



Vermilion Exploration & Production Ireland Ltd

Corrib Subsea Infrastructure Inspection and Maintenance Surveys - 2021

Natura Impact Statement

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1 EXECUTIVE SUMMARY

This Natura Impact Statement provides an assessment of the potential environmental impacts of a programme of offshore infrastructure inspection and maintenance surveys in relation to European Protected Sites. The work programme includes geophysical and visual inspection of the Corrib main offshore gas export pipeline and sections of the umbilical, the terminal treated surface water outfall pipeline, and infield flowlines and umbilicals and associated repair and maintenance activities.

The offshore and nearshore elements of the work programme will investigate features such as free-spanning and scouring, pipeline burial depth and integrity, as well as cathodic protection measures. The survey will be carried out using a combination of acoustic survey techniques (e.g. multibeam echo sounder, sub-bottom profiler, side-scan sonar). In addition, a visual survey using underwater video / camera imagery and ROV will be undertaken.

Pipeline maintenance tasks to ensure continued pipeline and structure integrity, protection and stability will include ROV water jet cleaning, placement of rock filter units or adjustment of physical protection devices for pipeline stabilisation or freespan correction, production choke valve or subsea control module replacement, wall thickness checks, and sacrificial anode checks, as necessary.

The work scope is proposed to take place between May and September 2021¹.

This document is a statutory requirement and has been prepared in accordance with Irish governmental guidance in order to support an Appropriate Assessment should the competent authority decide that such an assessment is required. It is the opinion of the authors of this assessment that all impacts are however screened out of requiring an Appropriate Assessment.

An outline of the Appropriate Assessment (AA) process is provided in Section 2 of this report, while Section 3 provides a background to the Corrib Gas development and outline details of the proposed works. The ecological characteristics of European sites in the vicinity of the proposed survey activities are described in Section 4 of this document, followed by an initial screening of impacts in Section 5, and then an assessment of likely effects and residual impacts on European sites in Section 6. Conclusions are set out in Section 7.

¹ Subject to regulatory approvals and efficient vessel programme timings.

2 INTRODUCTION

2.1 Purpose of this document

This Natura Impact Statement (NIS) provides an assessment of the potential environmental effects of the proposed inspection and maintenance surveys of the full length of the main offshore gas export pipeline and sections of the umbilical, the Bellanaboy Bridge Gas Terminal (BBGT) treated surface water outfall pipeline, and infield flowlines and umbilicals, in relation to European protected ('Natura 2000') sites. The document provides the information necessary for the competent authority to undertake an Appropriate Assessment to assess the effects of the project against the qualifying features (conservation objectives) of nearby or relevant Natura 2000 sites.

This has been prepared in accordance with the Birds and Natural Habitats Regulations² (SI 477 of 2011) and current guidance of the National Parks and Wildlife Service (NPWS) as described in 'Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities (Department of Environment, Heritage and Local Government³, 2009 (as revised February 2010))'.

The approach and methodology in assessing the environmental implications of the proposed activities for this NIS has been undertaken with due regard to the EPA 'Advice Notes for Preparing Environmental Impact Statements' (2015); EPA 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2017); and the Chartered Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Coastal and Marine (CEEM, 2018).

The ecological characteristics of European sites in the vicinity of the proposed survey activities are described in Section 4 of this document, followed by an initial screening of impacts in Section 5, and then an assessment of likely effects and residual impacts on European sites in Section 6. Conclusions are set out in Section 7.

The document provides an initial impact screening assessment for offshore survey activities followed by an assessment of impacts, which are scheduled to take place during the summer and autumn months of 2021. This document outlines the information required in order to assess whether or not the proposed activities, either when taken alone or in combination with any other offshore works, are likely to have a significant effect on a European site.

This assessment takes cognisance of the CJEU judgement in Case C-323/17 *People Over Wind & anor. v. Coillte*, which ruled that "*it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project*".

By undertaking the impact assessment in a stepwise manner in relation to the habitats and species of these sites, together with their conservation objectives, this document seeks to inform the screening process required at the first stage of the process pursuant to Article 6.3 of the EU Habitats Directive and also to provide full and detailed information as required for the second stage, that of Appropriate Assessment should the competent authority decide that such an assessment is required.

