The Wildlife and Countryside Act 1981 provides protection for certain bird species in the UK, implementing the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Birds Directive (2009/147/EC).

The Act makes it an offence (with exception to species listed in Schedule 2) to intentionally:

- kill, injure, or take any wild bird;
- take, damage or destroy the nest of any wild bird while that nest is in use or being built (also [take, damage or destroy the nest of a wild bird included in Schedule ZA1] under the Natural Environment and Rural Communities Act 2006); or
- take or destroy an egg of any wild bird.

Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young.

3. PROJECT DESCRIPTION

The proposed site investigations will involve geophysical, geotechnical, environmental (benthic sampling) intertidal, terrestrial and potentially marine mammal and bird surveys. The exact equipment specifications to be used are not yet confirmed, therefore, the frequency and sound level ranges of worst-case scenario of each equipment type has been presented to ensure the adequate assessment of species discussed herein. As multiple route options have been presented, the longest route option in Welsh waters (125 km) has been used to calculate the approximate number of samples to be collected.

3.1 Survey objective

The objective of the survey campaign is to acquire all appropriate data for the confirmation of a preferred offshore route. This includes detailed mapping of nearshore shallow geological and seabed character; mapping of seabed relief and features along offshore sections; and baseline environmental mapping along the entire marine cable corridor.

The data will be used to inform route design and support the environmental licence applications by providing information on the current situation and allowing effects to be predicted, and subsequently appropriate mitigation to be developed. It may also be used later to provide a baseline against which to monitor post construction effects of construction, operation and decommissioning.

3.2 Survey methodology

3.2.1 Geophysical Survey

The geophysical acquisition methodologies will comprise multibeam echosounder (MBES), side-scan sonar (SSS), magnetometry and sub-bottom profiler (SBP) surveys.

The objectives of the proposed geophysical survey are to:

- Map the seabed and sub-surface to assist in optimising the routing of the interconnector cable and to enable assessment of cable burial depth;
- Plan the scope and positioning of the geotechnical sampling programme along the proposed cable route;
- Identify marine habitat areas from which the benthic survey can be undertaken;
- Identify sensitive marine habitats which will need to be avoided during geotechnical and environmental sampling and cable and wind turbine installation; and
- Provide the geophysical data from which a marine archaeological assessment can be undertaken as part of the consenting process.

To meet these objectives, the geophysical survey will undertake the following tasks:

- Measure intertidal topography and seabed bathymetry, surface morphology and identify the nature of the seabed sediments - in particular the height, length and slopes of sand waves (topography, MBES, SSS);
- Identify the distribution and thickness of superficial sediments and rock head where possible (SBP);
- Identify the distribution of subsea geological features such as areas of exposed bedrock (MBES, SSS); and

- Identify the location, extent and nature of any impediments to laying or burial of the cables such as wrecks, debris on seafloor, rock outcrop, other cables, pipelines etc. (magnetometer, MBES, SSS).

The interpretation of the geophysical survey for cable routing forms the basis of the scope of work for geotechnical and benthic surveys.

The bathymetric, side scan and sub-bottom profiling systems proposed are characterised by a limited acoustic footprint with the directional, high-frequency, short-duration output attenuated within a few hundred metres of the survey vessel (Hartley Anderson Limited, 2020).

The geophysical survey corridor will be approximately 500 m wide (nominally 250 m either side of the centreline of the cable route).

3.2.2 Geotechnical Survey

The purpose of the proposed geotechnical survey is to evaluate the nature and mechanical properties of the superficial seabed sediments and intertidal sediments along the proposed cable route. The data will be used to inform future design studies, such as the determination of cable burial depth and methods.

The geotechnical survey techniques that may be used during the proposed marine survey include grab sampling, seabed cone penetrometer tests (CPTs), vibrocores (VCs), and boreholes. Boreholes will be used to determine deeper soil conditions at the export cable landfall to a depth of up to 25 m below ground level. VC and CPTs will be used across the entire application area. VCs and CPTs will be acquired at the same or separate locations as determined by review and interpretation of SBP data.

3.2.2.1 Vibrocore (VC)

A VC will be used to retrieve a soil sample by the lowering of a sample tube that is vibrated into the seabed. The VC will be launched from a vessel crane or A-frame. Samples will be taken at representative locations along the export cable routes and nominally will be every 1 km of survey.

- Shallow water VCs (target depth of 6 m, may penetrate up to 9 m): Approximately 150 VC samples will be collected, inclusive of an extra 20% contingency to provide conservative estimate. VCs may penetrate up to 9 m into the seabed and have a diameter of 150 mm. Therefore, sample volumes will be up to 0.16 m^3. For 60 collected samples, the approximate volume of sediment removed will be 24 m^3. Indicative equipment to be used is a high-performance corer (HPC) or a modular vibrocorer.

3.2.2.2 Cone Penetrometer Test (CPT)

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.

- Shallow water CPT: Approximately 150 samples will be taken, including extra 20% contingency to provide conservative estimate. Samples will be taken at representative locations along the export cable routes and nominally will be every 1 km of survey. The shallow water CPTs used during the survey will operate to a target depth of 6 m, but can achieve penetrations of up to 9m. No sediment will be removed from the seabed.

3.2.2.3 Borehole

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 and stabilised using a seabed frame. 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. The drilling flush and drill cuttings are largely returned to the vessel and re-used, however some loss of flush and cutting should be

expected. All drilling fluids will be in compliance with environmental requirements. The marine borehole(s) would be drilled to inform the horizontal directional drilling (HDD) for installation of the cable at the selected landfall and would be located within the nearshore area at approximately the 4 m depth contour (the exact location will be informed by the geophysical survey).

The landfall boreholes will be drilled using a percussion and a rotary corer and will likely be drilled from a jack-up barge (JUB), if undertaken in the intertidal or nearshore zone. If undertaken above mean high water, this would be undertaken from a tracked drilling machine on or near the shore. Alternative methods of drilling a borehole may also be considered, such as a remotely operated vehicle (ROV) drill.

Up to ten boreholes (up to eight intertidal and up to two marine) could be drilled, with a maximum of four intertidal and one marine borehole drilled per selected landfall. Each borehole (both landfall and marine) will remove a maximum of 0.25 m^3 of sediment. The number of legs used by the JUB is dependent on seabed conditions, current strength and wave action. For the proposed survey route, four legs are the most likely scenario. Each leg has a seabed footprint of approximately 2.54 m^2.

3.2.2.4 Technical specification

Depending upon the requirement identified from interpretation of the geophysical data, to inform the design of any potential HDD, there is potential for up to four boreholes (two planned and two as a contingency) to be drilled at each landfall either in the intertidal or terrestrial area. The necessary additional consents will be applied for if the borehole is required above Mean High Water Springs (MHWS).

The landfall boreholes will likely be drilled from a JUB. For the proposed landfall areas, four legs are the most likely scenario. Each leg has a footprint of approximately 2.54 m^2. Each borehole will have a footprint of approximately 0.02 m^2. Assuming a borehole depth of 25 m, the core sample removed will be approximately 0.25 m^3. Risings dispersed around the drill site will have a volume of approximately 0.15 m^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 1.82 m^2. The borehole will be left to collapse naturally following completion of drilling where the cuttings are likely to fall back down the hole.

3.2.3 Landfall topographic survey

Terrestrial survey methods at the landfall (shoreline and hinterland) may include a topographic survey of the ground elevations to ensure that there are continuous height measurements between the landfall and the cable route and to delineate hard features that will present an obstacle to cable installation. Terrestrial geophysical investigations may include seismic refraction of the cable route centreline and offset lines to provide information on sub-surface sediment layers and thicknesses using a ground penetrating radar survey, or similar. One of two techniques will be selected to acquire the data; either a traditional topographic survey using levels and reference points via real-time kinetic (RTK) foot or vehicle traverses, laser-scanning and/or an aerial drone survey using photogrammetry techniques.

3.2.4 Environmental survey

The aim of the proposed environmental survey is to map the distribution and extent of marine benthic habitats, presence and distribution of bats, presence of otters and otter holts, intertidal birds nesting and foraging locations along the proposed cable route. This will comprise a benthic sampling programme (using grab sampling) and video or still photographs. The sampling locations will be determined based upon interpretation of the geophysical data and selected to sample different habitats.

A grab sampler will be used to retrieve a soil sample of the seabed by the lowering of a mechanical grab. Each grab samples a volume of approximately 0.1 m^3. Grabs are required to obtain a sample

greater than 5 cm in depth, to try and achieve this, samples will be repeated for up to three attempts. It is likely that three grab samples will be taken at each station; two for faunal analysis and one for sediment and chemical analysis. Up to 30 sampling stations (this number includes an extra 20% as a conservative estimate) at representative locations along the preferred cable route. Exact locations are subject to results of the geophysical and archaeological survey and are dependent on geology but nomically will be every 5 km or where there is a change in habitat type. Indicative equipment to be used will be a grab sampler e.g. Day or Hamond. The grab will be launched from a vessel crane or A-frame.

Boxcores may be used to characterise shallow soils if the sediment is found to be very soft. Approximately 35 boxcores will be taken along the proposed cable route. Each boxcore will be taken at representative locations along the cable route (these numbers include an extra 20% as a conservative estimate) and will remove up to 0.0072 m^3 of sediment per sample, totalling 0.252 m^3 of sediment removed.

Drop-down camera (DDC) and video transect: At each geotechnical and environmental sampling station a DDC will be deployed to allow for further confirmation of sampling analysis. Additional photographs or video footage will be acquired along transects to characterise sensitive habitats or features. This technique involves no intrusive seabed sampling. Transect locations will be determined following review of the geophysical data.

For the terrestrial and intertidal area, a Phase 1 intertidal habitat walkover survey will be carried out by an experienced ecologist. The aim of the survey will be to identify and map the extent and distribution of intertidal biotopes. Intertidal floral and faunal surveys and intertidal bird and bat surveys are planned at the proposed cable landfall zone which will include transects, quadrats and core sampling. The exact location/zone of the intertidal survey will not be known until the preferred cable route and landfall has been chosen. At this time, it is assumed that it could take place at any of the three landfall zones and up to two landfalls may be selected for survey.

3.2.5 Birds and Marine Mammals Survey

Boat based and aerial/drone surveys may be conducted offshore and from landfall vantage points to determine usage of the survey area by birds, marine mammals and other megafauna. Species type and distribution within the survey area will be recorded.

3.3 Schedule

The intention is to commence the proposed site investigation activities as soon as feasible following award of a Marine Licence, taking into consideration any proposed mitigation requirements. The survey works will preferably be undertaken from the Spring months in 2024 onwards following award of the necessary licences and subject to weather conditions and vessel availability. However, there is potential for programme slippage and MCL are applying for a Marine Licence to be valid from Spring 2024 until the end of 2025 to provide contingency for any delays.

4. ASSESSMENT APPROACH

To determine whether the survey is likely to have a significant effect on any European site, either individually or in-combination with other plans or projects, a screening assessment was carried out.

4.1 Screening Process

4.1.1 Identification of Sites

The Habitat Regulations require European sites to be assessed.

- SACs are sites designated originally under the Habitats Directive (Council Directive 92/43/EC). SACs are selected for specific habitats listed on Annex I and for species listed on Annex II of the Directive.
- SPAs are sites designated originally under the Birds Directive (Council Directive 2009/147/EC). SPAs are selected for rare, threatened or vulnerable bird species listed in Article 4 of the Directive, and for regularly occurring migratory species.
- SCI are sites adopted by the EC but not formally designated by the government. They are designated under the Habitats Directive (Council Directive 92/43/EC) and selected for a significant contribution to the maintenance or restoration at a favourable conservation status of a habitat type in Annex I or of a species in Annex II.
- Ramsar sites are designated under the Convention on Wetlands (Ramsar, Iran, 1971), known as the "Ramsar Convention" to protect wetlands of international importance.

4.1.2 Site Selection Process

The potential for a European site to be significantly affected by this application's proposed survey works depends on whether receptors which are designated features of a European 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 European sites has therefore been achieved by applying the following steps:

1. Identify which receptors could be sensitive to the proposed site investigations.
2. Identify potential pressures and effects the proposed site investigations could have on these receptors and what the zone of influence (ZOI) for these receptors and then define an area of search (AOS):
   a. ZOI: the geographical spatial extent over which the activities are predicted to have an effect on the receiving environment.
   b. AOS: using zones of influence as a guide and expert judgement on the basis of best scientific knowledge, define a search area within which protected sites are identified to determine if the relevant receptor is a designated feature of the site.
3. Screen European sites within these search areas to identify features and assess whether designated features of the European Site could be significantly affected by the proposed site investigations.
4. Assess whether any SACs and SPAs further afield from the survey area have mobile features which may travel into the ZOI and have the potential to be significantly affected.

4.1.3 Identification of sensitive receptors

The receptors which could potentially be affected by the proposed site investigations and could be the features of European sites in the region are:

- Intertidal and benthic habitats;
- Fish;
- Birds; and
- Marine mammals (cetaceans and pinnipeds) and European otter.

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

The Joint Nature Conservation Committee (JNCC) Marine Pressures-Activities Database and definitions (JNCC, 2022) have been used to describe the potential pressures expected from the proposed survey activities. These potential pressures may be direct or indirect, temporary or permanent, beneficial or harmful to the site, or a combination of these. The ZOI (spatial extent over which effects may extend) has also been defined.

Consideration has also been given to how sensitive receptors could be affected and what the ZOI (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 European sites.

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

Benthic habitats have the potential to be directly affected in five 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;
- Through smothering by positioning of equipment on the seabed e.g. JUB legs, or concrete/steel mooring anchors;
- From the introduction of invasive non-native species (INNS) through either the survey equipment or the vessel; or
- Through accidental spillage events.

Given that sampling points have not been determined (exact locations will be selected following completion of the geophysical survey), the ZOI for benthic communities has been assumed to be the entire MaresConnect survey route. Relevant sites would include SACs designated for Annex I habitats which support benthic communities. Therefore, only SACs designated for benthic habitats which the MaresConnect Interconnector 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 sound. Effects may range from temporary behavioural changes, or temporary hearing loss, through to migration pathways being impeded by a noise barrier. Of the four migratory Annex II species known to be present in the vicinity of the MaresConnect survey corridor, only twaite shad are known to be sensitive to underwater noise generated from geophysical survey. Species, such as Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*) and river lamprey (*Lampetra fluviatilis*) have a lower sensitivity to sound as their swim bladder is located far from the ear (Popper *et al.* 2014). Therefore,

these species will only be sensitive to sound sources with a rapid pressure change, i.e. unexploded ordnance detonation, which is not proposed for this survey.

There is the potential that the noise could also impede migration to/from rivers near the MaresConnect survey corridor as twaite shad migrate from the sea to spawn in spring, usually between April and June (JNCC, 2022). A study conducted by Davies et. al (2020) reported that of 73 twaite shad tagged 12 individuals were recorded 200 km from their original location after migrating to sea. Whilst it is acknowledged that twaite shad may migrate distances greater than 100 km, it is recognised that species from protected sites further away are less likely to travel to the proposed MaresConnect survey corridor in high enough numbers for the population of qualifying species to be significantly affected. Therefore, a highly precautionary screening distance of 100 km has been applied based on professional judgement and the general acceptance of this figure in ecological assessments of migratory fish in other offshore development site investigations.

Marine birds – Advice on how to present assessment information on the extent and potential consequences of seabird displacement from offshore wind farm developments published by the JNCC (2017) states that for most bird species a standard displacement buffer of 2 km is recommended. For divers and sea ducks this should be extended to 4 km[1]. More recent advice from JNCC notes that red-throated diver (*Gavia stellata*) avoid a much larger area. For non-breeding red-throated diver, a pragmatic displacement buffer of at least 10 km is recommended (JNCC, 2022). The most vulnerable birds to disturbance would be nesting birds in the breeding season in the immediate vicinity of the proposed site investigations. 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 ZOI of disturbance on nesting birds has been assessed as up to 2 km from the MaresConnect Interconnector.

To allow for the mobility of bird species which could forage into the ZOI, all SPAs within 15 km have been screened as a starting point. Additionally, Woodward et al. (2019) was used to determine foraging ranges for seabirds during the breeding season to establish if seabirds were likely to be present in project area.

It is noted that seabirds from other, more distant SPAs occasionally forage in, travel through, or engage in other behaviours inside the MaresConnect survey corridor due to their typically wide foraging ranges. As the MaresConnect survey corridor is outside any core habitat use areas of the more distant SPAs, the frequency of birds with larger foraging ranges from these SPAs occurring within the MaresConnect survey corridor declines i.e. as the distance between the survey corridor and the further SPAs increases. It is unlikely that the population of longer ranging species from further SPAs will be in the vicinity of the proposed works in significant numbers or for a significant period of time, therefore the conservation objectives of sites with these species listed as a qualifying species will not be affected. A highly precautionary range of 100 km has been selected as an area of search for SPAs based on the standard area of search used for offshore wind farm installation. However, only those SPAs that directly overlap or are within 15 km of the proposed activities are considered to have the potential of being effected due to the highly localised, transient, and brief nature of the proposed site investigation works.

Marine mammals have the potential to be affected by changes in underwater noise. EC Habitats Directive Annex II listed species likely to be observed in the MaresConnect survey corridor include grey seal (*Halichoerus grypus*), harbour seal (*Phoca vitulina*), European otter (*Lutra lutra*), common bottlenose dolphin (*Tursiops truncates*) and harbour porpoise (*Phocoena phocoena*).

[1] The Joint SNCB Interim Displacement Advice Note (JNCC 2022) categorises species by their sensitivity to disturbance by wind farm structures, ship and helicopter traffic and their habitat specialisation. There are no similar guidelines for site investigations and therefore Intertek use the windfarm guidance as a proxy, recognising that the effects from site investigations will be significantly lower than from windfarm construction and therefore the use of the guidance is a more conservative approach to assessment.

There are no published guidelines on disturbance thresholds due to the complexity and variability of the responses of marine mammals to anthropogenic disturbance. JNCC have established an effective deterrent range (EDR) of 5 km for geophysical surveys (JNCC, 2020). Relevant sites would include SACs designated for marine mammals within 5 km of the MaresConnect survey corridor. 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 European sites:

- Any harbour porpoise or common bottlenose dolphin from European sites located in the relevant MU (JNCC, 2015) could be present in the MaresConnect Interconnector. The MU for harbour porpoise is the Celtic and Irish Sea; for bottlenose dolphin it is the Irish Sea and Offshore Channel, Celtic Sea and SW England;
- Harbour seals prefer to come ashore in sheltered waters, and they usually feed within 40-50 km from their haul-out site, they are not known to make trips greater than 50 km from haul out sites (DECC, 2016);
- Grey seal are known to travel large distances to forage up to 448 km Carter et al., 2022), and NRW recommends using the relevant OSPAR MU for screening purposes (NRW, 2022) which is the OSPAR Region III MU for the MaresConnect Interconnector; and
- European otter are known to have a home range of 20 km for females and 32 km for males (Nature Scot, 2021).

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

Table 4-1 Search areas and zone of influence (ZOI)

Interest feature	Species	Area of Search (AOS)	Zone of Influence (ZOI)
Benthic habitats	n/a	Immediate footprint of works	<5 m
Fish	Twaite shad	100 km	2.2 km
Birds	Most bird species	100 km	2 km
	Divers, seaduck	100 km	4 km
	Red-throated diver	100 km	10 km
Cetacean	Harbour porpoise	Celtic and Irish Sea MU	5 km (disturbance)
	Bottlenose dolphin	Irish Sea and offshore Channel and SW England MU	
Pinniped	Grey seal	OSPAR Region III MU	
	Harbour (common) seal	50 km	
European otter		32 km	250 m

4.1.5 In-combination effects

A key requirement of the Habitats Directive is that the effects of any project on the European site network should be considered in combination with other plans or projects. Only plans or projects that would increase the likelihood of significant effects should be considered.

The NRW Public register (NRW, 2023), Marine Management Organisation (MMO) Marine Case Management System Public Register (MCMS, 2023) and Kingfisher Bulletin (Kingfisher, 2023) have all been consulted to gather information on ongoing projects. As Notice to Mariners are only issued a few weeks prior to the commencement of survey activities, it is difficult to currently gauge what activities will be underway at the same time as the MaresConnect survey, however all known current projects that may cause a cumulative effect have been assessed for in-combination effects (Section 5.26).

4.1.6 Potential pressures scoped in

The JNCC Marine Pressures-Activities Database potential pressures scoped in, and their definitions (JNCC, 2022) are described in the subsequent sections.

4.1.6.1 Smothering and siltation rate changes (Light)

A change in the natural rates of siltation (increased or decreased). Siltation (or sedimentation) is the settling out of silt/sediments suspended in the water column. It can result in short lived sediment concentration gradients and the accumulation of sediments on the sea floor. This accumulation of sediments is synonymous with "light" smothering, which relates to the depth of vertical overburden. “Light” smothering relates to the deposition of layers of sediment on the seabed. For “light” smothering most benthic biota may be able to adapt, i.e. vertically migrate through the deposited sediment.

4.1.6.2 Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion.

Physical disturbance of sediments where there is limited or no loss of substratum from the system. Abrasion relates to the damage of the seabed surface layers (typically up to 50 cm depth).

4.1.6.3 Visual disturbance

The disturbance of biota by anthropogenic activities, e.g. increased vessel movements, such as during construction phases for new infrastructure (bridges, cranes, port buildings etc), increased personnel movements, increased tourism, increased vehicular movements on shore etc disturbing bird roosting areas, seal haul out areas etc.

4.1.6.4 Underwater noise changes

Increases over and above background noise levels (consisting of environmental noise (ambient) and incidental manmade/anthropogenic noise (apparent)) at a particular location. Species known to be affected are marine mammals and fish. The theoretical zones of noise influence (Richardson *et al.*, 1995) are temporary or permanent hearing loss, discomfort & injury; response; masking and detection. In extreme cases noise pressures may lead to death. The physical or behavioural effects are dependent on a number of variables, including the sound pressure level (SPL), loudness, sound exposure level (SEL) and frequency. High amplitude low and mid-frequency impulsive sounds and low frequency continuous sound are of greatest concern for effects on marine mammals and fish. Some species may be responsive to the associated particle motion rather than the usual concept of noise. Noise propagation can be over large distances (tens of kilometres) but transmission losses can be attributable to factors such as water depth and sea bed topography.

General equipment specifications for the geophysical, geotechnical and environmental survey and the associated underwater noise information are included in Appendix B (Table B-1). These are industry standard settings for surveys with similar specifications, as exact models of equipment are not currently known, with SPL levels identified from literature. As a result of the conclusions of Appendix B, CPT, magnetometers, box cores and grab samples all produce negligible level of underwater noise as they do not emit sound at a level considered to cause disturbance to marine receptors, so any disturbance would come from the vessel noise during these operations and as such this equipment will not be considered further in underwater noise assessments. MBES and SSS both emit frequencies that are not within the hearing range of the marine mammals expected to be present in the survey area. Appendix B summarised disturbance distances for SBP, vessel noise, USBL, borehole drilling and vibrocore sampling which have been listed in Table 4-2 where relevant.

4.1.6.5 Above water noise

This pressure relates to any loud noise made onshore or offshore by construction, vehicles (including aircraft), vessels, tourism, mining, blasting etc. that may disturb birds and reduce time spent in feeding or breeding area.

4.1.6.6 Unplanned events (accidental oil or chemical spills)

The likelihood of a large oil spill occurring from a project vessel is extremely low, however, as vessel details and subsequently the relevant onboard plans and procedures surrounding spills are currently unknown, this pressure (known as Hydrocarbon & PAH contamination - Includes those priority substances listed in Annex II of Directive 2008/105/EC in the JNCC Marine Pressures-Activities Database) has been scoped into the assessment. All project vessels will have control measures and Shipboard Oil Pollution Emergency Plans (SOPEP) in place and will adhere to MARPOL Annex I requirements.. As a result of adherence to these requirements (regardless of vessel size) being a requisite to working on the project, the likelihood of a spill event is very low and the amount of oil or chemical that may be spilled is expected to be very small and due to the metocean conditions in the region are expected to dilute and disperse rapidly, so only habitats have been assessed as a receptor of this pressure due to potential of absorption of any components from a spill.

4.1.6.7 Introduction or spread of INNS

Fouling organisms on vessel/rig hulls, INNS) may be introduced to the marine environment. Should these introduced species survive and form established breeding populations, they can result in negative effects on the environment. All vessels working on the project (for which it is relevant) will adhere to the International Convention for the Control and Management of Ship's Ballast Water and Sediments. Similarly, all survey equipment will have been dry for a considerable amount of time between working on the previous project and starting on the MaresConnect survey, meaning any INNS will be unlikely to survive. The contracted surveyors will be a from reputable company with relevant experience with benthic sampling and the best practice systems for operating the required equipment. However, as vessel details and subsequently the relevant onboard plans and procedures surrounding the control of INNS are not currently known, this pressure has been scoped into the assessment for habitats.

4.1.6.8 In-combination effects

Effects due to in-combination with other plans or projects.

4.1.6.9 Summary of pressures scoped into the assessment

Table 4-2 Potential pressures, zones of influence and protected site search area

Receptor	Potential Pressure	Project Activity	Zone of influence (ZOI)
Habitats	Smothering and siltation rate changes (Light)	Geotechnical surveys Environmental Survey	**Within MaresConnect survey corridor** Effects on the habitat due to site investigation activities may occur within the boundary of the MaresConnect survey corridor.

Receptor	Potential Pressure	Project Activity	Zone of influence (ZOI)
	Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Geotechnical surveys Environmental Survey	**Within MaresConnect survey corridor** Effects on the habitat due to site investigation activities may occur within the boundary of the MaresConnect Interconnector corridors. Up to 12 m^2 per borehole (including Jack-up-barge legs, borehole extraction and drill cuttings) 150 mm per Vibrocore (VC) 0.01 m^2 per Cone Penetration Test (CPT) 0.1 m^2 per grab sample
	Unplanned events (accidental oil or chemical spills)	Presence of installation vessel	**Within MaresConnect survey corridor** Effects on habitats due to a potential spill event are highly dependent on the size of the potential spill and the conditions at the time of the spill, but due to the metocean conditions in the region, it is expected that any potential spill event will be diluted and dispersed rapidly and so will occur within the boundary of the MaresConnect Interconnector corridors.
	Introduction or spread of INNS	Presence of installation vessel Geotechnical surveys Environmental Survey	**Within MaresConnect survey corridor** Effects on the habitat due to site investigation activities may occur initially within the boundary of the MaresConnect Interconnector corridors.
Birds	Visual disturbance	Presence of installation vessel Geophysical surveys	**Radial distances from MaresConnect survey corridor** ▪ 10 km Red-throated diver (JNCC 2022) ▪ 4 km divers and sea ducks (JNCC 2017) ▪ 2 km all other seabird species (JNCC 2017) It is recognised that some seabirds from other SPAs will forage and loaf in the ZOI. However, disturbance will be limited in extent and duration and there is sufficient space in the surrounding environment for birds to temporarily relocate
	Above water noise	Terrestrial and intertidal surveys	

Receptor		Potential Pressure	Project Activity	Zone of influence (ZOI)
Cetacean, fish, pinnipeds and otter		Underwater noise changes	Presence of installation vessel Geophysical surveys Geotechnical survey Environmental survey	**EDR of 5 km for geophysical surveys (including SBP and USBL)** (JNCC, 2020). **370 – 627 m - Vessel noise** Hatch et al., (2008) recorded typical 120 dB re 1 µPa isopleth of between 370 m – 627 m for research vessel sources (the isopleth at which NRW considers disturbance from continuous noise). **23 – 100 m – borehole drilling** (Willis et al. 2010; Nedwell and Brooker, 2008)
Pinniped	Grey seal	Visual disturbance	Presence of installation vessel	**500 m to 900 m** Studies conducted on disturbance of harbour seal to different vessel types found that the largest range was 50 m of a visual (and above water noise) disturbance (Paterson *et al.,* 2015; Calambokidis *et al.,* 1991). Between 900 m and 1,500 m, hauled out grey seals could be expected to detect the presence of vessels and at closer than 900 m a flight reaction could be expected (Marine Scotland 2019, Scottish Executive, 2007).
	Harbour seal			
Otter		Visual (and above water noise) disturbance	Presence of installation vessel	**250 m** Guidance on visual disturbance of otter from survey activities found that beyond approximately 250 m, visual disturbance from the proposed activity is unlikely to be an issue. It is expected that there are unlikely to be adverse disturbance on otter beyond these distances along the shoreline (NatureScot, 2023).

4.1.7 Potential pressures scoped out of assessment

Underwater sound changes – Diving birds

The likelihood of a noise sensitive diving bird being in the vicinity of a noise generating operation is very low due to the surface activity associated with such operations disturbing the birds prior to commencement of noise generation (BEIS, 2019; Fliessbach *et al*., 2019; Garthe & Hüppop, 2004; Leopold & Camphuysen, 2009).

Given the very low likelihood of interaction between the sound source and a diving bird due to the relatively short exposure time, the temporary and short-term nature of the survey work, the mobile nature of the surveys and the displacement of most diving species due to flushing disturbance, it can be determined that underwater noise would have no conceivable effect on diving seabirds in the vicinity including those which may forage in the area.

Collision above and below water with static or moving objects not naturally found in the marine environment.

There is a risk that marine mammals which are the features of SACs could collide with survey vessels. There is also a risk to basking shark, which are known to spend significant time at the surface and are

more vulnerable to collision. However, basking shark are not listed as Annex II species and are therefore not a feature of any SAC.

Shipping collision is a recognised cause of marine mammal mortality worldwide. The key factor influencing the injury or mortality caused by collisions is the ship size and its travelling speed (Schoeman *et al*, 2020).

A review of vessel collisions with marine animals undertaken by Schoeman et al (2020) identified that most important influences on severity of any potential effects are vessel size and speed, with small vessels being more likely to cause injury. Reduction of speeds to less than 10 knots was observed to reduce the risk of lethal injury to marine animals by 50% (Vanderlaan and Taggart, 2007 within Schoeman et al, 2020). Several organisations recommend reduction of vessel speeds to less than 10-13 knots to reduce the risk of collision with marine mammals, and other marine species (e.g. Federal Register, 2008; Ports of Auckland, 2015; JNCC, 2021).