² SI 477 of 2011 European Communities (Birds and Natural Habitats) Regulations 2011

³ As of 2016 the Department of Environment, Heritage and Local Government is known as the Department of Housing, Planning, Community, and Local Government

2.2 The stages of Appropriate Assessment

The requirement for appropriate assessment is set out in Article 6(3) of the EU Habitats Directive (92/43 EEC)⁴, which states:

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

Should a decision be reached to the effect that it cannot be said with sufficient certainty that the proposed annual inspection and maintenance survey of the Corrib subsea infrastructure is not likely to have significant effects on the Natura 2000 sites, then, as is stated above, it is necessary and appropriate to carry out an Appropriate Assessment of the implications of the proposed activity for the European sites in view of their conservation objectives.

The guidance for Appropriate Assessment (NPWS, 2009, revised February 2010) states:

*“AA is an impact assessment process that fits within the decision-making framework and tests of Articles 6(3) and 6(4) and, for the purposes of this guidance, it comprises two main elements. Firstly, a **Natura Impact Statement – i.e. a statement of the likely and possible impacts of the plan or project on a Natura 2000 site (abbreviated in the following guidance to “NIS”)** must be prepared. This comprises a comprehensive ecological impact assessment of a plan or project; it examines the direct and indirect impacts that the plan or project might have on its own or in combination with other plans and projects, on one or more Natura 2000 sites in view of the sites’ conservation objectives. Secondly, the competent authority carries out the AA, based on the NIS and any other information it may consider necessary. The AA process encompasses all of the processes covered by Article 6(3) of the Habitats Directive, i.e. the screening process, the NIS, the AA by the competent authority, and the record of decisions made by the competent authority at each stage of the process, up to the point at which Article 6(4) may come into play following a determination that a plan or project may adversely affect the integrity of a Natura 2000 site”.*

The European Commission’s guidance promotes a four stage process, as set out in Box 1 below (Figure 2-1), to complete the Appropriate Assessment, and outlines the tests required at each stage. Stages 1 and 2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of Article 6(3) or a necessary precursor for Stage 4.

⁴ Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, as amended by Council Directive 97/62/EC

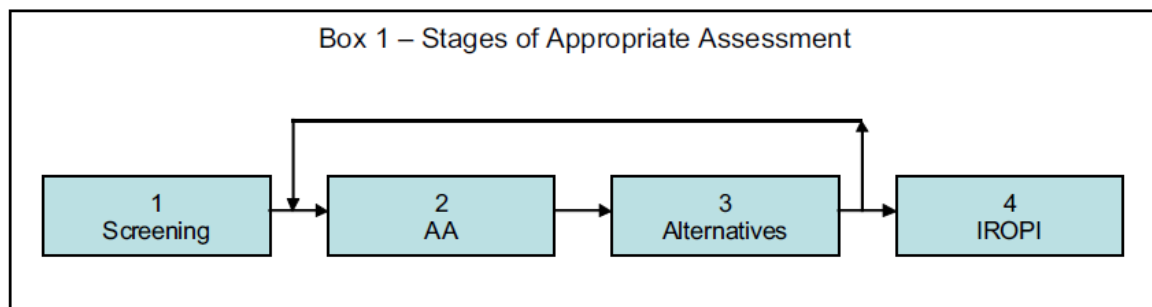


Figure 2-1: Stages of Appropriate Assessment

This NIS includes the ecological impact assessment and testing required under the provisions of Article 6(3) by means of the first stage of Appropriate Assessment, the screening process (as set out in the EU Guidance documents).

The NIS also provides the information required for the Competent Authority to complete the Appropriate Assessment (Stage 2) should this be necessary and appropriate in their opinion. An evaluation of alternatives has also been provided to demonstrate that all feasible alternatives for the proposed development had been considered and that the option with the least ecological impacts has been selected.

The first stage of an Appropriate Assessment is the screening exercise, which is undertaken to determine if it is necessary to proceed with further stages.

The Department of the Environment, Heritage and Local Government's⁵ guidance (2009 revised February 2010)) states:

"Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3):

- *whether a plan or project is directly connected to or necessary for the management of the site; and*
- *whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a European site in view of its conservation objectives.*

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation, unless potential impacts clearly can be avoided through the modification or redesign of the plan or project, in which case the screening process is repeated on the altered plan. The greatest level of evidence and justification will be needed in circumstances when the process ends at screening stage on grounds of no impact."