Vessels undertaking the surveys will be either stationary or travelling at a standard survey speed of approximately 5-7 km/h, which is equivalent to approximately 2.7-3.8 knots, which is significantly slower than speeds associated with high marine mammal collision risk. Additionally, the collision risk is lower than that posed by commercial shipping activity which typically operates at 14 knots. Therefore, risk of injury to marine mammals features from collision is very low, and the significance of any effects will be imperceptible.

4.2 Screening of European sites

Geographic information system (GIS) was used to map the boundaries of SACs and SPAs in relation to the MaresConnect survey corridor. All UK SACs and SPAs which are within the defined search areas for identified receptors have been listed along with their features in Appendix A Table A-1 (SACs), Table A-2 (SPAs) and Table A-3 (RAMSAR). Transboundary sites (ROI and France) are listed in Appendix A, Table A-4. A total of 34 sites were screened in this assessment.

For each European site, potential effects to the features were identified and it was determined whether there is the potential for an interaction between the proposed site investigation and the receptors i.e. whether there is a pressure-receptor pathway. This is determined by comparing information such as the extent of the ZOI with information regarding the conservation feature e.g. species foraging distances, spatial extent of habitats etc. The Stage 1 interactions were defined as follows:

- **Yes -** A pathway between the proposed site investigation and the feature can be identified that is likely to result in an effect; or
- **No -** Either a pathway between the proposed site investigation and the feature cannot be identified or a pathway exists but there is no physical overlap of the effect and the feature.

For all feature where it is determined that there is a potential pressure receptor pathway, the likely significance of the effect (LSE) has been assessed in light of the site's conservation objectives. Where an LSE has been determined, the assessment will proceed to Stage 2.

For all features where it is determined that there is no pathway, the features will be screened out from further assessment. Screening has been undertaken without consideration of any project specific mitigation measures.

5. STEP 1: SCREENING FOR LIKELY SIGNIFICANT EFFECTS

Appendix A presents the results of the initial screening, description of the sites qualifying features and identified whether there was a potential pressure-receptor pathway for effect. A summary of the sites screened for likely significant effects is presented in Table 5-1. The pressures on the sites have been reviewed taking into consideration the zones of influence, sensitivity of conservation features, duration and seasonality of operations and the project description and are discussed per site in the following sections.

No pressure receptor pathway could be identified for 97 of the total 150 sites (Appendix A, Tables A-1 – A-4), so subsequently they were screened out of the assessment and have not been discussed further.

The LSEs that have been screened in for the assessment are summarised in Table 5-1 below:

Table 5-1 Summary of UK sites screened into the assessment for possible likely significant effects

Site	Designation	Distance to survey corridor km	Penetration and/or disturbance of the substrate	Smothering and siltation rate changes (Light)	Underwater noise changes	Visual disturbance	Above water noise	Introduction or spread of INNS	Unplanned events (accidental oil or chemical spills)
SAC's									
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay	SAC	Within	Screened In		Screened out -No pressure receptor pathway. SAC designated for Annex I habitat features only			Screened In	
North Anglesey Marine / Gogledd Môn Forol	SAC	Within	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
Croker Carbonate Slabs	SAC	0.10	Screened out - No pressure receptor pathway	Screened In	Screened out -No pressure receptor pathway. SAC designated for Annex I habitat features only			Screened out - No pressure receptor pathway	
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau	SAC	42.8	Screened out - Due to distance of site to project works, no pressure-receptor pathway identified.		Screened In		Screened out - Due to distance of site to project works, no pressure-receptor pathway identified.		
North Channel	SAC	60.1	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
West Wales Marine / Gorllewin Cymru Forol	SAC	64.6	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			

Site	Designation	Distance to survey corridor km	Penetration and/or disturbance of the substrate	Smothering and siltation rate changes (Light)	Underwater noise changes	Visual disturbance	Above water noise	Introduction or spread of INNS	Unplanned events (accidental oil or chemical spills)
Cardigan Bay / Bae Ceredigion	SAC	109.0	Screened out - No pressure receptor pathway.		Screened In		Screened out - No pressure receptor pathway		
Pembrokeshire Marine / Sir Benfro Forol	SAC	171.7	Screened out - No pressure receptor pathway.		Screened In		Screened out - No pressure receptor pathway		
Dynesfeydd Môr Hafren / Bristol Channel Approaches	SAC	183.5	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
The Maidens	SAC	143.5	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
Lundy	SAC	240.2	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
Treshnish Isles	SAC	326.5	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
Isles of Scilly Complex	SAC	391	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
Monach Islands	SAC	452.6	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
North Rona	SAC	614.7	Screened out - No pressure receptor pathway. SAC designated for Annex II species features only		Screened In	Screened out - No pressure receptor pathway			
SPA's									
Irish Sea Front	SPA	Within	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Liverpool Bay	SPA	Within	Screened out - No pressure receptor pathway			Screened In		Screened out - No pressure receptor pathway	

Site	Designation	Distance to survey corridor km	Penetration and/or disturbance of the substrate	Smothering and siltation rate changes (Light)	Underwater noise changes	Visual disturbance	Above water noise	Introduction or spread of INNS	Unplanned events (accidental oil or chemical spills)
Anglesey Terns / Morwenoliaid Ynys Môn	SPA	3.04	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Ynys Seiriol / Puffin Island	SPA	9.90	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
The Dee Estuary	SPA	15.0	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Ribble and Alt Estuaries	SPA	40.3	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Carlingford Lough	SPA	42.6	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Morecambe Bay and Duddon Estuary	SPA	74.3	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island	SPA	78.5	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Bowland Fells	SPA	91.4	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		

Table 5-2 Summary of transboundary (ROI and France) sites screened for possible likely significant effects

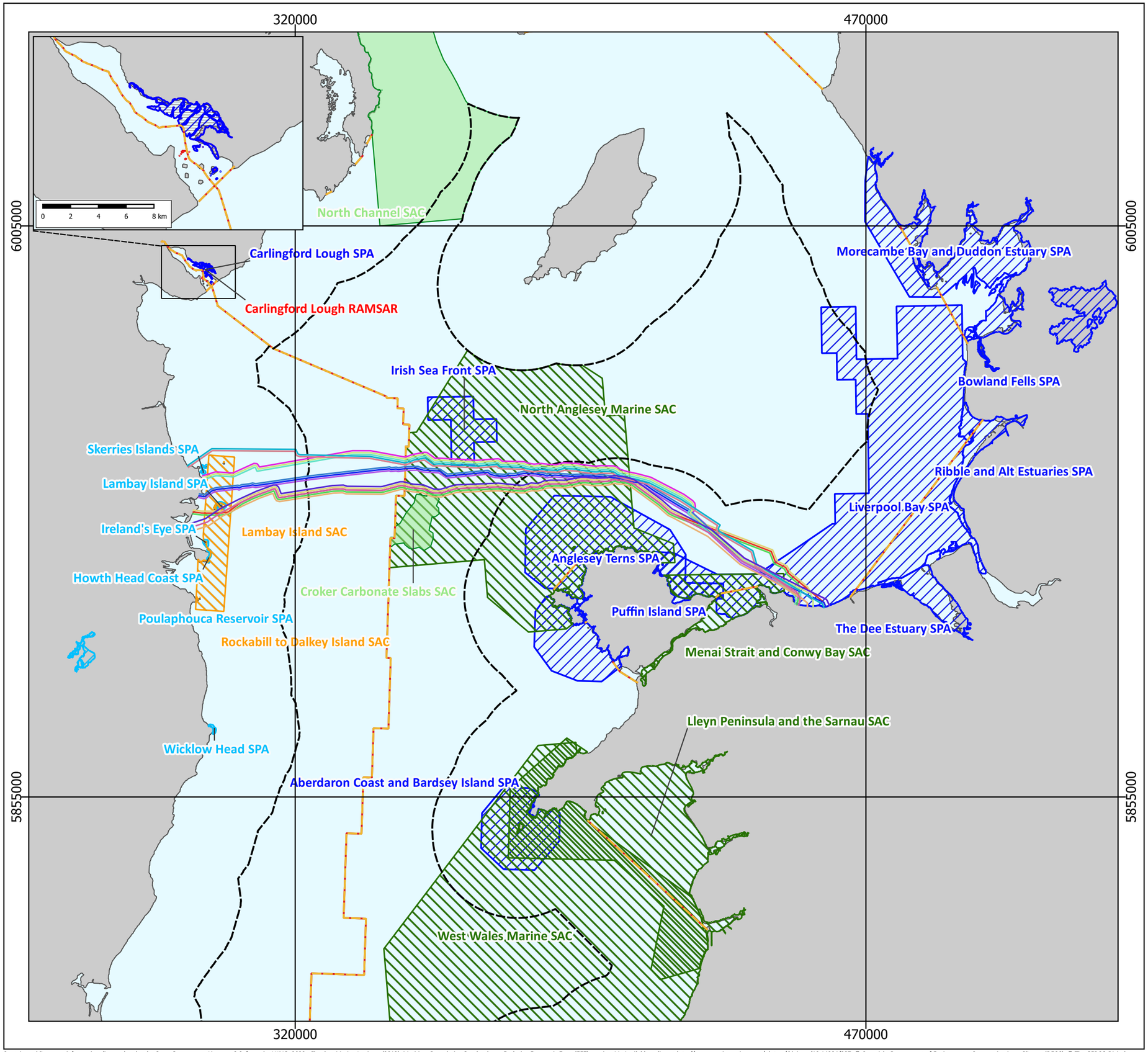
Site	Designation	Distance to survey corridor km	Penetration and/or disturbance of the substrate	Smothering and siltation rate changes (Light)	Underwater noise changes	Visual disturbance	Above water noise	Introdu-ction or spread of INNS	Unplanned events (accidental oil or chemical spills)
SAC's									
Rockabill to Dalkey Island	SAC	32.3	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Lambay Island	SAC	45.0	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Saltee Islands	SAC	150.4	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Slieve Tooey/Tormore Island/Loughros Beg Bay	SAC	205.3	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Horn Head and Rinclevan	SAC	219.8	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Inishbofin and Inishshark	SAC	266.5	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Slyne Head Islands	SAC	268.4	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Duvillaun Islands	SAC	273.0	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Inishkea Islands	SAC	276.5	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Blasket Islands	SAC	294.7	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Roaringwater Bay and Islands	SAC	312.9	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Nord Bretagne DH	SAC	397.4	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Tregor Goelo SAC	SAC	472.1	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			

Site	Designation	Distance to survey corridor km	Penetration and/or disturbance of the substrate	Smothering and siltation rate changes (Light)	Underwater noise changes	Visual disturbance	Above water noise	Introdu-ction or spread of INNS	Unplanned events (accidental oil or chemical spills)
Cote de Granit rose-Sept-Iles SAC	SAC	472.1	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Mers Celtiques - Talus du golfe de Gascogne SAC	SAC	490	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Baie de Morlaix SAC	SAC	497.8	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Abers - Cote des legendes SAC	SAC	513.9	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Ouessant-Molène SAC	SAC	536.7	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
Chaussée de Sein SAC	SAC	583.4	Screened out - No pressure receptor pathway.		Screened In	Screened out - No pressure receptor pathway			
			SPA's						
Lambay Island	SPA	47.3	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Skerries Islands	SPA	51.9	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Ireland's Eye	SPA	53.6	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Howth Head Coast	SPA	53.7	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Wicklow Head	SPA	80.5	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		
Poulaphouca Reservoir	SPA	90.1	Screened out - No pressure receptor pathway			Screened In	Screened out - No pressure receptor pathway		

MARESCONNECT INTERCONNECTOR

PROTECTED SITES
Overview of Screened Protected Sites within 100km of Seabed Survey

Drawing No: P2578-PROT-009 | A



Legend

Cable Routes
- W1I1
- W1I2
- W1I3
- W1I4
- W1I5
- W2I1
- W2I2
- W2I3
- W2I4
- W2I5
- W3I1
- W3I2
- W3I3
- W3I4
- W3I5

Adminstrative Boundaries
- 12NM Territorial Sea limit
- Exclusive Economic Zone (EEZ) Boundary

Environmental Designations
- GB SAC
- UK Offshore SAC
- ROI SAC
- UK SPA
- ROI SPA
- UK RAMSAR

NOT TO BE USED FOR NAVIGATION

Date	2023-08-29 12:26:26
Coordinate System	WGS 84 / UTM zone 30N
WKID	EPSG:32630
Scale @A3	1:1,000,000
Data Sources	UKHO; MarineRegions; DECC; NPWS; JNCC; NRW; GEBCO; ESRI
File Reference	J:\P2578\Mxd_QGZ\02_PROT \P2578_PROT.qgz
Created By	Oliver Bula
Reviewed By	Lewis Castle
Approved By	Vicky Fisk

0 15 30 45 60 km

MARESCONNECT INTERCONNECTOR

PROTECTED SITES
Overview of Screened Protected Sites

Drawing No: P2578-PROT-010 | A

0 800000

6300000

5500000

Legend

Cable Routes
- W1I1
- W1I2
- W1I3
- W1I4
- W1I5
- W2I1
- W2I2
- W2I3
- W2I4
- W2I5
- W3I1
- W3I2
- W3I3
- W3I4
- W3I5

Adminstrative Boundaries
- 12NM Territorial Sea limit
- Exclusive Economic Zone (EEZ) Boundary

Environmental Designations
- GB SAC
- UK Offshore SAC
- ROI SAC
- European SAC
- UK SPA
- ROI SPA
- UK RAMSAR

NOT TO BE USED FOR NAVIGATION

Date	2023-08-29 12:32:03
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WKID	EPSG:32630
Scale @A3	1:5,000,000
Data Sources	UKHO; MarineRegions; DECC; NPWS; JNCC; NRW; EEA; ESRI
File Reference	J:\P2578\Mxd_QGZ\02_PROT \P2578_PROT.qgz
Created By	Oliver Bula
Reviewed By	Lewis Castle
Approved By	Vicky Fisk

0 75 150 225 300 km

5.2 Likely Significant Effects Assessment

The following sections assess the likely significant effect of the project on the screened in protected sites. It is important to note that while multiple cables routes are proposed, only one cable route (or a combination of several sections of several route options) will be selected for survey. Therefore, for the purposes of this assessment to apply the precautionary principle the route nearest the protected sites and the route transiting within sites for the longest distances have been selected.

5.3 Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC

The marine survey corridor transverses through this SAC for approximately 5.52 km (longest distance of cables transiting through the site).

Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay is located on the east of Anglesey Island, Wales covering the Menai Strait and proceeds northwards to cover the waters between LLandundo and Moelfre. The SAC covers an area of approximately 265 km^2 (JNCC, 2015).

The site is designated for Annex I habitat 1110: Sandbanks which are slightly covered by sea water all the time, 1140 Mudflats and sandflats not covered by seawater at low tide, and 1170 Reefs. The Four Fathom Banks complex is located in the Menai Strait and Conwy Bay between mainland Wales and Anglesey. It is an uncommon type of subtidal sandbank in Wales since it is comparatively large, is shielded from wave action, but situated in an area of open coast (JNCC, 2015b). The sandbanks range in quality from generally clean, well-sorted, and rippling sand at the outer section of the bank where tidal streams are stronger to stable, muddy sand in areas that experience weak tidal streams (JNCC, 2015b). The fauna of the bank in very shallow water is species-rich, mobile sand environments, and is dominated by polychaete worms such as *Spio filicornis*. The banks can be high in numbers of bivalve which then hosts internationally important flocks of common scoter (*Melanitta nigra*) (JNCC, 2015b).

Traeth Lafan, the coasts of the Menai Strait, and the Foryd estuary are among the intertidal mudflats and sandflats of the Menai Strait and Conwy Bay on the north Wales coast (JNCC, 2015b). Traeth Lafan is an example of a vast mud and sandflat that is almost entirely marine, exposed to a wide range of waves, and offers a variety of sediment types with typical associated fauna (JNCC, 2015b). For instance, the bivalves cockle (*Cerastoderma edule*), gaper (*Mya arenaria*), and Baltic tellin (*Macoma balthica*) are widespread in more protected fine and muddy sand, whereas the shrimp (*Haustorius arenarius*) and (*Bathyporeia sarsi*) are found in movable clean sand (JNCC, 2015b). In more tide-swept locations, the sand-mason worm (*Lanice conchilega*) can be found.

Between mainland Wales and Anglesey, there are reefs in the Menai Strait and Conwy Bay, including the Great and Little Ormes, Puffin Island, and limestone reefs off the coast of southeast Anglesey. Although the area is mainly protected from wave action, the water is relatively turbid and has a high level of suspended material (JNCC, 2015b). Moreover, the tidal streams are strong, reaching up to 8 knots (4 m s-1) in some areas during spring tides (JNCC, 2015b). Because of this, the stony reefs of the Strait are habitat to a unique and diverse variety of animals that mostly obtain their food via filtering seawater. Sponge colonies, for instance, such as the breadcrumb sponge (*Halichondria panicea*). Any species that bore into rock can be found on limestone reefs, and several limestone specialists are confined to this particularly rare habitat. Among the species are the piddock (*Cliona celata*), the rock-boring sponge (*Hiatella arctica*), acorn worms (*Phoronis hippocrepiai*) and polychaete worms *Polydora* sp.

5.3.1 Conservation objectives

The conservation objectives of this site are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing;
- The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded; and
- The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded.

5.3.2 Penetration and/or disturbance of the substrate

During geotechnical and environmental sampling, approximately six VCs and one environmental grab station (three grab samples) will be sampled within the site boundary. All samples will be less than 1 m^3. Sampling will cause extremely localised disturbance of the seabed.

The Menai Strait is dominated by strong tidal currents which suspend high levels of seabed particles in the water column and the dynamic nature of this environment means that sediment deposition takes place constantly. Any localised depressions created within the sandbanks and mudflats during sampling will be rapidly dispersed and infilled following sample retrieval. Due to the small amount of sediment that will be retrieved from each sample (a total of 9 m^3) and the quick recovery time for any depressions made the survey will not have a significant effect on the conservation objectives of the site.

The potential effects to reef habitat are associated with the geotechnical surveys. Due to the hard-underlying substrate of reef, it will not be technically feasible to collect samples from the reef habitat utilising the geotechnical methods such as grab samples, CPT and VC. Prior to sampling, geophysical data will be analysed and a drop-down camera will be used to determine if any reef features are located at the sampling site, and no sample will be collected if reef habitat is present in the vicinity of the selected location. Taking this best-practice methodology, no significant effects are expected to reef features in this site.

Screening conclusion: No likely significant effect.

5.3.3 Smothering and siltation rate changes (Light)

A small volume of sediment will be collected from the seabed by each vibrocore sample (maximum 0.05 m^3) and environmental grab sample (maximum 0.02 m^3) within the SAC. Due to the small amount of sediment collected (a total of 9 m^3) and that any depressions are expected to be infilled through sediment movement once the sampling has concluded there will not be an increase in siltation rates at the site.

Screening conclusion: No likely significant effect

5.3.4 Unplanned events (accidental oil or chemical spills)

Although the chance of any accidental spillage of oil or other operational chemicals from any of the survey vessels is very low, there is still a small possibility that this could occur. Spillages occur for a variety of reasons such as accidental discharge. As the survey vessels to be used for the MaresConnect survey are currently unknown, it is not known exactly what oils and chemicals will be contained onboard, although the most likely risk is from the marine fuel oil used to power the vessel due to the quantities stored for the survey duration.

Any potential spillage has the potential to enter the qualifying habitats once the oil or chemical has been transported on the water surface, and has the potential to cause harm to any organism that relies on the habitat through poisoning or suffocation. Without mitigation, a spillage event may still occur and as a result an LSE cannot be ruled out.

Screening conclusion: Likely significant effect is possible, progress to Stage 2 Appropriate Assessment

5.3.5 Introduction or spread of INNS

There is the potential that INNS could enter the qualifying habitats of the site through several routes, including ballast water, the vessel hull or possibly through the geotechnical and environmental survey equipment that will come into contact with the seabed. The type of INNS will be dependent on where the vessel has travelled from or when the survey equipment was last used, however potential INNS that pose a current risk in north Wales include the slipper limpet (*Crepidula fornicata*) and Japanese wireweed (*Sargassum muticum*). These species can result in outcompeting native species for space and resources, dominating the supporting qualifying habitats. The slipper limit form large aggregations on the seabed, which can lead to smothering and can also alter sediment movements (Welsh Government, 2017). Japanese wireweed has been recorded in the Menai Strait, and the use of survey equipment in areas it inhabits could contribute to its further spread throughout the site (NRW, 2018c).

Without mitigation, there is the potential for INNS to be introduced or to spread further throughout the SAC, damaging the qualifying features and their ability to support native populations of various flora and fauna. As a result, LSE cannot be ruled out.

Screening conclusion: Likely significant effect is possible, progress to Stage 2 Appropriate Assessment

5.4 North Anglesey Marine / Gogledd Môn Forol SAC

The marine survey route transits through this SAC for approximately 60 km.

The North Anglesey Marine / Gogledd Môn Forol SAC has been identified as one of the best areas in the UK for harbour porpoise (*Phocoena phocoena*). The North Anglesey Marine SAC extends from the northern coast of the Isle of Anglesey into the Irish Sea. It sits at the northern end of St George's Channel, extending approximately halfway across to the Republic of Ireland, with boundary on the national waters of the Isle of Man. It covers an area of 3249 km^2 and includes a mix of habitats, such as coarse and sandy sediments, rock, and mud.

The site has been designated to assist in the management of harbour porpoise numbers in UK waters and falls under the Celtic and Irish Seas MU. The site is designated solely for harbour porpoise during the summer (April to September inclusive), which covers the entirety of the SAC boundary (JNCC, 2017a). The area included within the site covers important summer habitat for porpoises, which was identified as part of the top 10% persistent high density areas for the summer seasons within the UK (JNCC, 2017b).

Due to the transient nature of the harbour porpoise, site population estimates are unavailable. The Celtic and Irish Seas MU harbour porpoise population, of which the site is contained within, is estimated to be 62,517 individuals (IAMMWG, 2022).

Heinanen and Skov (2015) provides distribution maps that indicate observed summer densities of harbour porpoise in the region surrounding the marine survey corridor are <0.3 animals per km^2 for the period 1994 – 2011. In winter predicted densities increase to >3 animals per km^2 (modelled data for 1997, 2004 and 2009).

5.4.1 Conservation objectives

The conservation objectives with regard to harbour porpoise are 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:

- The species is a viable component of the site;
- There is no significant disturbance of the species; and,
- The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

Harbour porpoises are considered to be a 'viable component' of the site if they are able to survive and live successfully within it. The North Anglesey Marine / Gogledd Môn Forol SAC site has been selected primarily on the basis of its long-term, preferential use by harbour porpoise. The implication is that this site provides good foraging habitat, and it may also be used for breeding and calving. However, because the number of harbour porpoise using the site naturally varies, there is not an exact number of animals within the site above which the species is viable or below which it will become unviable.

5.4.2 Underwater sound changes

Geophysical surveys are considered to be of medium risk to the harbour porpoise population within the site (JNCC, NRW and DAERA, 2019). It is estimated that the geophysical survey vessel will be present within the site for approximately ten days and the geotechnical vessel for 17 days. No borehole drilling will take place within the SAC but vibrocore sampling will occur.

Appendix B concluded:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are therefore unlikely to disturb harbour porpoise.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including harbour porpoise.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

As a worst-case scenario it is possible that harbour porpoise could be disturbed by the SBP, vibrocore sampling and the presence of the vessel. Most sound energy generated by SBP will be directed towards the seabed and the pulse duration is very short with the survey constantly moving. A disturbance range of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore, marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. If a harbour porpoise were to find itself within the EDR of 5 km given for geophysical surveys (JNCC, 2020), it is calculated they would be able to move out of this EDR in less than 1 hour (Appendix B). As a result, the risk assessment concluded that the underwater noise generated by the marine survey would not be considered significant disturbance (as defined by JNCC (2010 and 2020)).

The Conservation Objectives and Advice on Operations published by the JNCC (2019) for the SAC suggest:

"Noise disturbance within the SAC from a plan/project individually or in combination is significant if it excludes harbour porpoises from more than

1. 20% of the relevant area of the site in any given day, and

2. An average of 10% of the relevant area of the site over a season."

The route through the SAC is 60 km long. It is estimated that the geophysical survey will be present in the SAC for 27 days, of which 10 days will be dedicated to the geophysical survey. The area of disturbance will move with the vessel, but as a worst-case the zone of disturbance has been calculated as 5 km for the entire 60 km; giving a total area of 300 km^2. This is equivalent to 9% of the North Anglesey Marine / Gogledd Môn Forol SAC (3249km^2). The area of disturbance is lower than the 10% threshold provided by JNCC as deemed to cause a significant effect on the site during the designated summer season. It is anticipated that the vessel will cover approximately 6 km per survey day based on the estimated 10 days within the site, which gives a total area of 30 km^2. This represents 0.87% of the site potentially disturbed in a single day, which is less than the 20% threshold. Similarly, the disturbance is temporary so will affect the area of the site for a small amount of the designated season and will not cause a significant effect over the course of a single day or the summer season.

Screening conclusion: No likely significant effect.

5.5 Croker Carbonate Slabs SAC

The marine survey corridor does not transit through this SAC but is approximately 0.10 km south of the nearest proposed cable route.

The Croker Carbonate Slabs SAC is an area in the mid-Irish Sea, approximately 30 km west of Anglesey, Wales. The site lies in 70 m water depth in the north, descending down to approximately 100 m at the south-west corner of the site. The SAC covers an area of approximately 116 km^2 (JNCC, 2019). The site is primarily designated for Annex I feature "submarine structures made by leaking gases" of which an area of 55km^2 of the total SAC has been identified. The seabed surface is composed of extensive areas of exposed methane-derived authigenic carbonate (MDAC). MDAC is a layer or crust that can produce

carbonate "pavements" and "chimneys," significant hard ground in contrast to the underlying sediment, when calcite precipitates and fills the pore spaces between the sand grains. When exposed at the seabed's surface, MDAC seems to be rapidly degraded and broken down into sand- and gravel-sized fragments by both biological activity (boring by bivalve molluscs) and water currents.

5.5.1 Conservation objectives

For the feature to be in favourable condition thus ensuring site integrity in the long term and contribution to Favourable Conservation Status of Annex I Submarine structures made by leaking gases. This contribution would be achieved by maintaining or restoring, subject to natural change:

- The extent and distribution of the qualifying habitat in the site;
- The structure and function of the qualifying habitat in the site; and
- The supporting processes on which the qualifying habitat relies.

5.5.2 Smothering and siltation rate changes (Light)

A small volume of sediment will be collected from the seabed by each vibrocore sample (maximum 0.16 m^3) and environmental grab sample (maximum 0.1 m^3), which may potentially be located on the boundary of the SAC. Due to the small amount of sediment collected and that any depressions are expected to be infilled once the sampling has concluded there will not be an increase in siltation rates at the site.

Screening conclusion: No likely significant effect

5.6 Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC

The marine survey route does not transit through this SAC but is located approximately 43 km south west of the marine survey area.

The primary reason for the site's designation is the presence of the Annex I listed habitats sandbanks which are slightly covered by water all the time; estuaries; coastal lagoons; large shallow inlets and bays; and reefs. Due to the distance of the site from the marine survey habitats were screened out for likely significant effect assessment. However, bottlenose dolphin and grey seal are present as a qualifying feature but not a primary reason for site selection. As both species are mobile and may forage in the proposed cable corridor the site has been included in the assessment.

The grey seal in the site are thought to be part of the wider north Wales population, considered to be at the scale of the SW England and Wales MU. Previous site surveys suggest that pup numbers and haul outs have remained stable or increased since 2009 at regularly monitored sites, such as Bardsey Island) (NRW, 2018b). Due to their mobile nature, population estimates are difficult to quantify for the site, however the north Welsh population at all haul out sites was estimated to be a maximum of approximately 1100. The main period of pup production is noted to be September and October; however, the season can range from August to November (CCW, 2009).

Bottlenose dolphin don't form a discrete site-based population within the SAC but are part of the wider Irish Seas MU, which has an estimated population of 293 individuals (JNCC, 2022). Dolphins associated with the Cardigan Bay SAC move into and through the Pen Llyn a'r Sarnau SAC and are considered part of a larger coastal population. The population is indicated to be in an overall favourable condition (NRW, 2018b).

5.6.1 Conservation objectives

The conservation objectives for the site is to achieve and maintain in the long-term favourable conservation status for the habitat and species features. With respect to grey seal and bottlenose dolphin this means:

- The population is maintaining itself on a long-term basis as a viable component of its natural habitat;
- The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future; and
- The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

5.6.2 Underwater sound changes

Appendix B concluded that:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are therefore unlikely to disturb bottlenose dolphin or grey seal.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including bottlenose dolphin and grey seal.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

Of the techniques that could potential disturb cetacean and pinniped (vessel noise, vibrocoring and sub-bottom profiling), the SBP has the larger ZOI and therefore the assessment below focuses on the effects of this technique.

A disturbance range for marine mammals and pinnipeds of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that

any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore, marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. The ZOI predicted for disturbance is conservative and numbers of animals that could potentially be disturbed are small, relative to the population estimates. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. Evidence suggests that avoidance behaviour will be temporary, with individuals returning to the area affected once the sound has ceased (Morton and Symonds 2002; Stone and Tasker 2006; Gailey et al. 2007; Stone et al. 2017). Grey seals have been shown to return to a survey area after the use of a small airgun array within two hours of the survey ceasing (Gordon et al., 2003). As the SAC is >40 km from the survey area, project activities will not impede animals from accessing preferred habitat (except on a very localised basis).

Screening conclusion: No likely significant effect.

5.6.3 Visual disturbance

Visual disturbance is only relevant to species that respond to visual cues, for hunting/foraging, behavioural responses or predator avoidance, and that have the visual range to perceive cues at distance. It is therefore particularly relevant to fish, birds, reptiles and mammals that depend on sight but less relevant to benthic invertebrates (JNCC, 2022).

The Marine Evidence-based Sensitivity Assessment (MarESA) is a methodical procedure for determining the pressures placed on a feature (such as a species or habitat) and how sensitive that feature is expected to be to those pressures (Tyler-Walters et al., 2018). In order to implement this strategy, MarESA used the pressure definitions given by OSPAR ICG-C and established pressure benchmarks (Tillin, Hull and Tyler-Walters, 2010). These benchmarks have been used in this assessment to understand if a likely significant effect will occur.

MarESA identification of pressure benchmarks detail that disturbance can be measured as daily duration of transient visual cues exceeds 10% of the period of site occupancy by the feature.

Two sources of disturbance have been identified:

- Disturbance from survey vessel movements; and
- Disturbance from geotechnical borehole drilling at the landfall and nearshore marine locations that are selected for geotechnical investigation.

Between 900 m and 1,500 m, hauled out grey seals could be expected to detect the presence of vessels and at closer than 900 m a flight reaction could be expected (Marine Scotland 2019, Scottish Executive, 2007). Therefore, given the distance of the marine survey area to the SAC (43 km), disturbance to seals at their haul-out sites within the Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC, due to the presence of survey vessels will not occur.

In context of the conservation objectives for the SAC, the presence of survey vessels will not affect the breeding, moulting and resting behaviour of seals and the population composition will not be affected due to the distance from the survey corridor to the site. While any individuals present which transit to the marine survey area, may be disturbed within the water by the survey and investigation activities, this disturbance effect will be temporary. There is a degree of background noise which grey seals will already be accustomed to; therefore, the proposed site survey and investigation works will not cause

disturbance at a level which will adversely affect the grey seal population at the marine survey area and will not prevent grey seal from accessing suitable habitat.

Screening conclusion: No likely significant effect

5.7 North Channel SAC

The marine survey route does not transit through this SAC but is approximately 60 km north of the nearest marine survey route.

The North Channel SAC, which lies on the eastern coast of Northern Ireland, has been recognised as a crucial harbour porpoise wintering region, supporting an estimated 1.2% of the 62,517 population of the UK's Celtic and Irish Seas MU. Despite being relatively small compared to most harbour porpoise SACs, this site's 1,604 km^2 supports regions where large groups of up to 100 harbour porpoises have been observed.

The North Channel site was identified as being within the top 10% of persistent high-density areas for harbour porpoise in UK waters during the winter season (Heinänen & Skov, 2015).

5.7.1 Conservation objectives

The conservation objectives with regard to harbour porpoise are 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 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:

- The species is a viable component of the site;
- There is no significant disturbance of the species; and,
- The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

5.7.2 Underwater sound changes

Appendix B concluded:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are, therefore, unlikely to disturb harbour porpoise.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however, exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including harbour porpoise.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

As a worst-case scenario it is possible that harbour porpoise could be disturbed by the SBP, vibrocore sampling and the presence of the vessel. Most sound energy generated by SBP will be directed towards the seabed and the pulse duration is very short with the survey constantly moving. A disturbance range of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. If a harbour porpoise were to find itself within the EDR of 5 km given for geophysical surveys (JNCC, 2020), it is calculated they would be able to move out of this EDR in less than 1 hour (Appendix B). As a result, the risk assessment concluded that the underwater noise generated by the marine survey would not be considered significant disturbance (as defined by JNCC (2010 and 2020)).

The Conservation Objectives and Advice on Operations published by the JNCC (2019) for the SAC suggest:

"Noise disturbance within the SAC from a plan/project individually or in combination is significant if it excludes harbour porpoises from more than

1. 20% of the relevant area of the site in any given day, and

2. An average of 10% of the relevant area of the site over a season."

The marine survey route does not transit through the SAC and the area of disturbance will move with the vessel, but as a worst-case the zone of disturbance has been calculated as 5 km. Due to the distance of the SAC from the survey route 20% noise disturbance of the relevant area will not occur as the zone of disturbance is 5 km and the SAC is located 60 km away.

Due to the mobility of the species, individuals from the North Channel SAC could be present in the marine survey area. However, as discussed above individuals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. If a harbour porpoise were to find itself within the EDR of 5 km given for geophysical surveys (JNCC, 2020), it is calculated they would be able to move out of this EDR in less than 1 hour (Appendix B).

Screening conclusion: No likely significant effect.

5.8 West Wales Marine / Gorllewin Cymru Forol SAC

The marine survey route does not transit through this SAC but is approximately 65 km south west of the nearest marine survey route.

The site is proposed for designation for the Annex II species harbour porpoise. Covering an area of 7,376 km^2, in both Welsh territorial and offshore waters, it has been proposed solely to assist in the management of harbour porpoise numbers in UK waters and is part of a larger suite of sites. Together the sites cover approximately 10.3% of the UK habitat and 18.7% of the UK population. The West Wales Marine SAC is part of the Celtic and Irish Seas MU.

The site has both summer and winter components, including important summer habitat for the species as well as areas in Cardigan Bay which has been identified as important during the winter. It is estimated that the site supports over 5,000 individuals for at least part of the year, whilst the MU supports an estimated population of 62,517 individuals (IAMMWG, 2022). The site's selection assessment document (JNCC 2017b) notes that harbour porpoise within the MU prefer water depths shallower than 40 m, and that lower densities are observed in areas with high levels of shipping activity (based on a threshold of approximately 50 ships per day in summer).

5.8.1 Conservation objectives

The conservation objectives with regard to harbour porpoise are 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 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:

- The species is a viable component of the site;
- There is no significant disturbance of the species; and,
- The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

5.8.2 Underwater sound changes

Appendix B concluded:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are therefore unlikely to disturb harbour porpoise.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including harbour porpoise.

- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

As a worst-case scenario it is possible that harbour porpoise could be disturbed by the SBP, vibrocore sampling and the presence of the vessel. Most sound energy generated by SBP will be directed towards the seabed and the pulse duration is very short with the survey constantly moving. A disturbance range of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. If a harbour porpoise were to find itself within the EDR of 5 km given for geophysical surveys (JNCC, 2020), it is calculated they would be able to move out of this EDR in less than 1 hour (Appendix B). As a result, the risk assessment concluded that the underwater noise generated by the marine survey would not be considered significant disturbance (as defined by JNCC (2010 and 2020)).

The Conservation Objectives and Advice on Operations published by the JNCC (2019) for the SAC suggest:

"Noise disturbance within the SAC from a plan/project individually or in combination is significant if it excludes harbour porpoises from more than

1. 20% of the relevant area of the site in any given day, and

2. An average of 10% of the relevant area of the site over a season."

The marine survey route does not transit through the SAC and the area of disturbance will move with the vessel, but as a worst-case the zone of disturbance has been calculated as 5 km. Due to the distance of the SAC from the survey route 20% noise disturbance of the relevant area will not occur as the zone of disturbance is 5km and the SAC is located 65km away.

Due to the mobility of the species, individuals from the West Wales Marine SAC could be present in the marine survey area. However, as discussed above individuals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. If a harbour porpoise were to find itself within the EDR of 5 km given for geophysical surveys (JNCC, 2020), it is calculated they would be able to move out of this EDR in less than 1 hour (Appendix B).

Screening conclusion: No likely significant effect.

5.9 Cardigan Bay / Bae Ceredigion

The marine survey route does not transit through this SAC but is approximately 109 km south of the nearest marine survey route.

The site is proposed for designation for the Annex II species bottlenose dolphin. Covering an area of 959 km^2 in Welsh waters, the site is part of the Irish Sea MU. The site also supports a significant presence of reefs, submerged or partially submerged sea caves, sandbanks which are slightly covered by seawater all the time, grey seal, river lamprey and sea lamprey.

The site is one of the only known areas in UK waters to support regularly occurring numbers, and the population is estimated to consist of around 147 individuals with the population in favourable condition (NRW, 2018a).

5.9.1 Conservation objectives

In regard to bottlenose dolphin and grey seal, the conservation objectives for the site are:

- The population is maintaining itself on a long-term basis as a viable component of its natural habitat.
- The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.
- The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

5.9.2 Underwater sound changes

Appendix B concluded that:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are therefore unlikely to disturb bottlenose dolphin or grey seal.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and, therefore, can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including bottlenose dolphin and grey seal.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

Of the techniques that could potential disturb cetacean and pinniped (vessel noise, vibrocoring and sub-bottom profiling), the SBP has the larger ZOI and therefore the assessment below focuses on the effects of this technique.

A disturbance range for marine mammals and pinnipeds of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. The ZOI predicted for disturbance is conservative and numbers of animals that could potentially be disturbed are small, relative to the population estimates. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. Evidence suggests that avoidance behaviour will be temporary, with individuals returning to the area affected once the sound has ceased (Morton and Symonds 2002; Stone and Tasker 2006; Gailey et al. 2007; Stone et al. 2017). Grey seals have been shown to return to a survey area after the use of a small airgun array within two hours of the survey ceasing (Gordon et al., 2003).As the SAC is >100 km from the survey area, project activities will not impede animals from accessing preferred habitat (except on a very localised basis).

Screening conclusion: No likely significant effect.

5.9.3 Visual disturbance

Visual disturbance is only relevant to species that respond to visual cues, for hunting/foraging, behavioural responses or predator avoidance, and that have the visual range to perceive cues at distance. It is therefore particularly relevant to fish, birds, reptiles and mammals that depend on sight but less relevant to benthic invertebrates which inhabit the seabed located at a greater distance from visual pressure (JNCC, 2022).

As discussed in Section 5.6.3, MarESA identification of pressure benchmarks detail that disturbance can be measured as daily duration of transient visual cues exceeds 10% of the period of site occupancy by the feature.

Two sources of disturbance have been identified:

- Disturbance from survey vessel movements; and
- Disturbance from geotechnical borehole drilling at the landfall and nearshore marine locations that are selected for geotechnical investigation.

Between 900 m and 1,500 m, hauled out grey seals could be expected to detect the presence of vessels and at closer than 900 m a flight reaction could be expected (Marine Scotland 2019, Scottish Executive, 2007). Therefore, given the distance of the marine survey area to the SAC (43 km), disturbance to seals

at their haul-out sites within the Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC, due to the presence of survey vessels will not occur.

In context of the conservation objectives for the SAC, the presence of survey vessels will not affect the breeding, moulting and resting behaviour of seals and the population composition will not be affected due to the distance from the survey corridor to the site. While any individuals present which transit to the marine survey area, may be disturbed within the water by the survey and investigation activities, this disturbance effect will be temporary. There is a degree of background noise which grey seals will already be accustomed to; therefore, the proposed site survey and investigation works will not cause disturbance at a level which will adversely affect the grey seal population at the marine survey area and will not prevent grey seal from accessing suitable habitat.

Screening conclusion: No likely significant effect

5.10 Pembrokeshire Marine / Sir Benfro Forol SAC

The marine survey route does not transit through this SAC but is approximately 172 km south west of the nearest marine survey route.

The Pembrokeshire Marine / Sir Benfro Forol SAC covers an area of 1380 km^2 and has been designated for the qualifying features Annex I habitats 1130 estuaries, 1160 large shallow inlets and bays, 1170 reefs and the Annex II species grey seal and shore dock. The site also supports populations of Annex I habitats 1110 sandbanks which are slightly covered by sea water all the time, 1140 mudflats and sandflats not covered by seawater at low tide, 1150 coastal lagoons, 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), 8330 submerged or partially submerged sea caves and Annex II species sea lamprey, river lamprey, allis shad, twaite shad and otter, all of which are present but not a primary reason for site selection.

The site supports a large breeding colony of grey seal with an expanding number of pupping sites. The population has been assessed as favourable (NRW, 2018b).

5.10.1 Conservation objectives

In regard to grey seal, the conservation objectives for the site are:

- The population is maintaining itself on a long-term basis as a viable component of its natural habitat.
- The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.
- The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

5.10.2 Underwater sound changes

Appendix B concluded that:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and pinnipeds and are therefore unlikely to disturb grey seal.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans and pinnipeds. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.

- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including bottlenose dolphin and grey seal.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

Of the techniques that could potential disturb cetacean and pinniped (vessel noise, vibrocoring and sub-bottom profiling), the SBP has the larger ZOI and, therefore, the assessment below focuses on the effects of this technique.

A disturbance range for marine mammals and pinnipeds of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. The ZOI predicted for disturbance is conservative and numbers of animals that could potentially be disturbed are small, relative to the population estimates. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. Evidence suggests that avoidance behaviour will be temporary, with individuals returning to the area affected once the sound has ceased (Morton and Symonds 2002; Stone and Tasker 2006; Gailey et al. 2007; Stone et al. 2017). Grey seals have been shown to return to a survey area after the use of a small airgun array within two hours of the survey ceasing (Gordon et al., 2003).As the SAC is >100 km from the survey area, project activities will not impede animals from accessing preferred habitat (except on a very localised basis).

Screening conclusion: No likely significant effect.

5.10.3 Visual disturbance

Visual disturbance is only relevant to species that respond to visual cues, for hunting/foraging, behavioural responses or predator avoidance, and that have the visual range to perceive cues at

distance. It is therefore particularly relevant to fish, birds, reptiles and mammals that depend on sight but less relevant to benthic invertebrates (JNCC, 2022).

As discussed in Section 5.6.3, MarESA identification of pressure benchmarks detail that disturbance can be measured as daily duration of transient visual cues exceeds 10% of the period of site occupancy by the feature.

Two sources of disturbance have been identified:

- Disturbance from survey vessel movements; and
- Disturbance from geotechnical borehole drilling at the landfall and nearshore marine locations that are selected for geotechnical investigation.

Between 900 m and 1,500 m, hauled out grey seals could be expected to detect the presence of vessels and at closer than 900 m a flight reaction could be expected (Marine Scotland 2019, Scottish Executive, 2007). Therefore, given the distance of the marine survey area to the SAC (>100 km), disturbance to seals at their haul-out sites within the Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC, due to the presence of survey vessels will not occur.

In context of the conservation objectives for the SAC, the presence of survey vessels will not affect the breeding, moulting and resting behaviour of seals and the population composition will not be affected due to the distance from the survey corridor to the site. While any individuals present which transit to the marine survey area, may be disturbed within the water by the survey and investigation activities, this disturbance effect will be temporary. There is a degree of background noise which grey seals will already be accustomed to; therefore, the proposed site survey and investigation works will not cause disturbance at a level which will adversely affect the grey seal population at the marine survey area and will not prevent grey seal from accessing suitable habitat.

Screening conclusion: No likely significant effect

5.11 Dynesfeydd Môr Hafren / Bristol Channel Approaches SAC

The marine survey route does not transit through this SAC but is approximately 183 km south east of the nearest marine survey route.

The Dynesfeydd Môr Hafren / Bristol Channel Approaches SAC covers an area of 5850 km^2 and is located within both Welsh and English waters. The site has been designated for its population of harbour porpoise and has been identified specifically as an area of winter importance for the species (October – March). It supports an estimated 4.7% of the UK Celtic and Irish Seas MU population (JNCC, 2023).

5.11.1 Conservation objectives

The conservation objectives with regard to harbour porpoise are 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 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:

- The species is a viable component of the site;
- There is no significant disturbance of the species; and,
- The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

5.11.2 Underwater sound changes

Appendix B concluded:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are therefore unlikely to disturb harbour porpoise.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including harbour porpoise.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

As a worst-case scenario it is possible that harbour porpoise could be disturbed by the SBP, vibrocore sampling and the presence of the vessel. Most sound energy generated by SBP will be directed towards the seabed and the pulse duration is very short with the survey constantly moving. A disturbance range of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. If a harbour porpoise were to find itself within the EDR of 5 km given for geophysical surveys (JNCC, 2020), it is calculated they would be able to move out of this EDR in less than 1 hour (Appendix B). As a result, the risk assessment concluded that the underwater noise generated by the marine survey would not be considered significant disturbance (as defined by JNCC (2010 and 2020)).

The Conservation Objectives and Advice on Operations published by the JNCC (2019) for the SAC suggest:

"Noise disturbance within the SAC from a plan/project individually or in combination is significant if it excludes harbour porpoises from more than

1. 20% of the relevant area of the site in any given day, and

2. An average of 10% of the relevant area of the site over a season."

The marine survey route does not transit through the SAC and the area of disturbance will move with the vessel, but as a worst-case the zone of disturbance has been calculated as 5 km. Due to the distance of the SAC from the survey route 20% noise disturbance of the relevant area will not occur as the zone of disturbance is 5 km and the SAC is located 183 km away (as the crow flies).

Due to the mobility of the species, individuals from the Bristol Channel Appoaches SAC could be present in the marine survey area. However, as discussed above individuals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. If a harbour porpoise were to find itself within the EDR of 5 km given for geophysical surveys (JNCC, 2020), it is calculated they would be able to move out of this EDR in less than 1 hour (Appendix B).

Screening conclusion: No likely significant effect.

5.12 Irish Sea Front SPA

The survey corridor transits through this SPA for approximately 6 km.

The Irish Sea SPA is known to regularly support a population of European importance for manx shearwater (*Puffinus puffinus*), which are likely to use the area as a foraging location during the breeding season. It is situated in the Irish Sea, approximately 35 km south-west of the Isle of Man and 36 km to the north-west of Anglesey and has an area of 180 km^2. The Irish Sea Front SPA is the UK's third-largest marine breeding manx shearwater assemblage (Kober et al., 2012). More than 12,000 manx shearwater may be present in the area, according to data from the European Seabirds at Sea (ESAS) database (ESAS, 2022).

5.12.1 Conservation objectives

To avoid significant deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long term and makes an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species. This contribution would be achieved through delivering the following objectives for each of the sites qualifying features:

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

5.12.2 Visual disturbance

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor. It is estimated that both survey vessels will be present in the site collectively for less than a week.

Manx shearwater score 1 for both disturbance susceptibility and habitat specialisation and therefore would not normally require further assessment (Joint SNBC Advice Note, 2017). However, as breeding manx shearwater is a qualifying feature of the Irish Sea Front SPA and the marine survey area is within the site it is considered further here.

During the breeding season (April to August) prior to dusk, adult manx shearwaters assemble in flocks or 'rafts' on the surface of the sea 1-10 km from the colony. When darkness falls, these 'rafting' birds, of up to 10,000 individuals in some locations, fly to their burrows to feed their chicks (McSorley et al. 2008).

The magnitude of the impact will depend on the degree of disturbance. The most disruptive activities are those that are sudden, noisy or fast. Vessels travelling at faster speeds cause a greater level of disturbance in terms of the proportion of birds flushing and at further distances (Bellefleur et al. 2009; Ronconi and St Clair 2002). Survey vessels will be slow moving, only between 100 – 300 m / hour, which is slower than walking speed (generally assumed to be 5 km / hour). 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). It is therefore concluded that any disturbance will be temporary and localised and will not result in any likely significant effects on manx shearwater.

Screening conclusion: No likely significant effect

5.13 Liverpool Bay SPA

The survey corridor transits through this SPA for approximately 19 km.

The Liverpool Bay/Bae Lerpwl SPA runs in a broad arc from Morecambe Bay to the east coast of Anglesey in the eastern Irish Sea, spanning northern England and north Wales. It is designated as an SPA for its waterbird assemblage, breeding little tern (*Sternula albifrons*), and common tern (*Sterna hirundo*), overwintering red-throated diver, little gull (*Hydrocoloeus minutus*), and common scoter. Its area is approximately 2,528 km^2.

The largest maritime little gull aggregation, the largest common scoter aggregation, and the third largest red-throated diver aggregation in the UK are all protected by the SPA as of the time of its extension in 2017.

A population estimate was produced for each species by calculating the mean of the highest counts from each year (mean of peak), over the most recent five years if data were available, as is standard practice defined by the Ramsar convention (Ramsar Convention Secretariat 2013). The estimated population of each species was then assessed against the UK SPA selection guideline thresholds (Stroud et al 2001) to determine whether any species occurred in numbers exceeding these thresholds (JNCC, 2016).

Little gull had a mean of peak population estimate of 333 individuals within Liverpool Bay/Bae Lerpwl area of search. The highest densities of little gull were consistently located offshore of Blackpool and the Ribble Estuary, close to the 12 nm line. The numbers of little gull recorded in Liverpool Bay/Bae Lerpwl were the second highest of all inshore areas of search around the UK.

Based on recent surveys, red-throated diver had a population estimate of 1,800, common scoter had an estimate of 141,801, little gull had an estimate of 319, common tern had an estimate of 180 breeding pairs, little tern had an estimate of 69 breeding pairs and the non-breeding waterbird assemblage contained an estimated 157,952 individuals (NE, NRW and JNCC, 2022).

5.13.1 Conservation objectives

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change; Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and
- The distribution of the qualifying features within the site.

5.13.2 Visual disturbance

The Joint SNCB Interim Displacement Advice Note (2022) categorises red-throated diver and common scoter as highly susceptible to disturbance with a high habitat specialisation (scores of 5 and 4 out of 5 respectively for both species). Little tern has a high habitat specialisation but low sensitivity to disturbance (scores of 4 and 2 out of 5, respectively). Common tern and little gull have not been categorised.

5.13.2.1 Vessel disturbance

Disturbance within the site boundary is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor. It is estimated that the geophysical survey vessel will be present within the site for approximately four days and the geotechnical vessel for five days.

Common scoter

Common scoters have a clustered distribution within Liverpool Bay SPA, with Colwyn Bay identified as one of three important areas for the species in the winter months due to its shallow water depth range. The species commonly use intertidal and subtidal sandy sediments for foraging. Non-breeding common scoters can be found around most of the coast of the UK, with concentrations around the Moray Firth, Firth of Forth, north-east England, East Anglia, Carmarthen Bay/Bae Caerfyrddin, Cardigan Bay/Bae Ceredigion, north Wales, and northwest England (Natural England, NRW and JNCC, 2022).

Common scoter have been classified as highly vulnerable to disturbance from vessel activity (Garthe and Hüppop, 2004), with flush distance in response to vessel disturbance is variable dependent on flock size. For a 35 m vessel, larger flocks were shown to flush at distances of between 1 – 2 km, whilst smaller flocks were observed to flush within 1 km of the vessel. Fishing vessels have been shown to not contribute to disturbance (Kaiser et al., 2006).

Whilst the exact vessels to be used for the survey are not yet known, it is expected that the survey vessels that will be used for the project will be between 15 - 60 m in length. As a result, it is likely that some birds will be disturbed due to the presence of the survey vessel. The survey will transit through the site at slow speed, stopping to collect samples at approximately 1 – 2 km intervals where the vessel will be stationary for a short period of time (a few hours maximum). Whilst common scoter have been shown to be sensitive to temporary habitat loss due to vessel disturbance, (Schwemmer et al., 2011), the transient and short-term nature of the survey mean any disturbance to common scoter will not be

prolonged, with all individuals expected to return to the site within a day once the survey has left the site.

Foraging ground within the proposed survey corridors will be temporarily unavailable for the duration of the survey, however, due to the anticipated abundance of prey in the region causing the high density of birds it is anticipated that any individuals affected will be able to find alternate foraging grounds within the SPA for the duration that the survey is present within the site. As a result, no likely significant effects are anticipated to this species.

Common tern

All terns are central place foragers leaving and returning to the breeding colony (the central place) on every foraging trip. The presence of the survey vessel within the site may cause visual disturbance. This may cause birds within the SPA to cease feeding or move away from the area, which may affect the energy requirements of the birds and influence individual fitness. The survey will quickly pass through the area during geophysical operations (average survey speed is approximately 3-3.5 knots [1.5-1.8 m/s]), while remaining stationary for up to an hour to collect any geotechnical or environmental samples.

Nesting activity may occur on the nearshore area just outside of the SPA boundary, where terrestrial and intertidal surveys are scheduled. These include geotechnical

Birds may take evasive action, but a single disturbance event does not have an immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time, and common tern are considered to have a low disturbance vulnerability index (Fleisbach et al., 2019). Some foraging grounds may be unavailable during the survey due to the presence of the vessel however the survey will only cover a small amount of the site in comparison to the available foraging area, meaning individuals will have access to other sites for the duration of the survey within the SPA. It is therefore not considered there will be a significant effect on common tern.

Little gull

Within the SPA, little gull have been shown to roost at sea with high densities consistently located offshore of the Blackpool and Ribble Estuary close to the 12 nm line (Allcock, O'Brien and Parsons, 2013). During periods of harsh weather individuals have been known to feed and seek shelter in adjacent English SPAs to the north of the Liverpool Bay SPA. Density estimates used to adjust the SPA boundary show that the survey corridor is not considered to be an important area for the species within the site, showing densities of below 0.07 birds per km^2 (Natural England, NRW and JNCC, 2016). Little gull also have a low disturbance vulnerability index score of 12 (the lowest in the assessment was 3.3 and the highest was 77.8) (Fleisbach et al., 2019).

Some foraging grounds may be unavailable during the survey due to the presence of the vessel, however the survey will only cover a small amount of the site in comparison to the available foraging area, meaning individuals will have access to the rest of the site for the duration of the survey within the SPA. If any individuals are disturbed, based on their low vulnerability to disturbance it is anticipated they would return to the area once the survey vessel has passed. Based upon this and the species' noted preference for the eastern section of the SPA, it is therefore not considered there will be a significant effect to little tern.

Little tern

All terns are central place foragers leaving and returning to the breeding colony (the central place) on every foraging trip. Woodward *et al.* (2019) estimate that the maximum foraging range of little tern alongshore is 5 km. The most-used breeding site for the species is the Dee Estuary, with foraging areas expanding west from the estuary (NE, NRW and JNCC, 2016). Given a distance of approximately 10 km

from the closest known important foraging site to the closest MaresConnect landfall option and the known preferences of the species (high habitat specialisation), it is considered unlikely that little tern will be breeding or foraging within the project area or within the 2 km zone of influence. Similarly, the species has a low susceptibility to disturbance, meaning they are anticipated to return quickly to the area if disturbed. If individuals are present in the vicinity of the survey corridor they may be disturbed, but as discussed previously regarding common tern, the temporary and transient nature of the survey will mean any disturbance is short-term and will only affect a small area of the site in comparison to the available foraging area. It is therefore not considered there will be a significant effect on common tern.

Red-throated diver

During the winter period, red-throated diver are entirely marine based and are unlikely to come ashore, so will therefore only be disturbed by vessel movements from the survey (underwater noise attenuating from VC sampling activity has been scoped out of the assessment due to the species strong aversion behaviour to vessel presence, meaning they will not be in range to cause a significant effect from any sampling activities). Whilst the Joint SNCB Interim Displacement Advice Note (2022) recommends a displacement radius of 10 km for the species regarding wind farm operation, it has been acknowledged that models suggest a displacement distance of 2 km for shipping may be appropriate (Natural England, NRW and JNCC, 2022). Due to the survey impacts on the species being more similar to shipping than the magnitude of a wind farm development, a displacement buffer of 2 km has been used.

It is well documented that red-throated diver are highly vulnerable to disturbance from a range of sources, including vessel movements (Fliessbach et al., 2019, Mendel et al., 2019, Schwemmer et al., 2011). The proposed marine survey corridors are located to the west of an area with previously recorded high numbers of individuals, with models informed by previous surveys showing some of the highest densities within the SPA off the coast of Abergale (Lawson et al., 2016; Natural England, NRW and JNCC, 2022).

In previous surveys, red-throated divers have been shown to exhibit disturbance behaviour more than 75% of the time when a ferry passes (Jarrett et al., 2021), but vessel speed has been shown to impact the length of time the disturbance lasts with faster vessels causing a slower return of individuals to the original location (Burger et al., 2019). Due to the slow movement of the survey vessel (average survey speed is approximately 3-3.5 knots [1.5-1.8 m/s]), it is anticipated that while any individuals present in the area are likely to be disturbed by the presence of the survey vessel, the disturbance will not be long-lasting, and birds will resettle to their original location once the vessel has continued along the survey corridor.

The majority of the length of the proposed survey routes within the SPA are located outside of the areas frequented by red-throated diver. The 2 km displacement buffer applied to the marine survey means that birds will still have large areas of the SPA available to forage for the short period of time the survey area is unavailable due to vessel presence. Similarly, the survey is transient and short-term meaning disturbance will be limited to a one-off event and is not considered to affect the long-term energetics or survival of the species. As a result, it is considered there will be no significant effect.

Screening conclusion: No likely significant effect

5.13.2.2 UAV disturbance

At the proposed landfall sites, topographic surveys will be conducted using either levels and reference points via RTK foot or vehicle traverses, laser-scanning and/or an aerial drone survey using photogrammetry techniques. Whilst the terrestrial area is outside of the SPA boundary, there could be the potential for designated species to be nesting within the vicinity of the survey area if an unmanned aerial vehicle (UAV) was selected to complete the survey. As a result, this activity has been

assessed against designated breeding species for the site – little tern, common tern and a waterbird assemblage.

The UAV will operate at a height of approximately 80 m altitude along pre-programmed parallel flight lines. Whilst the survey schedule is not yet available, it is predicted that the UAV flights would take no more than one week to complete at the selected landfall site.

UAVs can cause disturbance to seabirds, particularly ground nesting species during breeding season (Borrelle and Fletcher, 2017). Whilst little research focuses directly on the impacts that UAV surveys have on birds, it has been recorded that the altitude of the drone flight can affect the level of disturbance – during a survey of seabird colonies, at 10 m altitude most species showed signs of disturbance, whilst at 50 m altitude only one species was observed as exhibiting a detectable reaction (Weimerskirch *et al.* 2018). It has also been recorded that disturbed seabirds which left the area due to the presence of the UAV returned later once the UAV had gone (Mapes *et al* 2020). It is noted that seabird surveys are increasingly being conducted using UAVs due to a perceived reduction in disturbance compared to that of human researchers (Borrelle and Fletcher, 2017).

The planned height of the UAV survey should not disturb many species, however it is expected that any birds that are disturbed by the presence of the UAV will return to the site after the conclusion of the survey. UAV surveys have not been found to increase colony flight behaviour at waterbird nesting sites, however it has been found that sensitivity varies from species to species (Barr *et al.*, 2020). For example, shoveler have been found to display more active behaviours such as flushing during UAV flights, however during post-flight monitoring it was found that any shifts in behaviour were not sustained and individuals went back to pre-flight levels of activity. It has also been observed that common tern colonies have rapidly habituated to the use of a UAV during an aerial population survey with no evidence of sustained disturbance (Chabot et al., 2015). Similarly, any behavioural shifts were observed to be minimal and predicted to be unlikely in having major long-term effects on the fitness of bird species (Ryckmn *et al.*, 2022). UAV surveys were also found to cause less disturbance than ground or boat surveys to breeding avocets with no negative effects on nesting pairs (Valle and Scarton, 2020). Considering the evidence and the temporary nature of the proposed UAV survey, it is not anticipated that it will have a likely significant effect on any breeding bird species.

Screening conclusion: No likely significant effect

5.13.3 Above water noise

5.13.3.1 UAV noise

The use of a UAV for the topographic survey and the potential to drill boreholes at the selected landfall site may lead to above water noise disturbance to the designated bird species. The disturbance may lead to reduced time spent in the foraging or breeding area.

All designated species are considered sensitive to above water noise (Natural England, 2022). The disturbance effect of above water noise depends on several factors, including the duration and location of the activity in comparison to the receptor. The sensitivity of several species, including the red-throated diver, have been assessed as having the greatest sensitivity between 1 – 3 kHz, with a sharp reduction in sensitivity > 3 – 4 kHz (Hartley Anderson Limited, 2020). UAV sound is concentrated between 1.5 – 6 kHz (Duporge et al., 2021), meaning that over half of the range of emitted noise is beyond the sensitivity of the designated species of which hearing research is available.

Research has shown that sound levels 31.3 to 57.8 dB were recorded from a UAV flight during a bird survey, with sound levels decreasing the higher the altitude of the UAV (31.3 dB was recorded at 90 m) and the sound was typically lost amongst the background noise of animals, ocean waves and wind (Goebel et al., 2015).

Whilst the exact specifications of the UAV to be used for the survey are unknown, it is anticipated that due to the expected height of the proposed survey and its short duration (the survey is expected to take less than a week to complete, during which the UAV will only be operational at regular intervals) the noise of the survey will not exceed the usual background levels of the coastal area based on other anthropogenic (roads, recreational activities etc.) and natural (wind, waves etc.) sources. As a result, there will not be a likely significant effect on any of the designated species from the UAV survey.

5.13.3.2 Borehole drilling noise

Borehole drilling at the selected landfall within the marine survey corridor, whilst outside of the site boundary, has the potential to disturb the designated marine birds through the generation and attenuation of noise. Anthropogenic noise can be both continuous and impulsive. The borehole drilling activity is expected to take approximately one week per landfall selected for survey (up to a maximum of two landfalls).

Noise impacts on birds resulting in 'startling' range from 'minor fright', which may exhibit in increased agitation and a reduction in activity such as resting and feeding, to 'complete flight' which can lead to the spatial or temporal loss of access to resources, with the loss of feeding or resting places (RSK, 2011).

Jackson (2012) provides thresholds for a likely significant effect on bird populations as 70 decibels (dB) for continuous noise and 50 dB for impulsive noise, based on a review of relevant research and literature. These figures take into account more sensitive species reactions also.

For the proposed borehole drilling, the avoidance of 'complete flight' startling effects is desirable to ensure that the conservation objectives will not be hindered regarding the designated species of the Medway Estuary and Marshes SPA. The Wilson Report (HMSO, 1963) indicates that limited data suggests a noise level of approximately 85 dB 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).

A review of published research for the Environment Agency (EA), 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 (RSK, 2011).

There is a wealth of anecdotal evidence to suggest that birds readily habituate to noise and that noise is not a major factor in determining the suitability of a habitat. This is supported by ornithological monitoring of estuarine birds during construction activities in the Humber Estuary, undertaken by the Institute of Estuarine & Coastal Studies for the Environment Agency (RSK, 2011).

Providing the noise level is at a magnitude that is unlikely to startle and cause flight, the bird populations within the site are predicted to habituate to the borehole survey noise levels, with no significant effects.

Background noise sources which are likely to contribute noise levels at the landfall include the North Wales Expressway and the train line, both of which run parallel to the shore. To the south of the road, the Raynes Quarry is also located in close proximity to the site (approximately 400 m away). Noise outputs for the proposed borehole survey are not available, however, a noise assessment for a proposed borehole survey in the Ribble Estuary (RSK, 2011) provides noise data for a comparable survey. The noise output for the cable percussive rig had a sound pressure level (SPL) of 68 dB at 25 m. This information was used to model the impact of the drilling on the surrounding marsh environment, in this case a SSSI. The model results indicated that drilling boreholes on the marsh would result in a A-weighted (A) noise level of 55 dB(A) or greater, at a maximum radius of 93 m and 76 dB(A) occurred at approximately 10 – 11 m from the rig.

Considering the background noise present within close proximity to the SPA from the surrounding industry and the temporary nature of the borehole drilling it is likely that any birds present in the area will quickly habituate to the increased noise levels, which are predicted to be continuous rather than impulsive.

Whilst the schedule is not yet known for this project, it is anticipated that the intertidal and terrestrial boreholes will take approximately one week to complete. Given that noise levels attenuate away from the noise source the effects within the SPA are likely to be decreased with distance from these borehole locations.

The boreholes will take place outside of all site's boundaries so are not anticipated to disturb any nesting species within the footprint of the boreholes. However, as a precaution the area surrounding the borehole location will be checked for nests and activities will be halted if nest building occurs in the vicinity of the borehole location. As the noise from the activity may travel, as discussed previously it is believed all species will be habituated to the noise in the area and the survey will not cause any lasting additional disturbance.

Given the above discussion, it has been concluded that while low numbers of birds from the Liverpool Bay SPA may be present near the borehole works, any birds present in the area are likely to be habituated to the noise levels from existing nearby anthropogenic and if displaced can readily find other feeding grounds within the SPA. Therefore, there are no likely significant effects predicted.

Screening conclusion: No likely significant effect

5.14 Anglesey Terns / Morwenoliaid Ynys Môn SPA

The SPA is located approximately 3 km north of the nearest marine survey route.

Anglesey Terns / Morwenoliaid Ynys Môn SPA is located around the Isle of Anglesey, extending between 10 – 20 km offshore. The site contains lagoons, intertidal sediments (including sandflats and mudflats) islands, shingle bars, intertidal rock and sea inlets. The site supports the Irish Sea tern population as an important breeding habitat.

The site is designated for its breeding populations of four tern species - Arctic tern (*Sterna paradisae*), common tern, roseate tern (*Sterna dougallii*) and sandwich tern (*Sterna sandvicensis).* Based on data from between 1992 – 1997, the site supported 1290 breeding pairs of Arctic tern, 189 breeding pairs of common tern, 3 breeding pairs of roseate tern and 460 breeding pairs of sandwich tern.

5.14.1 Conservation objectives

The vision for these features is for them to be in a favourable conservation status, where all the following conditions are satisfied:

- The number of breeding terns within the SPA is stable or increasing.
- The number of chicks successfully fledged in the SPA and beyond is sufficient to help sustain the population.
- The range and distribution of terns within the SPA and beyond is not constrained or hindered.
- The extent of supporting habitats used by terns is stable or increasing.
- Supporting habitats are of sufficient quality to support the requirements of terns.
- There are appropriate and sufficient food sources for terns within access of the SPA.
- Actions or events likely to impinge on the sustainability of the population are under control.

5.14.2 Visual disturbance

All terns are central place foragers leaving and returning to the breeding colony (the central place) on every foraging trip. Whilst the survey does not pass through the site boundary, it is possible that any of the four tern species could be foraging within the marine survey corridor and be disturbed by the presence of the survey vessel.

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The Joint SNBC Displacement Advice Note (2022) lists Arctic, sandwich and roseate terns as having the same level of disturbance susceptibility (2 out of 5) and habitat specialisation (3 out of 5). Common tern have not been classified, however they have been assessed in other studies as having a low disturbance vulnerability index (Fleisbach et al., 2019). The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor. Whilst areas of the survey corridor may be unavailable as the vessel continues along it (the 2 km ZOI will travel with the vessel), it is expected that any individuals will be able to find alternative areas to forage within the surrounding areas. Due to the temporary and transient nature of the survey and the low susceptibility of all species to disturbance, it is considered there will not be any likely significant effects.

Screening conclusion: No likely significant effect

5.15 Ynys Seiriol / Puffin Island SPA

The SPA is located approximately 10 km south-west of the nearest marine survey route.

Ynys Seiriol / Puffin Island SPA is located off the eastern tip of the Isle of Anglesey and consists of a Carboniferous limescale block with steep cliffs on all sides. Guano-enriched soil covers most of the limestone surface, leading to widespread dense coverage of grasses and plants, whilst the sea cliffs support typical maritime flora. The SPA has been designated for its breeding population of cormorant (*Phalacrocorax carbo*), of which the site supported 556 breeding pairs (1.35% of the NW European (Atlantic) population at the time of designation) (CCW, 2008). The site covers an area of 0.32 km^2.

5.15.1 Conservation Objectives

The conservation objective for the Cormorant is to achieve and maintain favourable conservation status, in which all the following conditions are satisfied:

- The number of breeding cormorants within the SPA are stable or increasing.
- The abundance and distribution of prey species are sufficient to support this number of breeding pairs and for successful breeding.
- The management and control of activities or operations likely to adversely affect the Cormorants, is appropriate for maintaining the feature in favourable condition and is secure in the long term.

5.15.2 Visual disturbance

As the survey will take place 10 km from the SPA, it is not envisaged that any nesting activities will be disturbed by the works. There is the potential that individuals could be foraging within the survey area during the breeding season as cormorants have a mean maximum foraging distance of 25.6 km (Woodward et al., 2019), particularly as it is noted that breeding birds from the site forage in the surrounding waters (CCW, 2008).

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the

survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor.

Any foraging grounds used by cormorants which fall within the survey area will be temporarily unavailable as the survey vessel transits, however the range of their potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey. Similarly, as cormorants are considered opportunistic foragers who do not target particular species of fish they tend to feed on whatever is the most abundant fish they can find (van Eerden et al., 2012). This further supports the expectation that birds will find alternate foraging grounds for the duration of survey activities in the area.

Screening conclusion: No likely significant effect

5.16 The Dee Estuary SPA

The SPA is located approximately 15 km east of the nearest marine survey route.

The Dee Estuary SPA is a cross-boundary site situated on the English/Welsh border and consists of the largest macro-tidal coastal plain estuary between the Severn estuary and Solway Firth. The intertidal area is dominated by mudflats and sandflats, with saltmarsh present in the remaining areas. The mix of sandy and muddy sediments provides suitable habitats for a range of marine worms, molluscs and other invertebrates, which in turn provide an abundant food source for fish and waterbirds within the site. The site covers an area of 142.92 km^2.

The site is designated for breeding common tern and little tern; on passage sandwich tern and redshank (*Tringa tetanus*); and over-wintering bar-tailed godwit (*Limosa lapponica*), black-tailed godwit (*Limosa limosa islandica*), curlew (*Numenius arquata*), dunlin (*Calidris alpina*), grey plover (*Pluvialis squatarola*), knot (*Calidris canutus islandica*), oystercatcher (*Haematopus ostralegus*), pintail (*Anas acuta*), redshank, shelduck (*Tadorna tadorna*) and teal (*Anas crecca*). The site also supports an overwintering waterfowl assemblage consisting of 120,726 individuals based on a five-year mean peak (National Assembly for Wales, 2009).

5.16.1 Conservation Objectives

The conservation objectives of this site are to maintain all qualifying features in a favourable condition.

5.16.2 Visual disturbance

Only common tern and sandwich tern have been screened into the assessment. Little tern have been screened out as all proposed survey routes are outside of the species' mean maximum foraging range of 5 km (Woodward et al., 2019). All other qualifying species are wading birds and are therefore unlikely to be disturbed by activities taking place more than 2 km from the site.

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor.

It is possible that during the breeding season both tern species may be foraging within the proposed survey corridor. However, these species forage over a large area (30 km for common term and 80 km for sandwich tern (Woodward et al., 2019)) therefore the range of their potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced birds will move to forage in another suitable area. Similarly, both tern species have been

ranked as having low disturbance vulnerability indexes to disturbance from vessel traffic, calculated through categories including escaping distances when disturbed and habitat use flexibility (Fliessbach et al., 2019). It is therefore expected that due to the temporary and transient nature of the survey it will not have a significant effect on either species.

Screening conclusion: No likely significant effect

5.17 Ribble and Alt Estuaries SPA

The SPA is located approximately 40.3 km north-east of the nearest marine survey route.

The Ribble and Alt Estuaries SPA is composed of extensive intertidal mud and sandflats and large areas of saltmarsh. The site encompasses an area of 124.12 km^2.

The inner flats of the Ribble Estuary are flanked by very large areas of saltmarsh. The outer flats of the Ribble Estuary are sandy. They run south as a wide sandy shore along the Sefton Coast, England, merging into the Alt Estuary and extending as far south as Crosby. There is a large area of developing saltmarsh at Southport extending north. The intertidal sandflats on the Sefton Coast are extensive and have the highest exposure to wave action. The central flats of the Alt Estuary are also sandy but with a higher mud content, and a small saltmarsh on the east bank of the channel.

The large areas of intertidal sand and mudflats are submerged at high tide and exposed in the estuaries at low tide. They provide an important feeding habitat for birds. The estuary also provides extensive roosting sites for large populations of waterbirds. It is of major importance during the winter for duck and wader species and for supporting wader populations moving along the west coast of Britain during the spring and autumn migration periods (Natural England, 2017).

The SPA has been designated for breeding ruff (Calidris pugnax), common tern and lesser black-backed gull (Larus fuscus); and non-breeding bar-tailed godwit, Bewick's swan (*Cygnus columbianus bewickii*), black-tailed godwit, dunlin, golden plover (*Pluvialis apricaria*), grey plover, knot, oystercatcher, pink-footed goose (*Anser brachyrhynchus*), pintail, redshank, ringed plover (*Charadrius hiaticula*), sanderling (*Calidris alba*), shelduck, teal, whooper swan (*Cygnus cygnus*) and wigeon (*Mareca penelope*). The site is also designated for a breeding seabird assemblage and a non-breeding waterbird assemblage.

5.17.1 Conservation Objectives

The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- the extent and distribution of the habitats of the qualifying features;
- the structure and function of the habitats of the qualifying features;
- the supporting processes on which the habitats of the qualifying features rely;
- the populations of each of the qualifying features; and
- the distribution of qualifying features within the site.

5.17.2 Visual disturbance

The only species screened into the assessment was lesser black-backed gull due to its large foraging range of 127 km as a mean maximum value (Woodward et al., 2019). All other species are either wading species and unlikely to be affected by activities conducted more than 2 km from the site, or have a foraging range smaller than the distance from the closest proposed survey corridor to the site.

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor. Additionally, the Joint SNCB Interim Displacement Advice Note (2022) categorises the lesser black-backed gull as having a low susceptibility to disturbance and a low habitat specialisation level (scores of 2 and 1 out of a possible 5 respectively).

It is possible that during the breeding season lesser black-backed gull may be foraging within the proposed survey corridor. However, the range of their potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect

5.18 Carlingford Lough SPA/Ramsar

The SPA is located approximately 42.6 km north of the nearest marine survey route.

Carlingford Lough SPA lies between Killowen Point and Soldiers Point on the northern shores of Carlingford Lough, Northern Ireland. The site encompasses mostly intertidal habitat, with two islands, coastal saltmarsh and wet grasslands also present. The marine section of the site includes areas of open water within the Lough itself and in the area of the Lough mouth seawards to the limits of territorial waters as well as coastal waters northwards to the Bloody Bridge area on the Mournes Coast. Carlingford Lough lies along the Northern Ireland/Ireland border and as a separate SPA designation in Irish waters. The site covers an area of 8.27 km^2 and has the same boundary as the Ramsar site.

The site is designated for breeding sandwich tern and common tern, which supports populations of 650 and 509 respectively based on a five-year mean from 1995-2000. The site is also designated for its population of wintering light-bellied brent goose, which stands at 254 individuals (DOE, 2015). The Ramsar site is designated for the same species.

5.18.1 Conservation Objectives

The conservation objectives for this site are to maintain each feature in favourable condition.

5.18.2 Visual disturbance

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor.

The proposed survey corridor is outside of the foraging range of both tern species (Woodward et al., 2019), but is within the foraging range of light-bellied brent goose (a mean range of 53 km) (Clausen et al., 2013). The species forage within eelgrass beds as well as saltmarsh ecosystems and agricultural land. Due to the shallow depths that eelgrass grows at, it is not believed many individuals will interact with the survey area as it is not operating in the coastal waters surrounding the SPA. However, if any individuals are foraging within the survey area, it is expected that they will be able to find other suitable areas for foraging due to the small (2 km) area of influence of the marine survey.

Screening conclusion: No likely significant effect

5.19 Morecambe Bay and Duddon Estuary SPA

The SPA is located approximately 74 km north-east of the nearest marine survey route.

The Morecambe Bay and Duddon Estuary SPA is situated along the coast of northern Lancashire and southern Cumbria and includes the second largest embayment in Britain, after the Wash in Norfolk. The protected area represents the largest continuous area of intertidal mudflats and sandflats in the UK. The site includes several major estuaries where the river Wyre, Lune, Kent, Leven and Duddon enter the Irish Sea. In wave sheltered and estuarine areas the intertidal sediment transitions into large and extensive areas of saltmarsh and pioneer saltmarsh which form an important roosting habitat for many bird species. At high tide the birds then congregate at roost sites on the shore, and very large numbers of birds can be concentrated along the shore at a very limited number of locations. The site covers an area of 668.99 km^2.

The protected site comprises areas for breeding seabirds, foraging breeding seabirds, non-breeding seabirds and waterbirds utilising a range of habitats. The original features of the two SPAs are retained, with the addition of newly qualifying species. There are currently 27 features including two designated assemblages; in the breeding season the area regularly supports nearly 62,000 individual sea birds and in the winter it regularly supports over 210,000 individual waterfowl (Liley et al., 2015).

The site is designated for its populations of breeding common tern, herring gull, lesser black-backed gull, little tern and sandwich tern; and its populations of non-breeding bar-tailed godwit, black-tailed godwit, curlew, dunlin, golden plover, grey plover, knot, lesser black-backed gull, little egret, Mediterranean gull, oystercatcher, pink-footed goose, pintail, redshank, ringed plover, ruff, sanderling, shelduck, turnstone and whooper swan.

5.19.1 Conservation objectives

The conservation objectives of this site are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and,
- The distribution of the qualifying features within the site

5.19.2 Visual disturbance

The lesser black-beaked gull (*Larus fuscus*) is the only designated species screened into the assessment as the proposed cable corridors are within the species mean maximum foraging range of 127 km (Woodward et al., 2019).

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor. Additionally, the Joint SNCB Interim Displacement Advice Note (2022) categorises the lesser black-backed gull as having a low susceptibility to disturbance and a low habitat specialisation level (scores of 2 and 1 out of a possible 5 respectively).

Due to their large foraging range, it is consequently possible that during the breeding season lesser black-backed gull may be foraging within the proposed survey corridor. However, the range of their potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect

5.20 Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA

The SPA is located approximately 79 km north-east of the nearest marine survey route.

The site lies at the very southwestern tip of the Lleyn Peninsula, almost surrounded by the Irish Sea, and exposed to the prevailing winds and weather systems. Its habitats are necessarily influenced by its location, geology and the climate, and the coastal area supports some of the best remaining examples of coastal and maritime heaths and grasslands on the Lleyn, while areas further inland supporting more agriculturally improved areas. The site includes three islands, Ynys Enlli and two small islands known as Ynysoedd y Gwylanod. The site encompasses an area of 5.12 km^2.

The site is designated for its breeding and wintering population of chough (*Pyrrhocorax pyrrhocorax*) (24 individuals as of the late 1990s) and its breeding population of Manx shearwater (6930 pairs as of 1996) (NRW, 2014).

5.20.1 Conservation objectives

The conservation objectives for this site are organised by designated feature:

The vision for chough is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The breeding population of chough is at least 14 pairs, or 5% of the GB population.
- The wintering population of chough is at least 28 individuals, or 5% of the GB population.
- Sufficient suitable habitat is present to support the populations.
- Breeding population is stable or increasing.
- Productivity is stable.
- Non-breeding flocks are stable or increasing (summer and winter).
- Breeding and non-breeding birds use Ynys Enlli for feeding throughout the year.
- Chough feeding habitats are themselves in a favourable conservation status and that the specified and operational limits and grazing prescriptions for these habitats incorporate chough feeding requirements (i.e. sward height and bare ground).
- Disturbance of breeding and feeding chough is minimal.
- The factors affecting the feature are under control

The vision for this Manx shearwater is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Breeding population of Manx shearwater (confined to Ynys Enlli) is stable or increasing.
- Reproductive rates remain stable.
- Deaths from the lighthouse attractions, fencing and other infrastructure are minimal.

- No ground predators are introduced.
- Nesting birds are not disturbed by restoration works on boundary walls or recreational activities.
- All factors affecting the achievement of these conditions are under control

5.20.2 Visual disturbance

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor.

The Manx shearwater have a mean foraging range of 1346 km (Woodward et al., 2019), therefore, have been screened into the assessment based on the possibility individuals could be foraging within the proposed survey corridor. Choughs utilise coastal cliff foraging areas so will not be found in the proposed survey corridor.

It is consequently possible that during the breeding season lesser black-backed gull may be foraging within the proposed survey corridor. However, the range of their potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

The Joint SNCB Interim Displacement Advice Note (2022) categorises the Manx shearwater as not susceptible to disturbance with a low habitat specialisation (scores of 1 and 1 out of 5 respectively).

The magnitude of the impact will depend on the degree of disturbance. The most disruptive activities are those that are sudden, noisy or fast. 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 (Bellefleur et al. 2009; Ronconi and St Clair 2002). Survey vessels will be slow moving, with a maximum speed of 4 knots. 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 concluded that any disturbance will be temporary and localised and will not result in any likely significant effects on manx shearwater.

Screening conclusion: No likely significant effect

5.21 Bowland Fells SPA

The SPA is located approximately 91 km north-east of the nearest marine survey route.

The Bowland Fells SPA is an outlier of the Pennine Range encompassing the main upland block within the area of Lancashire known as the Forest of Bowland. The large-scale sweeping landscape of the area characterises the Bowland Fells National Character Area (NCA) within which most of the SPA sits with small areas in the Bowland Fringe and Pendle Hill NCA. Its area is approximately 160 km^2.

The rock underlying Bowland Fells is Millstone Grit beneath which lies Carboniferous Limestone. The extensive upland fells support the largest expanse of heather moorland in Lancashire. Dry upland heath dominated by heather and bilberry is found on the steeper slopes and valleys, while the extensive peat soils are characterised by blanket bog vegetation with sphagnum moss, cotton-grasses and heather and including rare plants such as bog rosemary. These provide habitat for a diverse upland breeding bird community, most notably scarce birds of prey such as hen harrier (largest aggregate in

the UK – 62%), merlin and peregrine, wading birds such as curlew and small upland passerine birds such as wheatear and ring ouzel.

The SPA has 3 breeding pairs of hen harrier as of 2018 (RSPB) with a five year mean of 1.4 breeding pairs from 2014-2018. The SPA was designated for holding 21 pairs of merlin, which in 1993 (time of designation) was 3.2% of the national population. As of 2018, the SPA holds 8-12 pairs of breeding merlin. The site is also designated for the breeding population of lesser black-backed gull, with a population of 11470 individuals (JNCC, 2015a), making the site one of the species' largest breeding colonies in England (Natural England, 2019).

5.21.1 Conservation objectives

The conservation objectives of this site are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and,
- The distribution of the qualifying features within the site

5.21.2 Visual disturbance

The lesser black-beaked gull (*Larus fuscus*) is the only designated species screened into the assessment as the proposed cable corridors are within the species mean maximum foraging range of 127 km (Woodward et al., 2019).

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity. The proposed survey will be a one-off event over a short period of time with the vessel moving along the survey corridor. Additionally, the Joint SNCB Interim Displacement Advice Note (2022) categorises the lesser black-backed gull as having a low susceptibility to disturbance and a low habitat specialisation level (scores of 2 and 1 out of a possible 5 respectively).

Due to their large foraging range, it is consequently possible that during the breeding season lesser black-backed gull may be foraging within the proposed survey corridor. However, the range of their potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect

5.22 Rockabill to Dalkey Island SAC

The SAC is located approximately 45 km west of the nearest marine survey route.

The Rockabill to Dalkey Island SAC includes a range of dynamic inshore and coastal waters in the western Irish Sea. These include sandy and muddy seabed, reefs, sandbanks and islands. This site extends southwards, in a strip approximately 7 km wide and 40 km in length, from Rockabill, running adjacent to Howth Head, and crosses Dublin Bay to Frazer Bank in south Co. Dublin. The site

encompasses Dalkey, Muglins and Rockabill islands. The site is designated for Annex I reefs and its population of reefs and harbour porpoise.

The area selected for designation represents a key habitat for the Annex II species Harbour Porpoise within the Irish Sea. Population survey data show that porpoise occurrence within the site boundary meets suitable reference values for other designated sites in Ireland. The species occurs year-round within the site and comparatively high group sizes have been recorded. Porpoises with young are observed at favourable, typical reference values for the species. Casual and effort-related sighting rates from coastal observation stations are significant for the east coast of Ireland and the latter appear to be relatively stable across all seasons. The selected site contains a wide array of habitats believed to be important for harbour porpoise including inshore shallow sand and mudbanks and rocky reefs scoured by strong current flow (DAHG, 2014a).

5.22.1 Conservation objectives

- To maintain the favourable conservation condition of Reefs within the site.
- To maintain the favourable conservation condition of Harbour porpoise within the site.

5.22.2 Underwater sound changes

The site has been screened into the assessment based on the possibility that harbour porpoise may be present in the survey area due to the location of the SAC in the same MU as the project area.

Appendix B concluded:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are therefore unlikely to disturb harbour porpoise.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including harbour porpoise.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

As a worst-case scenario it is possible that harbour porpoise could be disturbed by the SBP, vibrocore sampling and the presence of the vessel. Most sound energy generated by SBP will be directed towards the seabed and the pulse duration is very short with the survey constantly moving. A disturbance range of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. The marine survey route does not transit through the SAC and the area of disturbance will move with the vessel, but as a worst-case the zone of disturbance has been calculated as 5 km. Due to the mobility of the species, individuals from the Rockabill to Dalkey Islands SAC could be present in the marine survey area. However, as discussed above individuals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment.

Screening conclusion: No likely significant effect.

5.23 Lambay Island SAC

The SAC is located approximately 47 km west of the nearest marine survey route.

The Lambay Island SAC is an inhabited island lying 4 km off Portrane on the north Co. Dublin coast. The island rises to 127 m and is surrounded by steep cliffs on the north, east and south slopes. The site is located in the same area as the Lambay Island SPA (Section 5.21) but covers a smaller area of 4 km. The site is designated for Annex I reefs and vegetated sea cliffs, and its populations of grey seal and harbour seal. Much of the western third of the island is intensively farmed and built up. The rest of the island is a mixture of less intensively grazed land, rocky outcrops, patches of Bracken (*Pteridium aquilinum*) and Bramble (*Rubus fruticosus agg*.), and cliff slopes with typical maritime vegetation. Lambay Island is also flanked by extensive areas of reef habitat in both the intertidal and subtidal zones.

Lambay Island supports the principal breeding colony of grey seal on the east coast of Ireland, numbering 196-252 seals, across all ages. It also contains regionally significant numbers of harbour seal, of which up to 47 individuals have been counted at the site. Both species occur year-round and the island's intertidal shorelines, coves and caves are used by resting and moulting seals (DAHG, 2014b).

5.23.1 Conservation objectives

- To maintain the favourable conservation condition of Reefs within the site.
- To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts within the site.
- To maintain the favourable conservation condition of Grey seal within the site
- To maintain the favourable conservation condition of Harbour seal within the site.

5.23.2 Underwater sound changes

The site has been screened into the assessment based on the possibility that grey seal and harbour seal may be present in the survey area based on their foraging ranges, of which the project area is located within for both species at this site.

Appendix B concluded:

Appendix B concluded:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are therefore unlikely to disturb harbour porpoise.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including harbour porpoise.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

As a worst-case scenario it is possible that harbour porpoise could be disturbed by the SBP, vibrocore sampling and the presence of the vessel. Most sound energy generated by SBP will be directed towards the seabed and the pulse duration is very short with the survey constantly moving. A disturbance range of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. The marine survey route does not transit through the SAC and the area of disturbance will move with the vessel, but as a worst-case the zone of disturbance has been calculated as 5 km. Due

to the mobility of the species, individuals from the Lambay Island SAC could be present in the marine survey area. However, as discussed above individuals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment.

Screening conclusion: No likely significant effect.

5.24 Lambay Island SPA

The SPA is located approximately 47 km west of the nearest marine survey route.

The site is located in the same area as the Lambay Island SAC (Section 5.20) but covers a larger area of 6 km. The island contains habitats such as cobble storm beaches, sandflats, rocky shore and vegetated sea cliffs.

The site is designated for its populations of fulmar (*Fulmarus glacialis*), cormorant (*Phalacrocorax carbo*), shag (*Phalacrocorax aristotelis*), greylag goose (*Anser anser*), lesser black-backed gull (*Larus fuscus*), herring gull (*Larus argentatus*), kittiwake (*Rissa tridactyla*), guillemot (*Uria aalge*), razorbill (*Alca torda*) and puffin (*Fratercula arctica*). The site is also of special conservation interest for holding and assemblage of over 20,000 breeding seabirds.

12 species of seabird breed regularly on the island. A survey in 2004 recorded breeding cormorant (352 pairs), shag (1,734 pairs), guillemot (38,999 pairs), fulmar (727 pairs), lesser black-backed gull (133 pairs), herring gull (311 pairs), kittiwake (3,947 pairs), razorbill (3,805 pairs) and puffin (209 pairs). the island's populations of cormorant, shag, herring gull and guillemot are the largest in Ireland. In winter, Lambay Island supports nationally important populations of greylag goose (311) and herring gull (2,400) – figures are the five year mean peak for the winters 1995/96-1999/2000 (NPWS, 2011b).

5.24.1 Conservation objectives

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

5.24.2 Visual disturbance

Of the bird species listed in the site designation, there are seven species that may potentially forage in the marine survey corridor (Woodward *et al*. 2019): fulmar (mean maximum foraging range of 542 km), lesser black-backed gull (mean maximum foraging range of 147 km), herring gull (mean maximum foraging range of 58.8 km), kittiwake (mean maximum foraging range of 156 km), guillemot (mean maximum foraging range of 73.2 km), razorbill (mean maximum foraging range of 88.7 km) and puffin (mean maximum foraging range of 137.1 km). However, the range of all species' potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect.

5.25 Skerries Islands SPA

The SPA is located approximately 52 km west of the nearest marine survey route.

The Skerries Islands are a group of three small uninhabited islands, Shenick's Island, St Patrick's Island and Colt Island, situated between 0.5 km and 1.5 km off the north Co. Dublin coast. Skerries Islands SPA comprises the three islands and the seas surrounding them, to a distance of 200 m from the shore. The site is designated for its populations of cormorant, shag, light-bellied brent goose (*Branta bernicla*), purple sandpiper (*Calidris maritima*), turnstone (*Arenaria interpres*) and herring gull.

A survey in 1999 recorded an internationally important population of breeding cormorant (558 pairs) and nationally important populations of shag (100 pairs) and herring gull (300 pairs) within the site. In winter (mean peaks for the five-year period 1995/96- 1999/2000) the islands support an internationally important population of light-bellied brent goose (242) and nationally important populations of cormorant (391), purple sandpiper (46), turnstone (242) and herring gull (560) (NPWS 2009).

5.25.1 Conservation objectives

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

5.25.2 Visual disturbance

Of the bird species listed in the site designation, herring gull may potentially forage in the marine survey corridor based on their mean maximum foraging range of 58.8 km (Woodward *et al*. 2019). However, the range of herring gull's potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect.

5.26 Ireland's Eye SPA

The SPA is located approximately 54 km west of the nearest marine survey route.

Ireland's Eye is an uninhabited island located about 1.5 km north of Howth in Co. Dublin. The site encompasses Ireland's Eye, Rowan Rocks, Thulla, Thulla Rocks, Carrageen Bay and a seaward extension of 200 m in the west and 500m to the north and east. The site is designated for its nationally important breeding populations of cormorant, herring gull, kittiwake, guillemot and razorbill.

In 2001, a census of the site recorded population sizes of cormorant (438 pairs), kittiwake (1,024 pairs), guillemot (1,975 pairs) and razorbill (460 pairs), whilst a 1999 survey recorded 246 pairs of herring gull (NPWS, 2011a).

5.26.1 Conservation objectives

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

5.26.2 Visual disturbance

Of the bird species listed in the site designation, there are four species that may potentially forage in the marine survey corridor (Woodward *et al*. 2019): herring gull (mean maximum foraging range of 58.8 km), kittiwake (mean maximum foraging range of 156 km), guillemot (mean maximum foraging range of 73.2 km) and razorbill (mean maximum foraging range of 88.7 km). However, the range of all species' potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect.

5.27 Howth Head Coast SPA

The SPA is located approximately 54 km west of the nearest marine survey route.

Howth Head is a rocky headland situated on the northern side of Dublin Bay. The site comprises the sea cliffs extending from just east of the Nose of Howth to the tip of the Bailey Lighthouse peninsula.

The marine area to a distance of 500 m from the cliff base is included within the site. The cliffs vary from between about 60 m and 90 m in height, and in places comprise fairly sheer, exposed rock face. The site is designated for its nationally important breeding population of kittiwake (2269 pairs recorded in a 1999 survey of the site) (NPWS, 2011c).

5.27.1 Conservation objectives

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

5.27.2 Visual disturbance

Kittiwake may potentially forage in the marine survey corridor based on their mean maximum foraging range of 156 km (Woodward *et al*. 2019). However, the range of the species' potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is therefore expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect.

5.28 Wicklow Head SPA

The SPA is located approximately 81 km south-west of the nearest marine survey route.

Wicklow Head is a rocky headland with extensive exposures of mica-schist. It is situated approximately 3 kilometres south of Wicklow town. The site comprises the cliffs and cliff-top vegetation, as well as some heath vegetation. The marine area to a distance of 500 m from the base of the cliffs is included in the site. The site is designated for its nationally important population of kittiwake, of which 956 breeding pairs were recorded in a 2002 survey (NPWS, 2012b).

5.28.1 Conservation objectives

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

5.28.2 Visual disturbance

Kittiwake may potentially forage in the marine survey corridor based on their mean maximum foraging range of 156 km (Woodward *et al*. 2019). However, the range of the species' potential foraging grounds is large in comparison to the relatively narrow 2 km zone of influence. It is, therefore, expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect.

5.29 Poulaphouca Reservoir SPA

The SPA is located approximately 90 km south-west of the nearest marine survey route.

Poulaphouca Reservoir SPA, located in the western foothills of the Wicklow Mountains, was created in 1944 by damming of the River Liffey for the purpose of generating electricity from hydropower. The reservoir covers an area of approximately 20 km^2 and is the largest inland water body in the mid-east and south-east region of Ireland. Underlying the reservoir are sands and gravels deposited during the last glaciation, whilst the shores of the lake are mostly sandy. When water levels are low the exposed lake muds are colonised by an ephemeral flora of annual plant species.

The site is designated for its nationally important population of greylag goose (a mean peak of 701 individuals was recorded during the five seasons 1995/96 to 1999/2000) and lesser black-backed gull (651 individuals recorded during the same period) (NPWS, 2014a).

5.29.1 Conservation objectives

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

5.29.2 Visual disturbance

Lesser black-backed gull may potentially forage in the marine survey corridor based on their mean maximum foraging range of 147 km (Woodward *et al*. 2019). However, the range of the species' potential foraging grounds is large in comparison to the relatively narrow 2 km ZoI. It is, therefore, expected that displaced individuals will be able to find other suitable areas for foraging and will not be significantly affected by the proposed marine survey.

Screening conclusion: No likely significant effect.

5.30 Additional harbour porpoise SACs screened in

Based on updated screening advice received from NRW, all SACs with harbour porpoise listed as a qualifying feature should be screened into the assessment. As a result, the SACs listed in Table 5-3will be assessed. The decision has been made to assess them together as they are all located more than 100 km from the survey operations, and are all considered of equal importance to harbour porpoise populations within the Celtic and Irish Seas MU (although this varies based on time of year) (NRW, 2023b).

5.30.1 Sites screened into the assessment

Table 5-3 Harbour porpoise SACs located within the Celtic and Irish Seas MU not already assessed

Site Name	County	Conservation objectives
Blasket Islands SAC	ROI	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.
Roaringwater Bay and Islands SAC	ROI	
Nord Bretagne DH SAC	France	
Ouessant-Molène SAC	France	
Mers Celtiques - Talus du golfe de Gascogne SAC	France	
Chaussée de Sein SAC	France	
Abers - Cote des legendes SAC	France	
Baie de Morlaix SAC	France	
Tregor Goelo SAC	France	
Cote de Granit rose-Sept-Iles SAC	France	

5.30.2 Underwater sound changes

Appendix B concluded:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and are therefore unlikely to disturb harbour porpoise.

- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including harbour porpoise.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

As a worst-case scenario it is possible that harbour porpoise could be disturbed by the SBP, vibrocore sampling and the presence of the vessel. Most sound energy generated by SBP will be directed towards the seabed and the pulse duration is very short with the survey constantly moving. A disturbance range of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. If a harbour porpoise were to find itself within the EDR of 5 km given for geophysical surveys (JNCC, 2020), it is calculated they would be able to move out of this EDR in less than 1 hour (Appendix B). As a result, the risk assessment concluded that the underwater noise generated by the marine survey would not be considered significant disturbance (as defined by JNCC (2010 and 2020)).

Screening conclusion: No likely significant effect.

5.31 Additional grey seal SACs screened in

Based on updated screening advice received from NRW, all SACs with grey seal listed as a qualifying feature should be screened into the assessment. As a result, the SACs listed in Table 5-4 will be assessed. The decision has been made to assess them together as they are all located more than 100 km from the survey operations, and the sites are functionally linked with the same population of grey seal travelling throughout the OSPAR Region III MU (NRW, 2023b).

5.31.1 Sites screened into the assessment

Table 5-4 Harbour porpoise SACs located within the Celtic and Irish Seas MU not already assessed

Site Name	Country	Conservation objectives
Saltee Islands SAC	ROI	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.
Lundy SAC	UK	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving FCS of its Qualifying Features, by maintaining or restoring: ▪ The extent and distribution of qualifying natural habitats and habitats of qualifying species ▪ The structure and function (including typical species) of qualifying natural habitats ▪ The structure and function of the habitats of qualifying species ▪ The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely ▪ The populations of qualifying species, and, ▪ The distribution of qualifying species within the site
Isles of Scilly Complex SAC	UK	
Ouessant-Molène SAC	France	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.
Chaussée de Sein SAC	France	
Roaringwater Bay and Islands SAC	ROI	
Blasket Islands SAC	ROI	
Slyne Head Islands SAC	ROI	
Inishbofin and Inishshark SAC	ROI	
Duvillaun Islands SAC	ROI	
Inishkea Islands SAC	ROI	
Slieve Tooey/Tormore Island/Loughros Beg Bay SAC	ROI	
Horn Head and Rinclevan SAC	ROI	
The Maidens SAC	UK	To maintain (or restore where appropriate) the qualifying features to favourable condition.

Treshnish Isles SAC	UK	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and ▪ To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site; ▪ Distribution of the species within site; ▪ Distribution and extent of habitats supporting the species; ▪ Structure, function and supporting processes of habitats supporting the species; and ▪ No significant disturbance of the species.
Monach Islands SAC	UK	
North Rona SAC	UK	

5.31.2 Underwater sound changes

Appendix B concluded that:

- Multi-beam echosounders, and SSS both operate at frequencies that fall outside the hearing range of many cetaceans and pinnipeds and are therefore unlikely to disturb grey seal.
- SBP operate at lower frequencies than multi-beam echosounder and side scan sonar and therefore can be heard by cetaceans and pinnipeds. However, due to equipment design signal intensity reduces quickly away from the source. However, as per the EDR previously discussed for geophysical survey disturbance may occur up to 5 km radial distance from the sub-bottom profiler as a worst-case scenario.
- Vibrocore sampling may cause disturbance in proximity to the vessel, however exact ranges for disturbance are not currently available. It is anticipated that an individuals would have to be present for 12 hours close to the source to experience injurious effects.
- USBL positioning equipment operates at a low frequency that can be heard by low frequency cetaceans, such as minke whale, and can cause disturbance responses between 24 to 32m. The USBL operates outside of the hearing range of other marine mammals including bottlenose dolphin and grey seal.
- Vessel noise may cause disturbance within the range of 370 m – 627 m (Hatch et al., 2008), however it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

Of the techniques that could potential disturb cetacean and pinniped (vessel noise, vibrocoring and sub-bottom profiling), the SBP has the larger ZOI and therefore the assessment below focuses on the effects of this technique.

A disturbance range for marine mammals and pinnipeds of between 50 m (± 13 m) to 338 m (± 121 m) at 160 dB re 1 µPa depending on the water depth and sediment type encountered using a sparker system has been identified using Halvorsen and Heaney (2018). This is based on a sparker being the worst-case scenario due to its more omnidirectional operation than other SBP types. Lower frequencies generated by SBP are within the hearing range of marine mammals, therefore this type of equipment could have localised, temporary effects on marine mammal behaviour.

For disturbance to occur during vibrocore sampling marine mammals would need to be in closer proximity to the equipment, than for SBP operations (similar sampling depths ranged from 23 m – 100 m depending on variables such as sediment type (Erbe and Macpherson, 2017 and Nedwell and Brooker, 2008)), and based on disturbance distances identified for vessel noise it is likely they will not

be within this range to experience disturbance. The disturbance ranges for both of these equipment types are also markedly smaller than the 5 km EDR for the use of the SBP, and so it is anticipated that any disturbance from either of these sources would be a lot lower that the disturbance radius caused by the SBP.

The zone of ensonification based on the above geophysical survey methods are within proximity to the source, therefore marine mammals would need to be present in close proximity to the survey vessel and remain within the localised zone of ensonification for an extended period of time to experience injurious effects.

The proposed survey will be a one-off event and will progress slowly along the proposed survey corridor. The ZOI predicted for disturbance is conservative and numbers of animals that could potentially be disturbed are small, relative to the population estimates. Animals will have sufficient time to avoid the survey spread, and it is unlikely that they will swim under operating equipment. Evidence suggests that avoidance behaviour will be temporary, with individuals returning to the area affected once the sound has ceased (Morton and Symonds 2002; Stone and Tasker 2006; Gailey et al. 2007; Stone et al. 2017). Grey seals have been shown to return to a survey area after the use of a small airgun array within two hours of the survey ceasing (Gordon et al., 2003).As the SACs are all >100 km from the survey area, project activities will not impede animals from accessing preferred habitat (except on a very localised basis).

Screening conclusion: No likely significant effect.

5.32 Possible in-combination effects

The Habitats Regulations require that plans or projects are assessed alone and in-combination with other plans or projects to determine whether a likely significant effect to European sites could occur. Only plans or projects that would increase the likelihood of significant effects should be considered. To compile the relevant projects, Marine Licences available on the NRW Public Register and MCMS Public Register and ongoing work listed on Kingfisher Bulletin were reviewed in April 2023 and assessed based on their operational dates and activity type.

As Notice to Mariners are only issued a few weeks prior to the commencement of survey activities, it is difficult to currently gauge what activities will be underway at the same time as the MaresConnect marine survey. Despite this, the following projects are known to be ongoing in the marine area and will be operating during the same time period that the MaresConnect marine survey is applying for a Marine Licence for:

- Awel Y Mor – currently in the consenting process for installation, with the licence for operation of the wind farm to be valid until 2065. No offshore construction is anticipated until 2027.
- Morgan and Mona offshore wind farm seismic surveys - 3D Ultra High Resolution (UHR) surveys ongoing until 05 July 2023, geotechnical surveys until 31st October 2023.
- Morecambe offshore wind farm – consents applications ongoing, construction is not anticipated until 2026.
- West Anglesey Tidal Demonstration Zone – Passive Acoustic Monitoring (PAM) is ongoing at the site until November 2023
- Holyhead Deep tidal stream site – the project is consented with construction underway, however no timeline is publicly available.
- Ongoing maintenance of offshore wind farms within the Irish Sea - Rhyl Flats, Gwynt Y Mor, North Hoyle, Burbo Bank, Barrow, Ormonde, West of Duddon Sands and Walney.
- Aggregate extraction – Liverpool Bay and Hilbre Swash.

- Oil and gas extraction in Liverpool Bay
- Holyhead Harbour maintenance dredging – as and when required
- Holyhead Waterfront Regeneration Scheme – ongoing construction including a marina until March 2028
- Coastal defence improvements around Colwyn Bay, Rhos-on-Sea and Penrhyn Bay – work commenced in January 2023 in Penrhyn Bay and is expected to be completed in the summer
- Central Rhyl Coastal Defences Scheme – construction of coastal defences along the seafront in Rhyl until April 2026

The MaresConnect marine survey has the potential to interact with several other projects, including multiple coastal defence improvement schemes, three active aggregate extraction licences, active oil and gas extraction licences and ongoing maintenance of other wind farms in the area. These activities will all take place within the Liverpool Bay SPA. The MaresConnect survey will be transient and temporary, with both the geotechnical and geophysical survey taking approximately nine days to complete the route within the site. The Morgan and Mona UHR survey will have completed its activities by the time the MaresConnect survey commences. Based on the small footprint of the coastal defence works, and continual nature of the other activities in the area, and the background levels of disturbance present in the eastern levels of the site due to large amounts of vessel traffic leaving the Port of Liverpool (close to the extraction sites and several wind farms), it is considered species will have habituated to these ongoing sources of disturbance and when combined with the MaresConnect marine survey are not considered to have a significant effect.

The MaresConect marine survey could also have the potential to combine with activities in the North Anglesey Marine SAC, including both tidal stream sites, the Holyhead Harbour maintenance dredging and the Holyhead Waterfront regeneration scheme. The West Anglesey Tidal Demonstration Zone is currently conducting a PAM campaign, which will not have an effect on harbour porpoise as it doesn't not generate underwater noise. Based on the small footprint of the other activities, and the transient and temporary nature of the MaresConnect marine survey, even if all activities were to take place during the designated summer season, they would not combine to affect more than 20% of the site in a day, or 10% of the site over the season. As a result, there will be no significant effect to the site.

6. INFORMATION TO INFORM APPROPRIATE ASSESSMENT

Based on the screening assessment outcomes, LSE could not be ruled out for the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC for pressures of unplanned events (accidental oil or chemical spills) and introduction and spread of INNS. Further information is presented in the subsequent sections detailing mitigation to be undertaken during the survey works to mitigate any potential effects to the site.

6.1 Unplanned events (accidental oil or chemical spills)

As per the International Convention for the Prevention of Pollution from Ships (MARPOL) requirements, all vessels over 400 gross tonnage are required to have shipboard oil pollution emergency plans (SOPEP) detailing what would take place in the event of a spill to minimise its impact to the lowest practicable level. This is a requirement in UK law under the Merchant Shipping (Prevention of Oil Pollution) Regulations 2019.

It is a project requirement that any vessels that work on the project must be compliant with MARPOL requirements including having SOPEP plans in place as well as maintain oil spill equipment onboard to contain any potential spill. This is a requirement regardless of vessel size.

Oil spills on survey vessels are also considerably rare as the vessels carry no additional cargo that could contribute to a spill (such as the transportation of chemicals completed by tanker vessels) beyond the fuel needed to operate the vessel.

It is therefore considered that with the mitigation in place as discussed, combined with the likelihood of a spill occurring, that there will be no LSE on the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC.

6.2 Introduction or spread of INNS

The survey could potentially contribute to the introduction or spread of INNS through fouling on the hull of the vessel or through contamination of intrusive survey equipment such as the vibrocore or grab. As standard practice, all survey equipment will be rinsed between sampling sites before the vessel leaves the sampling location, to remove any potential species that could be left after sampling has taken place. This also prevents contamination of the samples collected for analysis. The equipment will be thoroughly cleaned before transport to the site, to ensure no INNS from where it was used previously are present. Additionally, the equipment to be used will have been dry for some time before being used for the MaresConnect survey, meaning any potential INNS that were present on the equipment will have been unlikely to survive.

All survey vessels will also undergo regular anti-fouling treatment, however the exact details of the procedure are not currently available as the vessels to be used have not yet bene identified. Further details of the antifouling process and the previous known locations of the vessels will be provided in the Biosecurity Risk Assessment (MaresConnect Marine INNS Biosecurity RA and Management Plan) which will be updated with more detail once it is available. This is anticipated to be at least 12 weeks before survey commencement.

The vessel will also not discharge any ballast water during operations as it will be too close to the shore for the full duration of the survey to be able to do so (no more than 200 nm from land at any point during the survey).

It is therefore considered that with the discussed mitigation in place, and once further details of the survey vessel are known, that there will be no LSE on the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC.

7. CONCLUSION

To determine whether the MaresConnect marine survey is likely to have a significant effect on any European sites or protected species, either individually or in-combination with other plans or projects, a HRA screening assessment was carried out.

The HRA screening considered 23 European sites either with marine components or which are connected fluvially to the marine environment.

Pressures associated with the marine survey were identified and included:

- Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion,
- Visual disturbance,
- Underwater sound changes,
- Smothering and siltation rate changes (Light), and
- Above water noise.

The screening assessment has concluded that the proposed survey will not have a significant effect on the conservation objectives of any European sites in UK or ROI waters except for the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC. Further information regarding mitigation planned for the survey regarding the two pressures, unplanned events (accidental oil or chemical spills) and introduction and spread of INNS, has been provided for an Appropriate Assessment in Section 6.

Without prejudice to the conclusion of the assessment, JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys will be followed during the survey.

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APPENDIX A

Screening Assessment

SCREENING ASSESSMENT

Table A-1 UK SAC Screening Assessment

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay	SAC	Within	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1110 Sandbanks which are slightly covered by sea water all the time - 1140 Mudflats and sandflats not covered by seawater at low tide - 1170 Reefs **Qualifying Annex I Habitats present but not Primary reason for selection:** - 1160 Large shallow inlets and bays - 8330 Submerged or partially submerged sea caves	Siltation rate changes, including smothering (depth of vertical sediment overburden) Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	**Yes** – Geotechnical and environmental sampling could affect siltation rates due to the removal of sediment. **Yes** – Geotechnical and environmental grab samples may be taken within the boundary of the SAC.	**SCREENED IN**
North Anglesey Marine / Gogledd Môn Forol	SAC	Within	**Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1351 Harbour porpoise (*Phocoena phocoena*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Croker Carbonate Slabs	SAC	0.10	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1180 Submarine structures made by leaking gases	Siltation rate changes, including smothering (depth of vertical sediment overburden) Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	**Yes** – Geotechnical and environmental sampling could affect siltation rates due to the removal of sediment. **No** – Penetration and/or disturbance of the substrate below the surface of the seabed will only occur within the direct footprint of the sampling activity. Sampling will not occur within this SAC boundary.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Great Orme's Head/ Pen y Gogarth	SAC	2.56	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 4030 European dry heaths - 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) **Qualifying Annex I Habitats present but not Primary reason for selection:** - 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified. Consideration has been given to whether suspended sediments e.g. from geotechnical boreholes, could be deposited over the habitats. However, given the small volume of risings it was concluded that levels of suspended sediment generated by the works would not be noticeable against the normal level of background fluctuations.	**SCREENED OUT**
Dee Estuary/ Aber Dyfrdwy	SAC	15.0	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1140 Mudflats and sandflats not covered by seawater at low tide - 1310 Salicornia and other annuals colonizing mud and sand - 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) **Qualifying Annex I Habitats present but not Primary reason for selection:** - 1130 Estuaries - 1210 Annual vegetation of drift lines - 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts - 2110 Embryonic shifting dunes - 2120 "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" - 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * Priority feature - 2190 Humid dune slacks	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified for Annex I (primary or non-primary). Consideration has been given to whether suspended sediments e.g. from geotechnical boreholes, could be deposited over the habitats. However, given the small volume of risings it was concluded that levels of suspended sediment generated by the works would not be noticeable against the normal level of background fluctuations. **No** - No pressure-receptor pathway for any Annex II species. Sea lamprey and river lamprey are not considered sensitive to underwater noise changes (Popper et al. 2014). As such they will not be affected by noise generated by proposed site investigations. Petalwort is a liverwort (bryophyte) which mainly grows on sand dunes	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Qualifying features listed within Annex II Species are as follows: **Qualifying Annex II Species present but not Primary reason for selection** - 1095 Sea lamprey (*Petromyzon marinus*) - 1099 River lamprey (*Lampetra fluviatilis*) - 1395 Petalwort (*Petalophyllum ralfsii*)		and therefore there is no receptor-pressure pathway due to distance of the project works.	
Bae Cemlyn/ Cemlyn Bay	SAC	18.0	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1150 Coastal lagoons * Priority feature **Qualifying Annex I Habitats present but not Primary reason for selection:** - 1220 Perennial vegetation of stony banks	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Glannau Ynys Gybi/ Holy Island Coast	SAC	27.1	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts - 4030 European dry heaths **Qualifying Annex I Habitats present but not Primary reason for selection:** - 4010 Northern Atlantic wet heaths with Erica tetralix	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes	SAC	36.1	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 2110 Embryonic shifting dunes - 2120 "Shifting dunes along the	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			shoreline with *Ammophila arenaria* (""white dunes"")" - 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * Priority feature - 2170 Dunes with Salix repens ssp. argentea (*Salicion arenariae*) - 2190 Humid dune slacks **Qualifying Annex I Habitats present but not Primary reason for selection:** - 3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1395 Petalwort (*Petalophyllum ralfsii*) - 1441 Shore dock (*Rumex rupestris*)			
Afon Gwyrfai a Llyn Cwellyn	SAC	36.1	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the Isoëto-Nanojuncetea - 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1106 Atlantic salmon (*Salmo salar*) - 1831 Floating water-plantain	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified. The otter foraging range is 32 km. Due to the distance of the site to the proposed investigative survey otter from this site will not be found in the marine survey corridor. Atlantic salmon are not considered sensitive to underwater noise changes (Popper et al. 2014). As such they will not be affected by noise generated by proposed site investigations.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			(*Luronium natans*) **Qualifying Annex II Species present but not Primary reason for selection** - Otter (*Lutra lutra*)			
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh	SAC	36.4	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1310 Salicornia and other annuals colonizing mud and sand - 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1130 Estuaries - 1140 Mudflats and sandflats not covered by seawater at low tide	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid	SAC	36.5	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1106 Atlantic salmon (*Salmo salar*) - 1831 Floating water-plantain (*Luronium natans*) **Qualifying Annex II Species present but not Primary reason for selection**	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified. The otter foraging range is 32 km. Due to the distance of the site to the proposed investigative survey otter from this site will not be found in the marine survey corridor. Atlantic salmon, brook, river and sea lamprey are not considered sensitive to underwater noise changes (Popper et al. 2014). As such they will not be affected by noise generated by proposed site investigations. Bullhead is a freshwater species and does not have a marine life stage.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			- 1095 Sea lamprey (*Petromyzon marinus*) - 1096 Brook lamprey (*Lampetra planeri*) - 1099 River lamprey (*Lampetra fluviatilis*) - 1163 Bullhead (*Cottus gobio*) - 1355 Otter (*Lutra lutra*)			
Sefton Coast	SAC	42.2	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 2110 Embryonic shifting dunes - 2120 "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" - 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * Priority feature - 2170 Dunes with Salix repens ssp. argentea (*Salicion arenariae*) - 2190 Humid dune slacks **Qualifying Annex I Habitats present but not Primary reason for selection:** - 2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) * Priority feature **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1395 Petalwort (*Petalophyllum ralfsii*) **Qualifying Annex II Species present but not Primary reason for selection:** - 1166 Great crested newt (*Triturus cristatus*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau	SAC	42.8	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1110 Sandbanks which are slightly covered by sea water all the time - 1130 Estuaries - 1150 Coastal lagoons * Priority feature - 1160 Large shallow inlets and bays - 1170 Reefs **Qualifying Annex I Habitats present but not Primary reason for selection:** - 1140 Mudflats and sandflats not covered by seawater at low tide - 1310 Salicornia and other annuals colonizing mud and sand - 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) - 8330 Submerged or partially submerged sea caves **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1395 Petalwort (*Petalophyllum ralfsii*) **Qualifying Annex II Species present but not Primary reason for selection:** - 1355 Otter (*Lutra lutra*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
			- 1349 Bottlenose dolphin (*Tursiops truncatus*) - 1364 Grey seal (*Halichoerus grypus*) - 1364 Grey seal (*Halichoerus grypus*)	Underwater sounds changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that bottlenose dolphin and grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
				Visual (and above water noise) disturbance	**Yes** – Grey seals which have transited from the SAC to the marine survey corridor may be disturbed visual (and above water noise disturbance) by the presence of vessels and sound produced by the proposed site investigations during haul out.	
Afon Eden - Cors Goch Trawsfynydd	SAC	46.8	**Qualifying features listed within Annex I habitats are as follows:** **Qualifying Annex I Habitats present but not Primary reason for selection:** - 7110 Active raised bogs * Priority feature **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1029 Freshwater pearl mussel (*Margaritifera margaritifera*) - 1831 Floating water-plantain (*Luronium natans*) **Qualifying Annex II Species present but not Primary reason for selection:** - 1106 Atlantic salmon (*Salmo salar*) - 1355 Otter (*Lutra lutra*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Pisces Reef Complex	SAC	50.7	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1170 Reefs	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Morfa Harlech a Morfa Dyffryn	SAC	51.7	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 2110 Embryonic shifting dunes - 2120 "Shifting dunes along the shoreline with *Ammophila arenaria*	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			(""white dunes"")" - 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * Priority feature - 2170 Dunes with Salix repens ssp. argentea (*Salicion arenariae*) - 2190 Humid dune slacks **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1395 Petalwort (*Petalophyllum ralfsii*)			
Murlough	SAC	53.9	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * Priority features - 2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea) * Priority feature **Qualifying Annex I Habitats present but not Primary reason for selection:** - 1110 Sandbanks which are slightly covered by sea water all the time - 1140 Mudflats and sandflats not covered by seawater at low tide - 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) - 2110 Embryonic shifting dunes - 2120 "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" - 2170 Dunes with Salix repens ssp. argentea (*Salicion arenariae*) **Qualifying features listed within**	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified. Harbour seal are not known to make trips larger than 50km away from their haul-out site (DECC, 2016) and therefore seals from this SAC will not be found in the area.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Annex II Species are as follows: **Primary Qualifying Annex II Species:** - 1065 Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia* **Qualifying Annex II Species present but not Primary reason for selection:** - 1365 Harbour seal (*Phoca vitulina*)			
Shell Flat and Lune Deep	SAC	57.0	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1110 Sandbanks which are slightly covered by sea water all the time - 1170 Reefs	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Clogwyni Pen Llyn/ Seacliffs of Lleyn	SAC	59.1	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
North Channel	SAC	60.1	**Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1351 Harbour porpoise (*Phocoena phocoena*)	Underwater sounds changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
West Wales Marine / Gorllewin Cymru Forol	SAC	64.6	**Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1351 Harbour porpoise (*Phocoena phocoena*)	Underwater sounds changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Strangford Lough	SAC	74.4	**Qualifying features listed within Annex I habitats are as follows:**	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Primary Qualifying Annex I Habitats: - 1140 Mudflats and sandflats not covered by seawater at low tide - 1150 Coastal lagoons * Priority feature - 1160 Large shallow inlets and bays - 1170 Reefs **Qualifying Annex I Habitats present but not Primary reason for selection:** -1210 Annual vegetation of drift lines - 1220 Perennial vegetation of stony banks - 1310 Salicornia and other annuals colonizing mud and sand - 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) **Qualifying Annex II Species present but not Primary reason for selection:** - 1365 Harbour seal (*Phoca vitulina*)		identified. Harbour seal are not known to make trips larger than 50 km away from their haul-out site (DECC, 2016) and therefore seals from this SAC will not be found in the area.	
Morecambe Bay	SAC	75.2	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1130 Estuaries - 1140 Mudflats and sandflats not covered by seawater at low tide - 1160 Large shallow inlets and bays - 1220 Perennial vegetation of stony banks - 1310 *Salicornia* and other annuals colonizing mud and sand - 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) - 2120 "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" - 2130 "Fixed coastal dunes with	No pressure-receptor pathway identified	Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			herbaceous vegetation (""grey dunes"")" * Priority feature - 2190 Humid dune slacks **Qualifying Annex I Habitats present but not Primary reason for selection:** - 1110 Sandbanks which are slightly covered by sea water all the time - 1150 Coastal lagoons * Priority feature - 1170 Reefs - 2110 Embryonic shifting dunes - 2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) * Priority feature - 2170 Dunes with Salix repens ssp. argentea (*Salicion arenariae*) **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1166 Great crested newt (*Triturus cristatus*)			
River Wye/ Afon Gwy	SAC	96.2	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation **Qualifying Annex I Habitats present but not Primary reason for selection:** - 7140 Transition mires and quaking bogs **Qualifying features listed within Annex II Species are as follows:**	No pressure-receptor pathway identified Underwater sounds changes	Due to distance of site to project works, no pressure-receptor pathway identified. No pressure-receptor pathway for the Annex II specie: Sea, river, brook, Atlantic salmon bullhead or otter. Twaite shad and allis shad are	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Primary Qualifying Annex II Species: - 1092 White-clawed (or Atlantic stream) crayfish (*Austropotamobius pallipes*) - 1095 Sea lamprey (*Petromyzon marinus*) - 1096 Brook lamprey (*Lampetra planeri*) - 1099 River lamprey (*Lampetra fluviatilis*) - 1103 Twaite shad (*Alosa fallax*) - 1106 Atlantic salmon (*Salmo salar*) - 1163 Bullhead (*Cottus gobio*) - 1355 Otter (*Lutra lutra*) **Qualifying Annex II Species present but not Primary reason for selection:** - 1102 Allis shad (*Alosa alosa*)		anadromous species. While, adult allis shad spend most of their lives in the marine phase and twaite shad have a large foraging distances (Davies et al. 2020; (Environment Agency, 2020), it is unlikely that either of the species from this SAC will be present in the marine survey corridor as they would have to travel around the coast of Wales. If species do travel it is unlikely they will be present in large numbers and therefore the conservation objectives of the site will be not affected.	
Drigg Coast	SAC	99.0	**Qualifying features listed within Annex I habitats are as follows:** **Primary Qualifying Annex I Habitats:** - 1130 Estuaries - 2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) * Priority feature - 2170 Dunes with Salix repens ssp. argentea (*Salicion arenariae*) **Qualifying Annex I Habitats present but not Primary reason for selection:** - 1140 Mudflats and sandflats not covered by seawater at low tide - 1310 Salicornia and other annuals colonizing mud and sand - 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) - 2110 Embryonic shifting dunes - 2120 "Shifting dunes along the	No pressure-receptor pathway identified	Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			shoreline with *Ammophila arenaria* (""white dunes"")" - 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * Priority feature - 2190 Humid dune slacks			
Cardigan Bay / Bae Ceredigion	SAC	109.0 (within relevant MU)	**Qualifying Annex I Habitats present but not Primary reason for selection:** - 1110 Sandbanks which are slightly covered by sea water all the time - 1170 Reefs - 8330 Submerged or partially submerged sea caves **Qualifying features listed within Annex II Species are as follows: Primary Qualifying Annex II Species:** - 1349 Bottlenose dolphin (*Tursiops truncates*) **Qualifying Annex II Species present but not Primary reason for selection:** - 1095 Sea lamprey (*Petromyzon marinus*) - 1099 River lamprey (*Lampetra fluviatilis*) 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that bottlenose dolphinwill be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Pembrokeshire Marine / Sir Benfro Forol	SAC	171.7 (within relevant MU)	**Qualifying features listed within Annex I habitats are as follows: Primary Qualifying Annex I Habitats:** - 1130 Estuaries - 1160 Large shallow inlets and bays - 1170 Reefs	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Qualifying Annex I Habitats present but not Primary reason for selection: - 1110 Sandbanks which are slightly covered by sea water all the time - 1140 Mudflats and sandflats not covered by seawater at low tide - 1150 Coastal lagoons * Priority feature - 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) - 8330 Submerged or partially submerged sea caves **Qualifying features listed within Annex II Species are as follows: Primary Qualifying Annex II Species:** - 1364 Grey seal (*Halichoerus grypus*) - 1441 Shore dock (*Rumex rupestris*) **Qualifying Annex II Species present but not Primary reason for selection:** - 1095 Sea lamprey (*Petromyzon marinus*) - 1099 River lamprey (*Lampetra fluviatilis*) - 1102 Allis shad (*Alosa alosa*) - 1103 Twaite shad (*Alosa fallax*) - 1355 Otter (*Lutra lutra*)			
Dynesfeydd Môr Hafren / Bristol Channel Approaches	SAC	183.5 (within relevant MU)	**Qualifying features listed within Annex II Species are as follows: Primary Qualifying Annex II Species:**	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			- 1351 Harbour porpoise (*Phocoena phocoena*)		sound changes resulting from survey techniques.	
Lundy	SAC	240.2 (within relevant MU)	**Annex I habitats that are a primary reason for selection of this site** - 1170 Reefs **Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site** - 1110 Sandbanks which are slightly covered by sea water all the time - 8330 Submerged or partially submerged sea caves **Annex II species present as a qualifying feature, but not a primary reason for site selection** 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Isles of Scilly Complex	SAC	391.0 (within relevant MU)	**Annex I habitats that are a primary reason for selection of this site** - 1110 Sandbanks which are slightly covered by sea water all the time - 1140 Mudflats and sandflats not covered by seawater at low tide - 1170 Reefs **Annex II species that are a primary reason for selection of this site** - 1441 Shore dock (*Rumex rupestris*) **Annex II species present as a qualifying feature, but not a primary reason for site selection** - 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
The Maidens	SAC	143.5 (within relevant MU)	**Annex I habitats that are a primary reason for selection of this site:** - 1170 Reefs **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Treshnish Isles	SAC	326.5 (within relevant MU)	**Qualifying Annex I Habitats present but not Primary reason for selection:** - 1170 Reefs **Qualifying features listed within Annex II Species are as follows:** **Primary Qualifying Annex II Species:** - 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Monach Islands	SAC	452.6 (within relevant MU)	**Annex I habitats that are a primary reason for selection of this site:** - 21A0 Machairs **Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site** - 2120 "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" - 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" **Annex II species that are a primary reason for selection of this site** - 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
North Rona	SAC	614.7 (within relevant MU)	**Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site** - 1170 Reefs - 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts - 8330 Submerged or partially submerged sea caves **Annex II species that are a primary reason for selection of this site** - 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Table A-2 UK SPA Screening Assessment

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Liverpool Bay	SPA	Within	**Breeding** - Little tern (*Sternula albifrons*) - Common tern (*Sterna hirundo*) **Overwintering (Non-breeding)** - Red-throated diver (*Gavia stellata*) - Little gull (*Hydrocoloeus minutus*) - Common scoter (*Melanitta nigra*) **Waterbird assemblage (Non-breeding)** - Including species above - Red-breasted merganser *(Mergus serrator)* - Great cormorant *(Phalacrocorax carbo)*	Visual disturbance	**Yes** – It is likely that some birds from the site will use the marine survey corridor for foraging and loafing activity and some birds may be feeding in the intertidal zone.	**SCREENED IN**
Anglesey Terns / Morwenoliaid Ynys Môn	SPA	3.04	**Breeding** - Arctic tern (*Sterna paradisae*) - Common tern (*Sterna hirundo*) - Roseate tern (*Sterna dougallii*) - Sandwich tern (*Sterna sandvicensis*)	Visual disturbance	**Yes** – Birds from the site could use the marine survey corridor for foraging and loafing activity and some birds may be feeding in the intertidal zone.	**SCREENED IN**
Irish Sea Front	SPA	Within	**Breeding** - Manx Shearwater (*Puffinus puffinus*)	Visual disturbance	**Yes** – Birds from the site will use the marine survey corridor for foraging and loafing activity and some birds may be feeding in the intertidal zone.	**SCREENED IN**
Ynys Seiriol / Puffin Island	SPA	9.90	**Breeding** - Great Cormorant (*Phalacrocorax carbo*)	Visual disturbance	**Yes** – Screened in for further assessment as cormorant are considered to be sensitive to visual and above water noise disturbance (Joint SNCB, 2022) and these cable corridors are within the species mean max foraging range (25.6 km) (Woodward et al., 2019). In addition, disturbance to individuals nesting	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
					within the site could occur from installation activities.	
Traeth Lafan/ Lavan Sands, Conway Bay	SPA	14.0	**Overwintering (Non-breeding)** - Eurasian oystercatcher (*Haematopus ostralegus*)	Visual disturbance	**No** – Eurasian oystercatcher is a wading bird and due to the distance of the SPA it is therefore unlikely to be disturbed by activities taking place 2 km from the site. In addition, disturbance is predicted to be limited to that initiated by the movement of the survey vessel or noise from geotechnical sampling.	**SCREENED OUT**
The Dee Estuary	SPA	15.0	**Breeding** - Little tern (*Sterna albifrons*) - Common tern (*Sterna hirundo*) **Overwintering (Non-breeding)** - Northern pintail (*Anas acuta*) - Eurasian teal (*Anas crecca*) - Dunlin (*Calidris alpina alpina*) - Red knot (*Calidris canutus*) - Eurasian oystercatcher (*Haematopus ostralegus*) - Bar-tailed godwit (*Limosa lapponica*) - Black-tailed godwit (*Limosa limosa islandica*) - Eurasian curlew (*Numenius arquata*) - Grey plover (*Pluvialis squatarola*) - Sandwich tern (*Sterna sandvicensis*) - Common shelduck (*Tadorna tadorna*) - Common redshank (*Tringa totanus*) - Waterbird assemblage **Concentration** - Sandwich tern (*Sterna sandvicensis*) - Common redshank (*Tringa totanus*)	Visual disturbance	**Yes** – Common tern are screened in for further assessment as these cable corridors are within the species mean max foraging range (18.0 km) (Woodward et al., 2019). In addition, disturbance to individuals nesting within the site could occur from installation activities. **No** - Little tern are screened out as the nearest cable is not within the species mean max foraging range (5 km) (Woodward et al., 2019). **Yes** - Sandwich tern screened in as these cable corridors are within the species mean max foraging distance (34.3 km) (Woodward et al., 2019). **No** – The rest of the species are wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. In addition, disturbance is predicted to be limited to that initiated by the movement of the survey vessel or noise from	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
					geotechnical sampling. Birds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity.	
Mersey Narrows and North Wirral Foreshore	SPA	28.1	**Breeding** - Common tern (*Sterna hirundo*) **Overwintering (Non-breeding)** - Sanderling (*Calidris alba*) - Dunlin (*Calidris alpina alpina*) - Red knot (*Calidris canutus islandica*) - Eurasian oystercatcher (*Haematopus ostralegus*) - Little gull (*Hydrocoloeus minutus*) - Bar-tailed godwit (*Limosa lapponica*) - Great cormorant (*Phalacrocorax carbo*) - Grey plover (*Pluvialis squatarola*) - Common redshank (*Tringa totanus*) - Waterbird assemblage **Concentration** - Little gull (*Larus minutus*) - Common tern (Sterna hirundo)	Visual disturbance	**No** – This cable is outside the foraging range for common tern (18.0 km) and great cormorant (25.6 km). Most of these species are wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. The non-wading species do not have foraging ranges that overlap with the marine survey corridor.	**SCREENED OUT**
Ribble and Alt Estuaries	SPA	40.3	**Breeding** - Common tern (*Sterna hirundo*) - Lesser black-backed gull (*Larus fuscus*) - Black-headed gull (*Larus ridibundus*) - Ruff (*Philomachus pugnax*) **Overwintering (Non-breeding)** - Northern pintail (*Anas acuta*)	Visual disturbance	**Yes** – Lesser black-backed gull are screened in for further assessment as these cable corridors are within the species mean max foraging range (127 km) (Woodward et al., 2019). In addition, disturbance to individuals nesting within the site could occur from installation activities.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			- Eurasian teal (*Anas crecca*) - Eurasian wigeon (*Anas penelope*) - Sanderling (*Calidris alba*) - Dunlin (*Calidris alpina alpina*) - Red knot (*Calidris canutus*) - Pink-footed goose (*Anser brachyrhynchus*) - Greater scaup (*Aythya marila*) - Great cormorant (*Phalacrocorax carbo*) - Eurasian oystercatcher (*Haematopus ostralegus*) - Bar-tailed godwit (*Limosa lapponica*) - Black-tailed godwit (*Limosa limosa islandica*) - Black (common) scoter (*Melanitta nigra*) - Eurasian curlew (*Numenius arquata*) - Grey plover (*Pluvialis squatarola*) - Common shelduck (*Tadorna tadorna*) - Common redshank (*Tringa totanus*) - Northern lapwing (*Vanellus vanellus*) - Waterbird assemblage **Concentration** - Sanderling (*Calidris alba*) - Ringed plover (*Charadrius hiaticula*) - Whimbrel (*Numenius phaeopus*) - Common redshank (Tringa totanus)		**No** - Common tern (18.0 km) and black-headed gull (18.5 km) are screened out as the nearest cable is not within the species mean max foraging range (Woodward et al., 2019) .The remaining species are wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. The non-wading species do not have foraging ranges that overlap with the marine survey corridor.	
Mersey Estuary	SPA	41.4	**Overwintering (Non-breeding)** - Northern pintail (*Anas acuta*) - Eurasian teal (*Anas crecca*) - Eurasian wigeon (*Anas penelope*) - Dunlin (*Calidris alpina alpina*) - Black-tailed godwit (*Limosa limosa islandica*)	Visual disturbance	**No** – These are wading birds and due to the distance of the SPA it is therefore unlikely to be disturbed by activities taking place 2 km from the site. In addition, disturbance is predicted to be limited to that initiated by the movement of the	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			- Eurasian curlew (*Numenius arquata*) - Grey plover (*Pluvialis squatarola*) - Great crested grebe (*Podiceps cristatus*) - Common redshank (*Tringa totanus*) - Common shelduck (*Tadorna tadorna*) - Northern lapwing (*Vanellus vanellus*) **Concentration** - Common redshank (*Tringa totanus*) - Ringed plover (*Charadrius hiaticula*)		survey vessel or noise from geotechnical sampling.	
Carlingford Lough	SPA	42.6	**Breeding** - Common tern (*Sterna hirundo*) - Sandwich tern (*Sterna sandvicensis*) **Overwintering (Non-breeding)** - Light-bellied brent goose (*Branta bernicla hrota* [Canada/Ireland])	Visual disturbance	**Yes** – Light-bellied brent goose are screened in for further assessment as the nearest cable corridor is within the species mean foraging range (53.0 km) (Clausen et al., 2013). **No** - Common tern (18.0km) and sandwich tern (34.3 km) are screened out as the nearest cable is not within the species mean max foraging range (Woodward et al., 2019). The remaining species are wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. The non-wading species do not have foraging ranges that overlap with the marine survey corridor.	**SCREENED IN**
Northern Cardigan Bay / Gogledd Bae Ceredigion	SPA	53.4	**Overwintering (Non-breeding)** - Red-throated diver (*Gavia stellata*)	Visual disturbance	**No** - Red-throated diver are screened out as the nearest cable is not within the species mean max foraging range (9 km) (Woodward et al., 2019).	**SCREENED OUT**
Martin Mere	SPA	59.9	**Overwintering (Non-breeding)** - Northern pintail (*Anas acuta*) - Eurasian teal (*Anas crecca*)	Visual disturbance	**No** – These are wading birds and due to the distance of the SPA it is therefore unlikely to be disturbed by	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			- Pink-footed goose (*Anser brachyrhynchus*) - Bewick's swan (*Cygnus columbianus bewicki*) - Whooper swan (*Cygnus cygnus*) - Waterbird assemblage		activities taking place 2 km from the site. In addition, disturbance is predicted to be limited to that initiated by the movement of the survey vessel or noise from geotechnical sampling.	
Killough Bay	SPA	68.1	**Overwintering (Non-breeding)** - Light-bellied brent goose (*Branta bernicla hrota* [Canada/Ireland])	Visual disturbance	**No** – Light-bellied brent goose are not screened in for further assessment as the nearest cable corridor is outside the species mean foraging range (53.0 km) (Clausen et al., 2013).	**SCREENED OUT**
Morecambe Bay and Duddon Estuary	SPA	74.3	**Breeding** - Black-headed gull (*Larus ridibundus*) - Common tern (*Sterna hirundo*) - Little tern (*Sterna albifrons*) - Herring gull (*Larus argentatus*) - Lesser black-backed gull (*Larus fuscus*) - Sandwich tern (*Sterna sandvicensis*) **Overwintering (Non-breeding)** - Grey plover (*Pluvialis squatarola*) - Ruff (*Philomachus pugnax*) - Bar-tailed godwit (*Limosa lapponica*) - Mediterranean gull (*Larus melanocephalus*) - Little egret (*Egretta garzetta*) **Concentration** - Northern pintail (*Anas acuta*) - Pink-footed goose (*Anser brachyrhynchus*) - Ruddy turnstone (*Arenaria interpres*) - Sanderling (*Calidris alba*) - Dunlin (*Calidris alpina alpina*) - Red knot (*Calidris canutus islandica*) - Ringed plover (*Charadrius hiaticula*)	Visual disturbance	**Yes** – Lesser black-backed gull are screened in for further assessment as these cable corridors are within the species mean max foraging range (127 km) (Woodward et al., 2019). In addition, disturbance to individuals nesting within the site could occur from installation activities. **No** - Little tern (5 km) and **c**ommon tern (18.0 km), sandwich tern (34.3 km) Mediterranean gull (20 km) and herring gull (58.8 km) are screened out as the nearest cable is not within these species mean max foraging range (Woodward, Thaxter and Owen, 2019). The remaining species are wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. The non-wading species do not have foraging ranges that overlap with the marine survey corridor.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			- Eurasian oystercatcher (*Haematopus ostralegus*) - Lesser black-backed gull (*Larus fuscus*) - Black tailed godwit (*Limosa limosa islandica*) - Eurasian curlew (*Numenius arquata*) - European golden plover (*Pluvialis apricaria*) - Common redshank (*Tringa totanus*) - Common shelduck (*Tadorna tadorna*) - Seabird assemblage - Waterbird assemblage			
Strangford Lough	SPA	74.4	**Breeding** - Arctic tern (*Sterna paradisaea*) - Common tern (*Sterna hirundo*) - Sandwich tern (*Sterna sandvicensis*) **Overwintering (Non-breeding)** - Red knot (*Calidris canutus islandica*) - Light-bellied brent goose (*Branta bernicla hrota* [Canada/Ireland]) - Common redshank (Tringa totanus) - Waterbird assemblage	Visual disturbance	**No** - Arctic tern (25.7 km), **c**ommon tern (18.0 km), and sandwich tern (34.3 km) are screened out as the nearest cable is not within these species mean max foraging range (Woodward et al., 2019). The remaining species are wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. The non-wading species do not have foraging ranges that overlap with the marine survey corridor.	**SCREENED OUT**
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island	SPA	78.5	**Breeding** - Manx Shearwater (*Puffinus puffinus*)	Visual disturbance	**Yes** – Manx shearwater are screened in for further assessment as the nearest cable corridor is within the species mean foraging range (1346 km) (Clausen et al., 2013).	**SCREENED IN**
Outer Ards	SPA	78.9	**Breeding** - Arctic tern (*Sterna paradisaea*) **Overwintering (Non-breeding)** - Light-bellied brent goose (*Branta bernicla hrota* [Canada/Ireland])	Visual disturbance	**No** - Arctic tern (25.7 km) and Light-bellied brent goose (53 km) are screened out as the nearest cable is not within these species mean max foraging range (Woodward et al., 2019). The remaining species are	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			- Ruddy turnstone (*Arenaria interpres*) - Ringed plover (*Charadrius hiaticula*) - European golden plover (Pluvialis apricaria)		wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. The non-wading species do not have foraging ranges that overlap with the marine survey corridor.	
Dyfi Estuary / Aber Dyfi	SPA	81.7	**Overwintering (Non-breeding)** - Greenland white-fronted goose (*Anser albifrons flavirostris*)	Visual disturbance	**No** – Birds identified as being sensitive to the proposed site surveys and investigations are nesting birds and individuals within 2 km of the FLAA. Bird species from this site could be foraging in the ZOI, however, disturbance will be limited in extent and duration and there is sufficient space in the surrounding environment for birds to temporarily relocate. Therefore, the proposed site surveys and investigations are not capable of undermining the site's conservation objectives.	**SCREENED OUT**
Bowland Fells	SPA	91.4	**Breeding** - Lesser black-backed gull (*Larus fuscus*) - Hen Harrier (*Circus cyaneus*) - Merlin (*Falco columbarius*)	Visual disturbance	**Yes** – Lesser black-backed gull are screened in for further assessment as these cable corridors are within the species mean max foraging range (127 km) (Woodward et al., 2019). In addition, disturbance to individuals nesting within the site could occur from installation activities. **No** - The remaining species are wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. The non-wading species do not have foraging ranges	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
					that overlap with the marine survey corridor.	
Lough Neagh and Lough Beg	SPA	95.7	**Breeding** - Common tern (*Sterna hirundo*) - Great crested grebe (*Podiceps cristatus*) **Overwintering (Non-breeding)** - Great crested grebe (*Podiceps cristatus*) - Bewick's swan (*Cygnus columbianus bewicki*) - Whooper swan (*Cygnus cygnus*) - European golden plover (*Pluvialis apricaria*) - Common pochard (*Aythya ferina*) - Tufted duck (*Aythya fuligula*) - Greater scaup (*Aythya marila*) - Goldeneye duck (*Bucephala clangula*) - Seabird assemblage - Waterbird assemblage	Visual disturbance	**No** - Common tern are screened out as the nearest cable is not within these species mean max foraging range (18.0 km) (Woodward et al., 2019). The remaining species are wading birds and therefore unlikely to be disturbed by activities taking place 2 km from the site. The non-wading species do not have foraging ranges that overlap with the marine survey corridor.	**SCREENED OUT**

Table A-3 UK Ramsar Sites Screening Assessment

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
The Dee Estuary	Ramsar	15.0	**Species with peak counts in spring/summer:** - Redshank (*Tringa totanus*) **Species with peak counts in winter:** Non-breeding waterbird assemblage - Teal (*Anas crecca*) - Shelduck (*Tadorna Tadorna*) - Oystercatcher (*Haematopus ostralegus*) - Curlew (*Numenius arquata*) - Pintail (*Anas acuta*) - Grey plover (*Pluvialis squatarola*) - Knot (*Calidris canutus islandica*) - Dunlin (*Calidris alpina alpina*) - Black-tailed godwit (*Limosa Limosa islandica*) - Bar-tailed godwit (*Limosa lapponic*) - Redshank (Tringa totanus)	Visual disturbance	**No** - These are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**
Corsydd Môn a Llyn/ Anglesey and Llyn Fens	Ramsar	20.3	The site supports a diverse flora and fauna with associated rare species and is of special value for maintaining the genetic and ecological diversity of the region.	Visual disturbance	**No -** No species are listed on the Ramsar Information Sheet, however based on the associated habitats of the Corsydd Môn/ Anglesey Fens SAC which shares the same boundary and the distance from the site to the project area it is considered any bird species present at the site based on the habitats present will not be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Mersey Narrows and North Wirral Foreshore	Ramsar	28.1	**Migratory speces:** - Knot (*Calidris canutus islandica*) **Over-wintering species:** - Bar-tailed godwit (*Limosa lapponic*) - Cormorant (*Phalacrocorax carbo*) - Sanderling (*Calidris alba*) - Oystercatcher (*Haematopus ostralegus*) - Grey plover (*Pluvialis squatarola*) - Dunlin (*Calidris alpina alpina*) - Redshank (*Tringa totanus*)	Visual disturbance	**No** - These are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**
Llyn Idwal	Ramsar	28.5	**Ramsar criterion 1** A small, shallow, oligotrophic corrie lake. The semi-circular rock basin (or cwm) containing the lake is one of the finest examples in Snowdonia. **Ramsar criterion 2** Species-rich plant community, including almost all of the species typical of oligotrophic waters in Britain. Notable species include Elatine hexandra and Subularia aquatica (both nationally scarce) and Pilularia globulifera (vulnerable at a European level).	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Ribble and Alt Estuaries	Ramsar	40.3	**Species with peak counts in spring/autumn:** - Black-tailed godwit (*Limosa Limosa islandica*) - Redshank (*Tringa totanus*) - Dunlin (*Calidris alpina alpina*) - Grey plover (*Pluvialis squatarola*) - Red knot (*Calidris canutus islandica*) - Ringed plover (*Charadrius hiaticula*) - Sanderling (Calidris alba) **Species with peak counts in winter:** - Teal (*Anas crecca*) - Oystercatcher (*Haematopus ostralegus*) - Pintail (*Anas acuta*) - Bar-tailed godwit (*Limosa lapponic*) - Wigeon (*Anas penelope*) - Pink-footed goose (*Anser brachyrhynchus*) - Tundra swan (*Cygnus columbianus bewickii*) - Whooper swan (*Cygnus cygnus*)	Visual disturbance	**No** - These are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**
Mersey Estuary	Ramsar	41.4	**Species with peak counts in spring/autumn:** - Shelduck (*Tadorna Tadorna*) - Black-tailed godwit (*Limosa Limosa islandica*) - Redshank (*Tringa totanus*) **Species with peak counts in winter:** Waterbird assemblage - Teal (*Anas crecca*) - Dunlin (Calidris alpina alpina) - Pintail (*Anas acuta*)	Visual disturbance	**No** - These are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Carlingford Lough	Ramsar	42.6	**Species regularly supported during the breeding season:** - Sandwich tern (*Sterna Sandvicensis*) **Species with peak counts in winter:** - Light-bellied brent goose (*Branta bernicla hrota*)	Visual disturbance	**Yes** – Light-bellied brent goose are screened in for further assessment as the nearest cable corridor is within the species mean foraging range (53.0 km) (Clausen et al., 2013). **No** - Ssandwich tern (34.3k m) are screened out as the nearest cable is not within the species mean max foraging range (Woodward et al., 2019).	**SCREENED IN**
Llyn Tegid	Ramsar	42.9	**Ramsar criterion 1** Largest natural lake in Wales, lying deep in a formerly glaciated trough. **Ramsar criterion 2** Plant species growing in or beside the lake are mudwort *Limosa aquatica*, six-stamened waterwort *Elatine hexandr*a, water sedge *Carex aquatilis* and floating water plantain *Luronium natans*, all of which are scarce in Britain. The latter species is regarded as vulnerable on a global scale. This site is also one of only six sites in Britain for the whitefish or gwyniad *Coregonus lavaretus*; the Welsh population of this fish is genetically distinct. Llyn Tegid is also an unusual habitat for the normally riverine fish grayling *Thymallus thymallus*. The Nationally Rare glutinous snail *Myxas glutinosa* has been rediscovered in the shallow gravels of the lake shore.	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Midland Meres and Mosses Phase 2	Ramsar	49.1	**Ramsar criterion 1** The site comprises a diverse range of habitats from open water to raised bog. **Ramsar criterion 2** Supports a number of rare species of plants associated with wetlands, including the nationally scarce cowbane *Cicuta virosa* and, elongated sedge *Carex elongata*. Also present are the nationally scarce bryophytes *Dicranum affine* and *Sphagnum pulchrum*. Also supports an assemblage of invertebrates including several rare species. There are 16 species of British Red Data Book insect listed for this site including the following endangered species: the moth *Glyphipteryx lathamella*, the caddisfly *Hagenella clathrata* and the sawfly *Trichiosoma vitellinae*.	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Martin Mere	Ramsar	59.9	**Species with peak counts in spring/autumn:** - Pink-footed goose (*Anser brachyrhynchus*) **Species with peak counts in winter:** Waterfowl assemblage - Wigeon (*Anas penelope*) - Tundra swan (*Cygnus columbianus bewickii*) - Whooper swan (*Cygnus cygnus*) - Pintail (*Anas acuta*)	Visual disturbance	**No** - These are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Midland Meres and Mosses Phase 1	Ramsar	62.2	**Ramsar criterion 1** The site comprises a diverse range of habitats from open water to raised bog. **Ramsar criterion 2** Supports a number of rare species of plants associated with wetlands including five nationally scarce species together with an assemblage of rare wetland invertebrates (three endangered insects and five other British Red Data Book species of invertebrates).	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Morecambe Bay and Duddon Estuary	Ramsar	74.3	Nationally important numbers of waterfowl during spring and autumn passage. **Species with peak counts in winter:** Waterfowl assemblage - Pintail (*Anas acuta*) - Red knot (*Calidris canutus islandica*) - Redshank (*Tringa totanus*)	Visual disturbance	**No** - These are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**
Strangford Lough	Ramsar	74.4	**Species regularly supported during the breeding season:** - Common tern (*Sterna hirundo*) - Sandwich tern (*Sterna sandvicensis*) **Species with peak counts in spring/autumn:** - Light-bellied brent goose (*Branta bernicla hrota*) - Redshank (*Tringa totanus*) **Species with peak counts in winter:** Waterfowl assemblage - Red knot (*Calidris canutus islandica*) - Shelduck (*Tadorna tadorna*)	Visual disturbance	**No** - The site is beyond the light-bellied brent goose's foraging range. The remaining species are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Outer Ards	Ramsar	78.9	**Species regularly supported during the breeding season:** - Arctic tern (*Sterna paradisaea*) **Species regularly supported during the winter season:** - Ruddy turnstone (*Arenaria interpres interpres*) - Light-bellied brent goose (*Branta bernicla hrota*) - Ringed plover (*Charadrius hiaticula*) - Golden plover (*Pluvialis apricaria*)	Visual disturbance	**No** - The site is beyond the light-bellied brent goose and arctic tern foraging range. The remaining species are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**
Rostherne Mere	Ramsar	81.1	**Ramsar criterion 1:** The site is one of the deepest and largest of the meres of the Shropshire-Cheshire plain. Its shoreline is fringed with common reed *Phragmites australis.*	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Turmennan Lough	Ramsar	82.1	**Ramsar Criterion 1:** Turmennan is a lowland valley mire with a range of edaphic conditions.	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Cors Fochno and Dyfi	Ramsar	82.7	**Ramsar criterion 1:** The site contains the largest expanse of primary raised mire in lowland Britain; the largest estuarine raised mire, and third-largest `active` raised mire in Britain**.**	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Duddon Estuary	Ramsar	83.9	Nationally important numbers of waterfowl during spring and autumn passage. **Species with peak counts in winter:** Waterfowl assemblage - Pintail (*Anas acuta*) - Red knot (*Calidris canutus islandica*) - Redshank (*Tringa totanus*)	Visual disturbance	**No** - These are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**
Lough Neagh and Lough Beg	Ramsar	95.7	**Species with peak counts in spring/autumn:** - Tundra swan (*Cygnus columbianus bewickii*) **Species with peak counts in winter:** Waterfowl assemblage - Goldeneye (*Bucephala clangula clangula*) - Pochard (*Aythya ferina*) - Greater scaup (*Aythya marila marila*) - Tufted duck (*Aythya fuligula*) - Whooper swan (*Cygnus cygnus*)	Visual disturbance	**No** - These are wading birds and therefore unlikely to be disturbed by activities taking place more than 2 km from the site.	**SCREENED OUT**
Magheraveely Marl Loughs	Ramsar	98.0	**Ramsar criterion 1:** Magheraveely Marl Loughs represent a rare wetland type both in Northern Ireland and in the EU's Atlantic region. **Ramsar criterion 2:** Magheraveely Marl Loughs support vulnerable vegetation communities and species.	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Table A-4 Transboundary Protected Sites Screening Assessment

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Codling Fault Zone (ROI)	SAC	32.33	Submarine structures made by leaking gases	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Rockabill to Dalkey Island (ROI)	SAC	44.95	Reefs Harbour porpoise (*Phocoena phocoena*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Lambay Island (ROI)	SAC	47.48	Reefs Vegetated sea cliffs of the Atlantic and Baltic coasts Grey Seal (*Halichoerus grypus*) Harbour Seal (*Phoca vitulina*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Rogerstown Estuary (ROI)	SAC	53.62	Estuaries Mudflats and sandflats not covered by seawater at low tide Salicornia and other annuals colonising mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Mediterranean salt meadows (*Juncetalia maritimi*) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) Fixed coastal dunes with herbaceous vegetation (grey dunes)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Howth Head (ROI)	SAC	53.88	Vegetated sea cliffs of the Atlantic and Baltic coasts European dry hearths	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Ireland's Eye (ROI)	SAC	54.08	Perennial vegetation of stony banks Vegetated sea cliffs of the Atlantic and Baltic coasts	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Baldoyle Bay (ROI)	SAC	55.67	Mudflats and sandflats not covered by seawater at low tide Salicornia and other annuals colonising mud and sand Atlantic salt meadows (*Glauco Puccinellietalia maritimae*) Mediterranean salt meadows (*Juncetalia maritimi*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Malahide Estuary (ROI)	SAC	55.87	Mudflats and sandflats not covered by seawater at low tide Salicornia and other annuals colonising mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Mediterranean salt meadows (*Juncetalia maritimi*) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) Fixed coastal dunes with herbaceous vegetation (grey dunes)	No pressure-receptor pathway identified	**No** – No pressure receptor pathway identified.	**SCREENED OUT**
North Dublin Bay (ROI)	SAC	57.59	Mudflats and sandflats not covered by seawater at low tide Annual vegetation of drift lines Salicornia and other annuals colonising mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Mediterranean salt meadows (*Juncetalia maritimi*) Embryonic shifting dunes Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Fixed coastal dunes with herbaceous vegetation (grey dunes) Humid dune slacks Petalwort (*Petalophyllum ralfsii*)			
South Dublin Bay (ROI)	SAC	63.52	Mudflats and sandflats not covered by seawater at low tide Annual vegetation of drift lines Salicornia and other annuals colonising mud and sand Embryonic shifting dunes	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Boyne Coast and Estuary (ROI)	SAC	63.85	Estuaries Mudflats and sandflats not covered by seawater at low tide Annual vegetation of drift lines Salicornia and other annuals colonising mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Embryonic shifting dunes Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) Fixed coastal dunes with herbaceous vegetation (grey dunes)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Clogher Head (ROI)	SAC	64.73	Vegetated sea cliffs of the Atlantic and Baltic coasts European dry heaths	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Bray Head (ROI)	SAC	66.57	Vegetated sea cliffs of the Atlantic and Baltic coasts European dry heaths	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Carlingford Shore (ROI)	SAC	68.05	Annual vegetation of drift lines Perennial vegetation of stony banks	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
River Boyne And River Blackwater (ROI)	SAC	68.54	Alkaline fens Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) River Lamprey (*Lampetra fluviatilis*) Salmon (*Salmo salar*) Otter (*Lutra lutra*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Ballyman Glen (ROI)	SAC	69.47	Petrifying springs with tufa formation (*Cratoneurion*) Alkaline fens	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
The Murrough Wetlands (ROI)	SAC	70.49	Annual vegetation of drift lines Perennial vegetation of stony banks Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Mediterranean salt meadows (*Juncetalia maritimi*) Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* Alkaline fens	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Knocksink Wood (ROI)	SAC	71.36	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*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Glen of the Downs (ROI)	SAC	72.24	Old sessile oak woods with Ilex and Blechnum in the British Isles	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Dundalk Bay (ROI)	SAC	73.14	Estuaries Mudflats and sandflats not covered by seawater at low tide Perennial vegetation of stony banks Salicornia and other annuals colonising	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Mediterranean salt meadows (*Juncetalia maritimi*)			
Wicklow Mountains (ROI)	SAC	74.05	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) Natural dystrophic lakes and ponds Northern Atlantic wet heaths with *Erica tetralix* European dry heaths Alpine and Boreal heaths Calaminarian grasslands of the *Violetalia calaminariae* Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) Blanket bogs (* if active bog) Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) Calcareous rocky slopes with chasmophytic vegetation Siliceous rocky slopes with chasmophytic vegetation Old sessile oak woods with Ilex and Blechnum in the British Isles Otter (*Lutra lutra*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Carlingford Mountain (ROI)	SAC	74.52	▪ Northern Atlantic wet heaths with *Erica tetralix* ▪ European dry heaths ▪ Alpine and Boreal heaths ▪ Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			(and submountain areas, in Continental Europe) ▪ Blanket bogs (* if active bog) ▪ Transition mires and quaking bogs ▪ Alkaline fens ▪ Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) ▪ Calcareous rocky slopes with chasmophytic vegetation ▪ Siliceous rocky slopes with chasmophytic vegetation			
Wicklow Reef (ROI)	SAC	76.29	Reefs	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Carriggower Bog (ROI)	SAC	76.78	Transition mires and quaking bogs	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Glenasmole Valley (ROI)	SAC	79.4	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) Petrifying springs with tufa formation (*Cratoneurion*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Rye Water Valley/Carton (ROI)	SAC	82.88	Petrifying springs with tufa formation (*Cratoneurion*) Narrow-mouthed Whorl Snail (*Vertigo angustior*) Desmoulin's Whorl Snail (*Vertigo moulinsiana*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Magherabeg Dunes (ROI)	SAC	84.96	Annual vegetation of drift lines Embryonic shifting dunes Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) Fixed coastal dunes with herbaceous vegetation (grey dunes) Petrifying springs with tufa formation (*Cratoneurion*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Deputy's Pass Nature Reserve (ROI)	SAC	88.82	Old sessile oak woods with Ilex and Blechnum in the British Isles	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Buckroney-Brittas Dunes and Fen (ROI)	SAC	89.09	Annual vegetation of drift lines Perennial vegetation of stony banks Mediterranean salt meadows (*Juncetalia maritimi*) Embryonic shifting dunes Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) Fixed coastal dunes with herbaceous vegetation (grey dunes) Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) Dunes with *Salix repens* ssp. argentea (*Salicion arenariae*) Humid dune slacks Alkaline fens	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Vale of Clara (Rathdrum Wood) (ROI)	SAC	90.14	Old sessile oak woods with Ilex and Blechnum in the British Isles	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Red Bog, Kildare (ROI)	SAC	92.04	Transition mires and quaking bogs	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Codling Fault Zone (ROI)	SAC	32.33	Submarine structures made by leaking gases	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Rockabill to Dalkey Island (ROI)	SAC	44.95	Reefs Harbour Porpoise (*Phocoena phocoena*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Lambay Island (ROI)	SAC	47.48	Reefs Vegetated sea cliffs of the Atlantic and Baltic coasts Grey Seal (*Halichoerus grypus*) Harbour Seal (*Phoca vitulina*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Blasket Islands (ROI)	SAC	294.7 (within relevant MU)	1170 Reefs 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts 4030 European dry heaths 8330 Submerged or partially submerged sea caves 1349 Bottlenose dolphin (*Tursiops truncatus*) 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that bottlenose dolphin and grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Roaringwater Bay and Islands (ROI)	SAC	312.9 (within relevant MU)	1160 Large Shallow Inlets and Bays 1170 Reefs 1230 Vegetated Sea Cliffs 4030 Dry Heath 8330 Sea Caves 1351 Harbour Porpoise (*Phocoena phocoena*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise and grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			1355 Otter (*Lutra lutra*) 1364 Grey Seal (*Halichoerus grypus*)			
Saltee Islands (ROI)	SAC	150.4 (within relevant MU)	1140 Tidal Mudflats and Sandflats 1160 Large Shallow Inlets and Bays 1170 Reefs 1230 Vegetated Sea Cliffs 8330 Sea Caves 1364 Grey Seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Slyne Head Islands (ROI)	SAC	268.4 (within relevant MU)	1170 Reefs 1349 Bottlenose dolphin (*Tursiops truncatus*) 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that bottlenose dolphin and grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Inishbofin and Inishshark (ROI)	SAC		1150 Coastal Lagoons 3110 Oligotrophic Waters containing very few minerals 4010 Wet Heath 4030 Dry Heath 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Duvillaun Islands (ROI)	SAC	273.0 (within relevant MU)	1349 Bottlenose dolphin (*Tursiops truncatus*) 1364 Grey seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that bottlenose dolphin and grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Inishkea Islands (ROI)	SAC	276.5 (within relevant MU)	21A0 Machairs 1364 Grey seal (*Halichoerus grypus*) 1395 Petalwort (*Petalophyllum ralfsii*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that grey seal will be disturbed by the underwater sound	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
					changes resulting from survey techniques.	
Slieve Tooey/Tormore Island/Loughros Beg Bay (ROI)	SAC	205.3 (within relevant MU)	1230 Vegetated Sea Cliffs 1330 Atlantic Salt Meadows 1410 Mediterranean Salt Meadows 2110 Embryonic Shifting Dunes 2120 Marram Dunes (White Dunes) 2130 Fixed Dunes (Grey Dunes) 2140 Decalcified Empetrum Dunes 2150 Decalcified Dune Heath 2170 Dunes with Creeping Willow 2190 Humid Dune Slacks 4060 Alpine and Subalpine Heaths 7130 Blanket Bogs (Active) 1014 Narrow-mouthed Whorl Snail (*Vertigo angustior*) 1355 Otter (*Lutra lutra*) 1364 Grey Seal (*Halichoerus grypus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Horn Head and Rinclevan (ROI)	SAC	219.8 (within relevant MU)	2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) 2170 Dunes with *Salix repens ssp.argentea* (*Salicion arenariae*) 2190 Humid dune slacks 21A0 Machairs 1013 Geyer's Whorl Snail (*Vertigo geyeri*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			1364 Grey seal (*Halichoerus grypus*) 1395 Petalwort (*Petalophyllum ralfsii*) 1833 Slender Naiad (*Najas flexilis*)			
Ouessant-Molène (France)	SAC	536.7 (within relevant MU)	1110 Sandbanks which are slightly covered by sea water all the time 1150 Coastal lagoons 1170 Reefs 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 1310 Salicornia and other annuals colonizing mud and sand 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1430 Halo-nitrophilous scrubs (Pegano-Salsoletea) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') 2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes') 2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) 3120 Oligotrophic waters containing very few minerals generally on sandy	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise, bottlenose dolphin and grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			soils of the West Mediterranean, with *Isoetes* spp 4030 European dry heaths 7230 Alkaline fens 8220 Siliceous rocky slopes with chasmophytic vegetation 1421Ferns (*Trichomanes speciosum*) 1441 Shore dock (*Rumex rupestris*) 1351 Harbour Porpoise (*Phocoena phocoena*) 1349 Bottlenose dolphin (*Tursiops truncatus*) 1364 Grey seal (*Halichoerus grypus*) 1355 Otter (*Lutra lutra*)			
Chaussée de Sein (France)	SAC	583.4 (within relevant MU)	1110 Sandbanks which are slightly covered by sea water all the time 1170 Reefs 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 1310 Salicornia and other annuals colonizing mud and sand 2110 Embryonic shifting dunes 2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes') 1441 Shore dock (*Rumex rupestris*) 1351 Harbour Porpoise (*Phocoena phocoena*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise, bottlenose dolphin and grey seal will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			1349 Bottlenose dolphin (*Tursiops truncatus*) 1364 Grey seal (*Halichoerus grypus*)			
Nord Bretagne DH (France)	SAC	397.4 (within relevant MU)	1351 Harbour Porpoise (*Phocoena phocoena*) 1349 Bottlenose dolphin (*Tursiops truncatus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise and bottlenose dolphin will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Mers Celtiques - Talus du golfe de Gascogne (France)	SAC	490.0 (within relevant MU)	1170 Reefs 1351 Harbour Porpoise (*Phocoena phocoena*) 1349 Bottlenose dolphin (*Tursiops truncatus*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise and bottlenose dolphin will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**
Abers - Cote des legendes (France)	SAC	513.9 (within relevant MU)	1110 Sandbanks which are slightly covered by sea water all the time 1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1150 Coastal lagoons 1160 Large shallow inlets and bays 1170 Reefs 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 1310 Salicornia and other annuals colonizing mud and sand	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise, grey seal and bottlenose dolphin will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1430 Halo-nitrophilous scrubs (*Pegano-Salsoletea*) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') 2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes') 2170 Dunes with *Salix repens ssp argentea* (*Salicion arenariae*) 2190 Humid dune slacks 4030 European dry heaths 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels 8220 Siliceous rocky slopes with chasmophytic vegetation 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion) 9130 Asperulo-Fagetum beech forests 1106 Black salmon (*Salmo salar*) 1903 *Liparis loeselii* 1044 Southern Coenagrion (*Coenagrion mercuriale*) 1007 *Elona quimperiana* 1308 Barbastelle (*Barbastella barbastellus*) 1365 Common seal (*Phoca vitulina*)			

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			1304 Greater horseshoe bat (*Rhinolophus ferrumequinum*) 1351 Harbour Porpoise (*Phocoena phocoena*) 1349 Bottlenose dolphin (*Tursiops truncatus*) 1364 Grey seal (*Halichoerus grypus*) 1355 Otter (*Lutra lutra*)			
Baie de Morlaix (France)	SAC	497.8 (within relevant MU)	1110 Sandbanks which are slightly covered by sea water all the time 1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1160 Large shallow inlets and bays 1170 Reefs 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 1310 Salicornia and other annuals colonizing mud and sand 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)* 1430 Halo-nitrophilous scrubs (Pegano-Salsoletea) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') 4030 European dry heaths	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels 8220 Siliceous rocky slopes with chasmophytic vegetation 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion) 9180 Tilio-Acerion forests of slopes, screes and ravines 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) 1421 *Trichomanes speciosum* 1102 Allis shad (*Alosa alosa*) 1103 Shad (*Alosa fallax*) 1095 Great sea lamprey (*Petromyzon marinus*) 1106 Black salmon (*Salmo salar*) 1308 Barbastelle *(Barbastella barbastellus*) 1364 Grey seal (*Halichoerus grypus*) 1355 Eurasian otter (*Lutra lutra*) 1351 Common Porpoise (*Phocoena phocoena*) 1304 Greater horseshoe bat (*Rhinolophus ferrumequinum*) 1303 Lesser horseshoe bat (*Rhinolophus hipposideros*)			
Tregor Goëlo (France)	SAC	472.1 (within relevant MU)	1110 Sandbanks which are slightly covered by sea water all the time	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1150 Coastal lagoons 1160 Large shallow inlets and bays 1170 Reefs 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 1310 Salicornia and other annuals colonizing mud and sand 1320 Spartina swards (*Spartinion maritimae*) 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') 2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes') 2190 Humid dune slacks 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) 3120 Oligotrophic waters containing very few minerals generally on sandy		will be disturbed by the underwater sound changes resulting from survey techniques.	

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			soils of the West Mediterranean, with *Isoetes* spp 4020 Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix* 4030 European dry heaths 6230 Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels 8220 Siliceous rocky slopes with chasmophytic vegetation 8230 Siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* or of the *Sedo albi-Veronicion dillenii* 8330 Submerged or partially submerged sea caves 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae or Ilici-Fagenion*) 9130 *Asperulo-Fagetum* beech forests 9180 *Tilio-Acerion* forests of slopes, screes and ravines 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) 1421 *Trichomanes speciosum*			

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			1102 Allis shad (*Alosa alosa*) 1103 Shad (*Alosa fallax*) 1163 Freshwater sculpin (*Cottus gobio*) 5315 *Cottus perifretum* 1096 Brook lamprey (*Lampetra planeri*) 1095 Great sea lamprey (*Petromyzon marinus*) 1106 Black salmon (*Salmo salar*) 1441 Shore Dock (*Rumex rupestris*) 1044 Southern Coenagrion (*Coenagrion mercuriale*) 1007 *Elona quimperiana* 1083 Stag Beetle (*Lucanus cervus*) 1308 Barbastelle (*Barbastella barbastellus*) 1364 Grey seal (*Halichoerus grypus*) 1355 Eurasian otter (*Lutra lutra*) 1323 Bechstein's bat (*Myotis bechsteinii*) 1321 Geoffroy's bat (*Myotis emarginatus*) 1324 Greater mouse-eared bat (*Myotis myotis*) 1351 Common Porpoise (*Phocoena phocoena*) 1304 Greater horseshoe bat (*Rhinolophus ferrumequinum*) 1303 Lesser horseshoe bat (*Rhinolophus hipposideros*) 1349 Bottle-nosed Dolphin (*Tursiops truncatus*)			

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Côte de Granit rose-Sept-Iles (France)	SAC	472.1 (within relevant MU)	1110 Sandbanks which are slightly covered by sea water all the time 1140 Mudflats and sandflats not covered by seawater at low tide 1150 Coastal lagoons 1160 Large shallow inlets and bays 1170 Reefs 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 1310 Salicornia and other annuals colonizing mud and sand 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1410 Mediterranean salt meadows (*Juncetalia maritimi*) 1430 Halo-nitrophilous scrubs (*Pegano-Salsoletea*) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') 2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes') 2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) 2190 Humid dune slacks 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Underwater sound changes	**Yes** – Appendix B Underwater Noise Risk Assessment concluded there is the potential that harbour porpoise will be disturbed by the underwater sound changes resulting from survey techniques.	**SCREENED IN**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation 4030 European dry heaths 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels 8220 Siliceous rocky slopes with chasmophytic vegetation 8230 Siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* or of the *Sedo albi-Veronicion dillenii* 9130 *Asperulo-Fagetum* beech forests 9180 Tilio-Acerion forests of slopes, screes and ravines 1421 *Trichomanes speciosum* 1102 Allis shad (*Alosa alosa*) 1103 Shad (*Alosa fallax*) 1095 Great sea lamprey *(Petromyzon marinus*) 1106 Black salmon (*Salmo salar*) 1441 Shore Dock (*Rumex rupestris*) 1007 *Elona quimperiana* 1083 Stag Beetle (*Lucanus cervus*) 1364 Grey seal (*Halichoerus grypus*) 1365 Common seal (*Phoca vitulina*) 1351 Common Porpoise (*Phocoena phocoena*)			

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			1304 Greater horseshoe bat (*Rhinolophus ferrumequinum*) 1349 Bottle-nosed Dolphin (*Tursiops truncatus*)			
Rockabill (ROI)	SPA	44.05	Purple Sandpiper (*Calidris maritima*) Roseate Tern (*Sterna dougallii*) Common Tern (*Sterna hirundo*) Arctic Tern (*Sterna paradisaea*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Lambay Island (ROI)	SPA	47.26	Fulmar (*Fulmarus glacialis*) Cormorant (*Phalacrocorax carbo*) Shag (*Phalacrocorax aristotelis*) Greylag Goose (*Anser anser*) Lesser Black-backed Gull (*Larus fuscus*) Herring Gull (*Larus argentatus*) Kittiwake (*Rissa tridactyla*) Guillemot (*Uria aalge*) Razorbill (*Alca torda*) Puffin (*Fratercula arctica*)	Visual disturbance	**Yes** - Fulmar (542 km), lesser black-backed gull (147 km), herring gull (58.8 km), kittiwake (156 km), guillemot (73.2 km), razorbill (88.7 km) and puffin (137.1 km) are screened in for further assessment as the cable corridors are within the species mean max foraging range	**SCREENED IN**
Skerries Islands (ROI)	SPA	51.88	Cormorant (*Phalacrocorax carbo*) Shag (*Phalacrocorax aristotelis*) Light-bellied Brent Goose (*Branta bernicla hrota*) Purple Sandpiper (*Calidris maritima*) Turnstone (*Arenaria interpres*) Herring Gull (*Larus argentatus*)	Visual disturbance	**Yes** - Herring gull (58.8 km) are screened in for further assessment as the cable corridors are within the species mean max foraging range	**SCREENED IN**
Rogerstown Estuary (ROI)	SPA	53.47	Greylag Goose (*Anser anser*) ▪Light-bellied Brent Goose (*Branta bernicla hrota*) Shelduck (*Tadorna tadorna*) Shoveler (*Anas clypeata*) Oystercatcher (*Haematopus ostralegus*) Ringed Plover (*Charadrius hiaticula*) Grey Plover (*Pluvialis squatarola*) Knot (*Calidris canutus*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Dunlin (*Calidris alpina*) Black-tailed Godwit (*Limosa limosa*) Redshank (*Tringa totanus*) Wetland and Waterbirds			
Ireland's Eye (ROI)	SPA	53.61	Cormorant (*Phalacrocorax carbo*) Herring Gull (*Larus argentatus*) Kittiwake (*Rissa tridactyla*) Guillemot (*Uria aalge*) Razorbill (*Alca torda*)	Visual disturbance	**Yes** - Kittiwake (156 km), herring gull (58.8 km), guillemot (73.2 km) and razorbill (88.7 km) are screened in for further assessment as these cable corridors are within the species mean max foraging range	**SCREENED IN**
Howth Head Coast (ROI)	SPA	53.69	Kittiwake (*Rissa tridactyla*)	Visual disturbance	**Yes** - Kittiwake are screened in for further assessment as these cable corridors are within the species mean max foraging range (156 km)	**SCREENED IN**
Malahide Estuary (ROI)	SPA	56.63	Great Crested Grebe (*Podiceps cristatus*) Light-bellied Brent Goose (*Branta bernicla hrota*) Shelduck (*Tadorna tadorna*) Pintail (*Anas acuta*) Goldeneye (*Bucephala clangula*) Red-breasted Merganser (*Mergus serrator*) Oystercatcher (*Haematopus ostralegus*) Golden Plover (*Pluvialis apricaria*) Grey Plover (*Pluvialis squatarola*) Knot (*Calidris canutus*) Dunlin (*Calidris alpina*) Black-tailed Godwit (*Limosa limosa*) Bar-tailed Godwit (*Limosa lapponica*) Redshank (*Tringa totanus*) Wetland and Waterbirds	No pressure-receptor pathway identified	**No -** Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
North Bull Island (ROI)	SPA	57.07	Light-bellied Brent Goose (*Branta bernicla hrota*) Shelduck (*Tadorna tadorna*) Teal (*Anas crecca*) Pintail (*Anas acuta*) Shoveler (*Anas clypeata*) Oystercatcher (*Haematopus ostralegus*) Golden Plover (*Pluvialis apricaria*) Grey Plover (*Pluvialis squatarola*) Knot (*Calidris canutus*) Sanderling (*Calidris alba*) Dunlin (*Calidris alpina*) Black-tailed Godwit (*Limosa limosa*) Bar-tailed Godwit (*Limosa lapponica*) Curlew (*Numenius arquata*) Redshank (*Tringa totanus*) Turnstone (*Arenaria interpres*) Black-headed Gull (*Chroicocephalus ridibundus*) Wetland and Waterbirds	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Baldoyle Bay (ROI)	SPA	57.27	Light-bellied Brent Goose (*Branta bernicla hrota*) Shelduck (*Tadorna tadorna*) Ringed Plover (*Charadrius hiaticula*) Golden Plover (*Pluvialis apricaria*) Grey Plover (*Pluvialis squatarola*) Bar-tailed Godwit (*Limosa lapponica*) Wetland and Waterbirds	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
River Nanny Estuary and Shore (ROI)	SPA	61.86	Oystercatcher (*Haematopus ostralegus*) Ringed Plover (*Charadrius hiaticula*) Golden Plover (*Pluvialis apricaria*) Knot (*Calidris canutus*) Sanderling (*Calidris alba*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Herring Gull (*Larus argentatus*) Wetland and Waterbirds			
South Dublin Bay and River Tolka Estuary (ROI)	SPA	62.21	Light-bellied Brent Goose (*Branta bernicla hrota*) Oystercatcher (*Haematopus ostralegus*) Ringed Plover (*Charadrius hiaticula*) Grey Plover (*Pluvialis squatarola*) Knot (*Calidris canutus*) Sanderling (*Calidris alba*) Dunlin (*Calidris alpina*) Bar-tailed Godwit (*Limosa lapponica*) Redshank (*Tringa totanus*) Black-headed Gull (*Chroicocephalus ridibundus*) Roseate Tern (*Sterna dougallii*) Common Tern (*Sterna hirundo*) Arctic Tern (*Sterna paradisaea*) Wetland and Waterbirds	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Boyne Estuary (ROI)	SPA	64.04	Shelduck (*Tadorna tadorna*) Oystercatcher (*Haematopus ostralegus*) Golden Plover (*Pluvialis apricaria*) Grey Plover (*Pluvialis squatarola*) Lapwing (*Vanellus vanellus*) Knot (*Calidris canutus*) Sanderling (*Calidris alba*) Black-tailed Godwit (*Limosa limosa*) Redshank (*Tringa totanus*) Turnstone (*Arenaria interpres*) Little Tern (*Sterna albifrons*) Wetland and Waterbirds	No pressure-receptor pathway identified	**No -** Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Dalkey Islands (ROI)	SPA	64.04	Roseate Tern (*Sterna dougallii*) Common Tern (*Sterna hirundo*) Arctic Tern (*Sterna paradisaea*)	No pressure-receptor pathway identified	**No -** Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
Carlingford Lough (ROI)	SPA	68.28	Light-bellied Brent Goose (*Branta bernicla hrota*) Wetland and Waterbirds	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Dundalk Bay (ROI)	SPA	68.59	Great Crested Grebe (*Podiceps cristatus*) Greylag Goose (*Anser anser*) Light-bellied Brent Goose (*Branta bernicla hrota*) Shelduck (*Tadorna tadorna*) Teal (*Anas crecca*) Mallard (*Anas platyrhynchos*) Pintail (*Anas acuta*) Common Scoter (*Melanitta nigra*) Red-breasted Merganser (*Mergus serrator*) Oystercatcher (*Haematopus ostralegus)* Ringed Plover (*Charadrius hiaticula*) Golden Plover (*Pluvialis apricaria*) Grey Plover (*Pluvialis squatarola*) Lapwing (*Vanellus vanellus*) Knot (*Calidris canutus*) Dunlin (*Calidris alpina*) Black-tailed Godwit (*Limosa limosa*) Bar-tailed Godwit (*Limosa lapponica*) Curlew (*Numenius arquata*) Redshank (*Tringa totanus*) Black-headed Gull (*Chroicocephalus ridibundus*) Common Gull (*Larus canus*) Herring Gull (*Larus argentatus*) Wetland and Waterbirds	Visual disturbance	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
The Murrough (ROI)	SPA	70.97	Red-throated Diver (*Gavia stellata*) Greylag Goose (*Anser anser*) Light-bellied Brent Goose (*Branta bernicla hrota*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**

Site Name	Designation	Distance to nearest proposed cable corridor (km)	Feature(s) of Conservation Interest	Potential pressure	Likely to be significantly affected by intrusive survey works?	Screening Outcome
			Wigeon (*Anas penelope*) Teal (*Anas crecca*) Black-headed Gull (*Chroicocephalus ridibundus*) Herring Gull (*Larus argentatus*) Little Tern (*Sterna albifrons*) Wetland and Waterbirds			
Wicklow Mountains (ROI)	SPA	74.26	Merlin (*Falco columbarius*) Peregrine (*Falco peregrinus*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
River Boyne and River Blackwater (ROI)	SPA	74.48	Kingfisher (*Alcedo atthis*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Wicklow Head (ROI)	SPA	80.52	Kittiwake (*Rissa tridactyla*)	Visual disturbance	**Yes** - Kittiwake are screened in for further assessment as these cable corridors are within the species mean max foraging range (156 km)	**SCREENED IN**
Stabannan-Braganstown (ROI)	SPA	81.65	Greylag Goose (*Anser anser*)	No pressure-receptor pathway identified	**No** - Due to distance of site to project works, no pressure-receptor pathway identified.	**SCREENED OUT**
Poulaphouca Reservoir (ROI)	SPA	90.14	Greylag Goose (*Anser anser*) Lesser Black-backed Gull (*Larus fuscus*)	Visual disturbance	**Yes** - Lesser black-backed gull (147 km) are screened in for further assessment as these cable corridors are within the species mean max foraging range	**SCREENED IN**

APPENDIX B

Underwater Noise Risk Assessment

B.1 INTRODUCTION

One of the most important pressures to consider related to the proposed project is the effects of underwater sound changes on marine biota. This noise assessment will examine the effects underwater noise can have on marine species and whether the MaresConnect marine survey will have a significant effect on any species that have been identified as qualifying features of European sites included in the assessment, or as European Protected Species (EPS) that may be present in the area. The screening assessment has concluded that the only EPS species likely to be present in the vicinity of the survey area are marine mammals (whales, dolphins and porpoises), so these species have been included in the assessment.

B.2 SOURCES OF NOISE

B.2.1 Background sound

How a receptor is affected by a change in underwater sound is linked to the current exposure levels and associated background noise. Sounds in the ocean originate from natural causes such as earthquakes, rainfall, and animal noises; and anthropogenic activities such as shipping, fishing activities, seismic survey, research activities, sonars, and recreation activities. Although some sound sources can be identified, the sources of others cannot, and they are considered part of the background noise. All noise produced by anthropogenic activities above 20 – 30 dB above background noise is considered to have the potential for disturbance to sensitive marine mammals (Cato, 2009).

Background noise in the UK is influenced by human activities, such as from fishing activities, shipping vessels and fishing gear (Merchant *et al*., 2016). Within the Irish Sea, the majority of the background noise comes from shipping (Harland et al., 2006). The proposed survey corridors are adjacent to busy shipping routes linking the UK and Ireland and access to the Atlantic, with over 200,000 ships passing through per year at the busiest areas, which will generate significant background vessel noise (Marine Traffic, 2021).

Due to the lack of baseline data for the Irish Sea and specifically within the proposed survey corridors, specific background noise levels could not be considered in this assessment, though background noise does exist.

B.2.2 Continuous and impulsive sound

Based on frequency and intensity characteristics, anthropogenic sound is categorised into two groups: high-intensity impulsive sound; and continuous sound. Impulsive sounds are characterised by large fluctuations of pressure in time, and typically exhibit rapid rise times. Examples of impulsive sound includes pulses generated during pile driving, seismic surveys and explosives. Continuous noise is characterised by low levels of sound spread over a longer period of time, typically many seconds, minutes or even hours. The amplitude of the sound may vary throughout the duration, but the amplitude does not fall to zero for any significant time. Vessel noise and noise from small geophysical surveying equipment such as multi-beam echosounders fall within the category of continuous noise.

B.2.3 Survey equipment sound

The survey equipment being used during each part of the survey, and the type of noise produced by the equipment are displayed in Table B-1, below.

Table B-1 Summary of Survey Equipment

Equipment	Purpose	Sound Type								
		Onshore Survey	Geophysical	Shallow Geotechnical	Ground Truthing/ Environment	Crossings ROV		Frequency	Source level SPL (peak) in dB re 1 µPa	Sources
Sub-Bottom Profiler (SBP) – Boomer/Sparker	Provides information on superficial (20 to 50m) sediment structure		✓				Impulsive	Boomers: 0.5 – 5 kHz Sparker – 0.3 – 5 kHz	196 – 247 dB re 1 µPa	Danson (2005), King (2013), BOEM (2016), BEIS (2020), Jiménez-Arranz et al. (2020)
Sub-Bottom Profiler (SBP) – Chirper/Pinger	Provides information on superficial (20 to 50m) sediment structure		✓				Continuous	Chirp: 3-40 kHz Pingers: 2.5 – 7 kHz	196 – 247 dB re 1 µPa	
Side Scan Sonar (SSS)	Provides information about the seabed topology and presence of objects on the seabed		✓				Continuous	300 -900 kHz	200 – 240 dB re 1 µPa	BOEM (2016), BEIS (2020), DAHG (2014), Jiménez-Arranz et al. (2020)
Multibeam Echosounder (MBES)	Provides information about the seabed topology, surface morphology and presence of objects on the seabed		✓				Continuous	200 – 500 kHz	210 – 245 dB re 1 µPa	Danson (2005), Hopkins (2007), BEIS (2020), Jiménez-Arranz et al. (2020)
Ultrashort baseline (USBL)	A USBL system has a hull mounted transducer with a transceiver attached to survey equipment. It uses low frequency acoustic sound to verify subsea positioning.						Continuous	19 – 34 kHz	184 – 202 dB re 1 µPa	Jiménez-Arranz et al. (2020)
Borehole drilling	Provides sediment samples to 20m depth for testing	✓					Continuous	0.002 – 50 kHz	142 – 190 dB re 1 µPa	DAHG (2014), Erbe and McPherson (2017), BEIS (2020)
Vibrocore	Provides sediment samples to 6m depth for testing			✓			Continuous	30 – 50 Hz	<180-190 dB re 1 µPa	BOEM (2017), Chorney et al., (2011)
Cone Penetrometer Test (CPT)	Provides information concerning the mechanical properties of the near surface sediment	✓		✓			N/A	Sounds are those associated with concurrent drilling and/or vessels, these are not sonic techniques. Noise generated from		

Equipment	Purpose	Sound Type								
		Onshore Survey	Geophysical	Shallow Geotechnical	Ground Truthing/ Environment	Crossings ROV		Frequency	Source level SPL (peak) in dB re 1 µPa	Sources
Magnetometer	Detect metallic objects		✓					these operations is below levels commonly considered in marine noise regulations.		
Box cores/grab samples	Provides sediment and infauna samples for testing				✓					
ROV Photography/ DDV	Provides information on seabed features				✓	✓				
Unmanned Aerial Vehicle (UAV) Surveys	To establish topology and landscape features of the onshore environment	✓					Aerial UAV noise only	No underwater noise generated		

B.3 RISK ASSESSMENT

B.3.1 Receptor Sensitivity

B.3.1.1 Cetaceans and pinnipeds

Cetaceans and pinnipeds have evolved to use sound as an important aid in navigation, communication, and hunting (Richardson *et al*., 1995).

Southall *et al*. (2019) separated marine mammals into auditory groups based on their functional hearing sensitivity. The generalised hearing ranges of these groups are provided by the National Marine Fisheries Service (NMFS) (2018) as summarised in Table B-2, below.

High intensity or prolonged noise can cause temporary or permanent changes to animals' hearing. Where the threshold of hearing is temporarily altered, it is considered a temporary threshold shift (TTS), and the animal is expected to recover. If there is permanent aural damage (permanent threshold shift (PTS)) where the animal does not recover, social isolation and a restricted ability to locate food may occur (Southall *et al*., 2007).

Table B-2 Marine mammal groups based on auditory bandwidth

Group (based on auditory bandwidth)	Species observed within and in proximity to the Foreshore Licence Application Area	Auditory range
Low-frequency cetaceans (LF)	Minke whale, Humpback whale, Fin whale	7Hz – 35kHz
High frequency cetaceans (HF)	Short-beaked common dolphin, Common bottlenose dolphin, White-beaked dolphin, Long-finned pilot whale, Northern bottlenose whale	150Hz – 160kHz
Very high frequency cetaceans (VHF)	Harbour porpoise	275Hz – 160kHz
Pinnipeds in water	Grey seal Harbour seal	50Hz– 86 kHz
Pinnipeds in air		75Hz – 30kHz

Source: Southall et al 2019

The thresholds for the onset of PTS and TTS, as published in Southall *et al.* (2019) are provided in Table 4-2. These reflect the current peer-reviewed published state of scientific knowledge.

Table B-3 Injury thresholds for marine mammals from impulsive (SPL, unweighted) and continuous (Sound Exposure Level (SEL), weighted) sound

Auditory group	Impulsive noise		Continuous noise	
	SPL (unweighted) – dB re 1 µPa (peak)		SEL (24 hr, weighted) - dB re 1 µPa-2s	
	PTS onset	TTS onset	PTS onset	TTS onset
LF	219	213	199	179
HF	230	224	198	178
VHF	202	196	173	153
PW	232	226	219	199

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. An animal's ability to detect sound depends on its hearing sensitivity and the magnitude of the sound compared to the

background noise levels. In simple terms for a sound to be detected it must be louder than background noise levels and above the animal's hearing sensitivity at the relevant sound frequency. The direction of the sound is also important. Cetaceans are considered to have generalised hearing ranges. Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) (2011) use a reference value of 140 dB re. 1µPa (peak) for disturbance of harbour porpoise within European waters. A threshold of 145 dB re. 1µPa (peak) is used for pinnipeds in water based on research cited in Heinis and de Jong (2015). NRW have recommended 160 dB re. 1µPa isopleth as the threshold for disturbance for harbour porpoise from impulsive geophysical survey equipment in HRAs (as this constitutes Level B harassment) and 120 dB re. 1µPa for other continuous noise sources, such as vessel noises (NRW, 2023). As most noise research is focused on harbour porpoise due to their status as VHF mammals and therefore their greater risk to disturbance, these values have been applied to all marine mammals in this assessment to allow for a worst-case approach.

Introduced sound may cause behavioural responses in animals, such as individuals moving away from the sound source and remaining at a distance until the activities have passed. There may also be changes in foraging, migratory or breeding behaviours; all factors that can affect the local distribution or abundance of a species. Introduced sound may also cause masking or disruption of the animal's own signals, whether used for communication, foraging or other purposes. This may in turn affect foraging and reproductive opportunities. Behavioural disturbance to a marine mammal is hereafter considered as the disruption of natural behavioural patterns, for example: feeding, migration, breeding and nursing.

There are no published guidelines on disturbance thresholds due to the complexity and variability of the responses of marine mammals to anthropogenic disturbance. The JNCC have established a likely conservative EDR of 5 km for geophysical surveys, which includes all SBP types (JNCC 2020). The EDR represents the limit range at which disturbance effects have been detected (for example avoidance behaviour), specifically for harbour porpoise (Crocker & Fratantonio 2016, Crocker *et al*., 2019). On this basis, there is the potential for the proposed site investigations to induce a disturbance response in marine mammals within 5 km, in particular very high and high frequency cetacean species. Swimming at 1.5 m/s (Otani et al. 2000), marine mammals will be able to move out of this EDR in less than one hour.

B.3.1.2 Fish

Several features of a fish's anatomy, life cycle and habitats will determine the potential effects of sound on fish. Popper *et al*. (2014) classified sensitivity of fish species to underwater sound based on the presence or absence of a swim bladder, used by many teleost fish species for buoyancy control, hearing, respiration etc. Fish species that lack swim bladders, including shark species, are not as vulnerable to trauma from sound pressure changes and have low sensitivity to underwater noise (Popper *et al*., 2014).

Limited data is available to inform fish hearing capabilities however fish are able to detect sound pressure to hear from 1Hz to possibly 1kHz (Popper and Hawkins, 2018). Popper *et al*. (2014) provide sound exposure guidelines for injury to fish, which have been used in the assessment for continuous noise and impulsive noise.

Generally, fish species with specialisations for sound pressure detection (e.g. a swim bladder) can hear higher frequencies (between 200Hz – 3kHz) than fishes lacking morphological adaptations, which can detect sound at lower frequencies between 100Hz to 1kHz (Carroll *et al*., 2017).

The values for fish with swim bladders which are involved in hearing have been given in Table B-4, as these are the most sensitive category of fish.

Table B-4 Injury and disturbance thresholds for impulsive sound

Type of Animal	Mortality and potential mortal injury	Impairment	
		Recoverable injury	Temporary Threshold Shift (TSS)
Fish: swim bladder involved in hearing (primarily pressure detection)	>207 dB re 1 µPa (peak)	>207 dB re 1 µPa (peak)	186dB re 1 μPa^2.s

Popper *et al*. (2014) Table 7.4.

Nedwell *et al.* (2004) have categorised the hearing sensitivity of eleven fish species based on their anatomy. There is no information available on the sensitivity of smelt. Species with 'high' sensitivity are herring and sprat. 'Medium' sensitivity species are likely to have a restricted frequency range. Shad, from the Clupeidae family (the same as herring) are known to be sensitive to underwater sound and can detect ultrasonic signals to at least 180 kHz (Plachta and Popper, 2003). Sea lamprey are another protected species that may be present within the project area and have a hearing range of 50-300 Hz (Mickle *et al.* 2019).

Most activities operate within frequencies above the audible range for specialist hearing species, such as 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. Herring show significant avoidance behaviour within approximately 66m of cable laying activity (e.g. use of dynamic positioning (DP) thrusters) (Nedwell *et al*. 2012). European eel is less sensitive to underwater sound changes and therefore it could be inferred that the zone of significant disturbance would be less than that for herring.

B.3.2 Assessment

B.3.2.1 Vessel movements

For vessels such as those used for surveys the frequency range of the vessel movement and operation is 50-300 Hz with a Source Peak Level (SPL) (root mean square (RMS)) sound pressure of 160-175 dB re 1 µPa2 @ 1m (National Parks and Wildlife Service (NPWS), 2014). The survey vessels will use thrusters sporadically throughout the survey; therefore, the source level will fluctuate throughout the duration of the survey within this range.

The estimated sound levels exceed the thresholds for the onset of a temporary threshold shift for some species of cetaceans and pinnipeds, indicating that there is the potential for temporary auditory injury to these animals. As low frequencies travel further, a temporary avoidance response may be invoked by the project for species able to hear well at lower frequencies, such as the minke whale and harbour seal. Thompson et al. (2006) state that, for harbour seal, vessel noise may be audible up to 20 km from source, depending on the noise frequency; although evidence suggests that seals are able to habituate to anthropogenic noise.

Statoil ASA (2015) presents underwater modelling for a typical cable lay vessel using DP (expected to be similar to survey vessels using DP); concluding that the radius of the potential zone of disturbance for all marine mammals is 5 km. However, it notes that due to the worst-case assumptions made in the modelling (very precautionary approach assuming 120 dB re 1 µPa criteria for disturbance combined with worst case source noise assumptions), it is possible that the 5 km range is overly pessimistic. Statoil ASA (2015) also state that studies by Hermannsen et al (2014), Palka & Hammond (2001) and Barlow (1988) have reported avoidance ranges of 800 to 1,200 m for propeller driven ships. NRW (2023) recommend a 120 dB re 1 µPa2 isopleth for disturbance of harbour porpoise from

continuous noise sources such as vessels, Hatch et al., (2008) recorded typical 120 dB re 1 µPa isopleth of between 370m - 627m for research vessel sources, although it should be noted that real time sound modelling of more modern vessels has recorded much lower distances.

It is assumed that all marine mammals will move away at a speed of 1.5 m/s (Otani et al. 2000, Lepper et al. 2012) from a sound source level. This is considered conservative as there is data (McGarry et al. 2017, Kastelein et al. 2019, van Beest et al. 2018) to suggest that animals will, at least initially, move away at much higher speeds (e.g. harbour porpoise at 1.9m/s, Kastelein et al. 2019). During the proposed site investigations, the survey vessel will be operating at lower speeds, therefore it is expected that any individuals in proximity to the survey vessel will be able to move away from the area affected to avoid injurious noise levels. Whilst the action of moving away from a sound level is a behavioural response, animals will be able to return to the area immediately following the vessels transit through the area.

Fish are known to avoid vessels as it has been a problem during abundance research in the past. Much of the machinery required to move a vessel produces vibration varying in frequency that radiates in pressure waves from the hull, which could affect species with a large hearing range such as herring (Mitson and Knudsen, 2003). The avoidance behaviour exhibited by fish when a vessel approaches varies widely and can be observed when a vessel is up to 250 m away, suggesting that underwater noise propagates ahead of the vessel (Vabø *et al.* 2002). Avoidance behaviour can include diving and horizontal movements (De Robertis,and Handegard 2013). Based on their observed avoidance behaviour it is expected that the propagation of underwater noise generated by the vessel will give fish time to move out of a range that could cause injury, particularly as the vessel will be moving at a speed of no more than 4 knots. Disturbance is expected to be temporary, with fish in previous studies mostly returning to normal behaviour within 20 – 30 minutes (Weilgart 2018).

The vessel noise generated by the proposed surveys should be considered in the context of the existing background sound. Ambient sounds in the Irish Sea area dominated by shipping and other anthropogenic activities (Harland et al., 2006; Merchant, 2018). The proposed survey corridors cross and are adjacent to shipping lanes transiting from the UK to Ireland and heading south to the Atlantic, with more than 200,000 routes per km^2 per year, which is the equivalent to over 17 vessels passing every hour in some areas (Marine Traffic, 2021). As a result, marine mammals are likely to have some habituation to underwater noise generated by vessels (Cato, 2009; Thompson *et al*., 2006). Therefore, the change in underwater sound caused by the addition of the vessels for the proposed surveys will not be noticeable above natural and anthropogenic noise in the region.

The region is already used by large ships and ferries, particularly in the area surrounding the proposed survey route. The addition of a survey vessels is unlikely to be noticeable against the background of normal shipping activity fluctuations. In addition, survey operations will be temporary and transient, with the vessel moving slowly through the region. Therefore, no likely significant effects of disturbance to marine mammals are expected from the presence of survey vessels.

B.3.2.2 Geophysical survey

Sub-bottom profilers

SBP systems are used to produce images of the sub-structures of the seabed. SBPs include boomers and sparkers, which generate impulsive noise, and pingers and chirper systems which generate continuous noise. The resolution and type of images required determines which system is required. Sound intensity and frequency ranges of the sound sources to be used are given in Table B-1. All of the SBP sources transmit within the acoustic range of, and are therefore audible to some marine mammals, including harbour porpoise, bottlenose dolphin and grey seal (Danson, 2005; King, 2013; Bureau of Ocean Energy Management (BOEM), 2016).

Most sound energy generated by SBPs will be directed towards the seabed and the pulse duration is very short with the survey constantly moving. Individuals would have to travel directly below the equipment in order to be subjected to these peak sound pressure levels. For geophysical surveys it is best practice to follow the Joint Nature Conservation Committee (JNCC) guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017). JNCC (2017) affirms that adherence to the guidelines constitutes best practice and will, in most cases, reduce the risk of injury to marine mammals to negligible levels.

The UK Department for Business, Energy & Industrial Strategy (BEIS) undertook noise modelling as part of a review of consented offshore wind farms in the Southern North Sea SAC (designated to conserve harbour porpoise) which was based on the maximum source levels and bandwidths obtained from a range of SBPs. The results of the noise modelling demonstrated that for harbour porpoise in particular, the onset of PTS could arise from between 17 m and 23 m from source and potential behavioural effects within 2.4 km and 2.5 km (BEIS, 2020). This was based on the use of a Chirper with a peak SPL of 267 dB re 1 µPa-m, which is higher than the SPL range of many SBPs identified by research (Table B-1).However, for injury to occur, marine mammals are required to remain within this localised zone of ensonification for an extended period of time.

It is acknowledged that chirpers (and pingers) are more directional sources due to their use of periodic waveforms to emit sound, rather than boomer or sparker systems due to their use of pulsed sound emission. As a result, boomers and sparkers could have the potential for greater disturbance as sound has the potential to travel further. Boomers are recorded to have a – 3 dB beam width of between 46 – 90˚ with sparkers being mostly omnidirectional, compared to a – 3 dB beam width of between 36 – 80˚ for chirpers and a beam width of 55˚ at 3.5 kHz for pingers. For both pingers and chirpers higher frequency operations result in more focussed beams (Hartley Anderson Limited, 2020). Using a 160 dB re 1 µPa-m SPL isopleth (as recommended for geophysical disturbance by NRW (2023)), SBP are estimated to cause disturbance within a distance of between 50 m (± 13 m) to 338 m (± 121 m) depending on the water depth and sediment type using a sparker system (Halvorsen and Heaney, 2018). This was selected as a worst-case scenario based on likely water depths and sediments that will be encountered during the survey, as well as having the largest isopleth distances of the SBP types sampled in the study.

Research has shown that marine mammals can swim away from a sound source level at a speed of 1.5m/s (Otani *et al*., 2000, Lepper *et al*., 2012). This is considered conservative as there is research to suggest that animals will move away at much higher speeds e.g. harbour porpoise at 1.9 m/s (McGarry *et al.* 2017, van Beest *et al.* 2018; Kastelein *et al*. 2019), at least initially. During the proposed site investigations, the survey vessel will be operating at lower speeds, therefore it is expected that any individuals in proximity of the survey vessel will be able to move outside of the zone of ensonification to avoid injurious noise levels.

Behavioural impacts to marine mammals from project-related vessel noise are expected but are not extensive, severe or biologically significant. Impacts could include temporary disruption of communication or echolocation from auditory masking; behaviour disruptions of individual or localized groups of marine mammals; or limited, localized, and short-term displacement of individuals of any species from the immediate area around the vessels. These impacts will pass as the vessel moves through the area and normal behaviour will be re-established quickly. Individuals are expected to return to the site within a short period after operations have ceased however (Bowles et al. 1994; Morton and Symonds 2002; Stone and Tasker 2006; Gailey et al. 2007; Stone et al. 2017), with grey seals returning to a survey area after the use of a small airgun array within two hours (Gordon et al., 2003).

Based on the temporary and transient nature of the survey, injurious effects as a result of the SBP are considered highly unlikely and the duration of any potential disturbance is limited. SBP activities will be undertaken in accordance with JNCC guidelines for minimising disturbance and injury to marine

mammals. This will ensure that a 500 m pre shooting search zone is clear of marine mammals prior to starting operations and where applicable a soft start procedure will be implemented, reducing the possibility of impacting marine mammals during operations.

The frequency range of SBPs overlaps with the hearing ranges of fish, and, therefore, may be audible to some fish species and cause disturbance. The peak SPL for boomers may also exceeds the Popper *et al*. (2014) threshold for injury and mortality to fish given in Table 2-3. However, this would only occur within close proximity to the survey equipment. Fish are likely to leave the survey area during the survey activities horizontally or move to deeper water, away from the noise source (Løkkeborg and Soldal, 1993; Engas *et al.*, 1993, 1996). Therefore, it is unlikely that fish will experience significant impact other than temporary displacement from the immediate area surrounding the geophysical survey activity. Additionally, geophysical surveys progress relatively quickly, typically 1m/s (approximately 2 knots) and the maximum time that any point within an 83 m radius of the survey vessel would experience noise levels above the thresholds is less than 5 minutes. The impact to fish will be temporary and transient. Therefore, there is unlikely to be a significant impact to fish from boomers in the proposed surveys.

The operating frequency of SBPs overlaps with the hearing thresholds of diving birds. However, the sensitivity of diving birds, particularly red-throated diver (Joint SNCB, 2017; Schwemmer et al., 2011), to above-water disturbance which will be caused by the vessels undertaking the survey activities, means that it is unlikely that birds will forage and dive in the vicinity of the surveys. Additionally, the surveys will be transient and temporary so it is unlikely that there will be a significant impact to diving birds from the proposed surveys.

MBES

MBES are widely used in the marine environment to measure water depth by emitting rapid pulses of sound towards the seabed and measuring the sound reflected (BEIS 2020). Sound frequencies emitted, in water depths of less than 200m, are typically between 300 and 400kHz (Danson, 2005; Hopkins, 2007; Lurton and DeReutier, 2011). The equipment which will be used in the surveys has a minimum frequency of 200 kHz. Sound source levels have been reported ranging from 210 – 245 dB re 1µPa-m (Genesis 2011, Lurton and DeReutier 2011). Evidence has shown that MBES operating at greater than 200 kHz do not cause behavioural responses in harbour porpoise, known to be highly sensitive to disturbance (Dyndo et al. 2015). This is because the frequency range falls outside the hearing thresholds of marine mammals and the sound attenuates more swiftly than lower frequencies and operate at a lower power (JNCC 2017). The MBES survey will have a minimum frequency of 200 kHz, which is outside of the auditory range of marine mammals (Table 6-1, above) and will therefore not cause injurious or disturbance effects. For the same reason, fish and diving birds will also not experience injurious or disturbance effects.

Side Scan Sonar

Side Scan Sonar (SSS) systems operate at relatively high frequencies (between 300 - 900kHz) with maximum source levels up to 200-240 dB re 1 µPa-m (peak SPL) (SCAR 2002). The relatively high frequencies at which SSS operates will attenuate more swiftly than lower frequencies with sound levels reducing rapidly from the source. The operating frequency is outside of the hearing threshold of cetaceans, pinnipeds, fish and birds (Section B.3.1 above) and is therefore unlikely to cause disturbance or injury to these species.

Ultra-short baseline positioning

Ultra-short baseline (USBL) systems are used to determine the position of subsea survey items, including ROVs, towed sensors, etc. This involves the emission of sound from a vessel-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. A USBL system consists of a transducer, which is mounted on the vessel and a transponder attached to the

ROV. The transducer transmits acoustics through the water and the transponder sends a response which is detected by the transducer. USBL systems will be required for the execution of the majority of survey activities and may be required continuously throughout survey periods. The system operates by emitting a low frequency acoustic pulse between the transponder on the vessel and the transducer on the subsea unit. This means that USBL operate at a frequency outside of the auditory band of harbour porpoise, bottlenose dolphin and grey seal which are qualifying features of European sites in the survey area. Low frequency emissions propagate further than high frequency emissions, increasing the potential for exposure over a greater spatial area than would higher frequency emissions (such as those from MBES or SSS). However, the only low-frequency sensitive species expected to be present in the survey area is the minke whale, which has a low density estimate of approximately 0-0.005 individuals per 100 km^2 (Hammond *et al*., 2017), so the potential for an injury occurring should very low.

At a 160 dB re 1 µPa (considered Level B harassment), USBL can cause disturbance between 24 – 32 m (NOAA, 2020). The USBL system is likely to be employed intermittently, with gaps between noise emissions offering animals the opportunity to move away from the source and avoid exposure, especially considering the disturbance distance from the source is short. Considering that the surveys themselves will take place while the vessel is moving, the cumulative exposure level for the USBL system (as measured by the M-weighted SEL) will be lower based on the premise that animals are highly unlikely to follow the mobile noise source. The USBL maximum sound intensity of 202 dB re 1 µPa is likely to be very quickly dissipated to below the PTS SEL value of 199 dB re 1 µPa for low frequency hearing cetaceans. Therefore this activity is unlikely to present any risk to cetaceans in the area.

B.3.2.3 Geotechnical survey

Borehole drilling

There is limited publicly available data on noise generated by geotechnical borehole. Therefore, examples of comparable projects have been used to estimate the impact of underwater noise from borehole drilling.

Underwater noise measurements were recorded from a jack-up barge (JUB) undertaking geotechnical boreholes in Swansea Bay, Wales. This activity involved a percussion corer used to take soft sediment samples and rotary coring used for hard rock samples, which is similar to the method proposed in this survey. Sediment varied through the site from soft muds to coarse sand. Sediments were typically 20 m thick overlying sedimentary mud rock or shale. These conditions are similar to those within the survey area (EMODnet, 2021), and therefore the noise measurements provided below have been used as an analogy. During soft sediment coring, in the Swansea survey, the highest SPL recorded (at 23 m from the JUB) was 107 db re 1µPa (peak) at 10 Hz. For hard rock drilling the highest SPL was also 107 dB re 1µPa (peak) at 10 Hz but it was recorded at 7.5 m from the JUB (Willis *et al*., 2010).

Noise generated by borehole drilling from a JUB were also measured in Western Australia. During geotechnical site investigations involving shallow core drilling to 16-17 m in sand and mudstone source levels of 142–145 dB re 1 µPa rms @ 1 m (30–2000 Hz) were recorded (Erbe and McPherson, 2017).

Evidence reported in Nedwell and Brooker (2008) from a drilling operation with a comparable SPL of 162 dB dB re 1 µPa concluded that avoidance ranges for cetaceans were <100 m from the activity.

The threshold for disturbance is lower than for injury, but activity will be short in duration at each location (12 hours for geotechnical boreholes). Marine mammals are therefore unlikely to be disturbed by noise from the geotechnical survey, unless they are in close proximity to the work. This is unlikely given that the presence of the survey vessel and JUB will likely lead to small-scale temporary displacement of marine mammals. The boreholes will also be drilled within the intertidal and nearshore area, where mammals are likely to be already disturbed by other human activity taking

place off the North Wales coast. The borehole drilling will not take place in any SACs designated for marine mammals or pinnipeds.

The source level frequency for borehole drilling may be within the auditory range of hearing specialist fish, and so may cause disturbance. However, borehole drilling is below the Sound Exposure Level (SEL) for a TTS or injury to hearing fish (Popper *et al*., 2014). Therefore, borehole drilling will not cause a TTS or injury to fish during the proposed surveys. However, in the context of the baseline sound environment, the low frequency noise associated with borehole drilling for the proposed site investigations will not be distinct above natural and anthropogenic noise in the region. Any disturbance effects on fish from noise associated with operations will be localised, temporary and transient. There will be no long-term effect on the distribution of the species.

The frequency of underwater noise generated by borehole drilling overlaps with the hearing thresholds of diving birds. However, the sensitivity of diving birds, particularly red-throated diver (Joint SNCB, 2017; Schwemmer et al., 2011), to above-water disturbance which will be caused by the vessels undertaking the survey activities, means that it is unlikely that birds will forage and dive in the vicinity of the surveys. Additionally, the surveys will be transient and temporary so it is unlikely that there will be a significant impact to diving birds from the proposed surveys.

Vibrocore

Vibrocores are used to retrieve soil samples by penetrating the seabed with a tube using a vibration mechanism. A pneumatic or electric vibrahead vibrates the tube, causing the sediment to liquify and facilitating penetration into the sediment. These vibrations emit low levels of noise, with low frequencies emitted and a SPL of up to 180 to 190 dB re 1 µPa (BOEM, 2017). This is within the threshold to cause TTS for some marine mammal species (Table B-3).

Vibrocores are only used for short durations, typically around 10 minutes per sample until the vibrocore is submerged and a sample can be taken. For marine mammals and fish to experience TTS they would have to be continuously exposed to the noise at close proximity for 12 hours. Additionally, individuals are likely to move away from the source of the sound. Therefore, given the intermittent and short-term nature of vibrocore sampling, marine mammals and fish are unlikely to experience TTS and there will be no injurious effects.

Marine mammals and fish may temporarily move away from the surveys during vibrocore sampling. However, due to the short sampling duration for vibrocore, marine mammals will also likely only experience small-scale temporary displacement from the area. There will be no long-term effect on the distribution of these species.

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 or risk of injury to marine mammals or fish from vibrocore sampling as part of the proposed site investigations.

B.4 CONCLUSION

In conclusion, the proposed MaresConnect marine survey will not have a distinct effect on any population of qualifying marine species or EPS that may be present within the project area. The assessment results show that multi-beam echosounder and side scan sonar equipment operates at frequencies outside of the hearing range of species expected to be present in the vicinity of the survey corridor. Additionally, the guidance from JNCC (2017) that states that any multi-beam surveys in waters shallower than 200 m do not require mitigation as the as the higher frequencies used attenuate more quickly than lower frequencies.

Whilst the sub-bottom profiler may operate at frequencies that could potentially cause harm to cetaceans, pinnipeds and sensitive fish species, the survey vessel will be moving at slow speeds

allowing any affected animals to move away from the noise source without long-term impacts. The activities and noise sources involved in the project are temporary and transitory thereby the duration of any disturbance is limited, meaning there will be no long-term effect on the distribution of designated marine mammal species or EPS.