Section 5 comprises the required assessment as laid out in the screening sections and screening matrix of the guidance documentation⁶ (Stage 1 of the AA process). While Section 6 assesses the impacts (if any) on the integrity of Natura 2000 sites (Stage 2 of the AA process).

⁵ As of 2016 the Department of Environment, Heritage and Local Government is known as the Department of Housing, Planning, Community, and Local Government

⁶ EC (2018): European Commission. Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, (21-11-18) C (2018) 7261 Final. Commission Notice Brussels

With regard to the screening process (Stage 1), EU Commission guidance⁷ states:

“This stage examines the likely effects of a project or plan, either alone or in combination with other projects or plans, upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant. This assessment comprises four steps:

- *determining whether the project or plan is directly connected with or necessary to the management of the site;*
- *describing the project or plan and the description and characterisation of other projects or plans that in combination have the potential for having significant effects on the Natura 2000 site;*
- *identifying the potential effects on the Natura 2000 site;*
- *assessing the significance of any effects on the Natura 2000 site”.*

2.3 Previously Assessed Activities

Offshore and nearshore pipeline surveys have been assessed previously in the Offshore Supplementary Update Report (RSK, 2010) and have been undertaken as assessed and approved under the 2011 Section 40 Consent.

A Natura Impact Screening Statement (NISS, EACS, 2015) was submitted as part of the Consent to Operate application in 2015. This considered the future activities associated with the offshore pipeline and concluded that “the operation of the Corrib Pipeline when taken either individually or in combination with other plans of projects is not likely to have any significant effect on any European site”. The conclusion concurred with those of previous assessments and approvals were given by the Minister following his Department’s consultations with prescribed bodies and assessment by external consultants. The previous assessments included those submitted between 2013 and 2019 a number of Natura Impact Screening Statements (NISS) that were submitted to the Department of Communications, Energy, and Natural Resources (DCENR⁸) (between 2016 and 2020 these were submitted to the Department for Communications, Climate Action and the Environment (DCCAE) for the approval of offshore surveys. The most recent approved submission (2019) was an NIS for annual inspection, maintenance and renewal surveys of the Corrib offshore pipeline route corridor and in-field flowlines (RSK, 2019) which was approved by the DCCAE on the 26th November 2019 subject to review by the Petroleum Affairs Directorate (PAD). This work was completed in the summer months of 2020 and this proposed scope of work will follow similar principles. These screening reports took into consideration the potential impacts on the West Connacht Coast SAC, the designation of which was notified (2012) subsequent to the 2011 Section 40 Consent, as well as other European sites in the wider locality, with the potential to be affected by the survey activities.

Marine mammal monitoring carried out in relation to offshore activities subsequent to the Offshore Supplementary Report (RSK, 2010) and the 2011 Section 40 Consent is described in four marine mammal monitoring reports describing the annual monitoring undertaken by the Coastal and Marine Research Centre (CMRC) of University College Cork (Anderwald et al., 2011; 2012, Haberlin et al., 2013, Culloch et al., 2014).

In addition to the NISS reports (described above) submitted in support of applications for surveys of the offshore pipeline, a Natura Impact Statement was submitted for an Ocean Bottom Cable (OBC) seismic survey of the Corrib Gas Field (to support the Appropriate

⁷ Paragraph 3.1 of ‘Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological Guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (Nov. 2001)

⁸ From 2016 the DCENR is known as the Department of Communications, Climate Action and the Environment (DCCAE)

Assessment process for the West Connacht Coast SAC) (2013).

Vermilion is committed to the reduction of environmental impacts throughout the Corrib Development and will implement best practice with respect to marine mammals throughout any activities along the offshore pipeline route (including in the vicinity of the West Connacht Coast SAC). The procedures implemented for their protection are in compliance with all requirements imposed on the Corrib Development by the statutory agencies.

Furthermore, Article 42 of S.I 477 of 2011 European Communities (Birds and Natural Habitats) Regulations 2011 stipulates that screening for Appropriate Assessment of a plan or project not directly connected with or necessary to the management of a European Site shall be carried out by the competent authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site.

2.4 Alternatives

The primary objective of the proposed subsea inspection and maintenance survey is to inspect and assess pipeline / umbilical and other subsea infrastructure integrity using a range of techniques along with small-scale maintenance / repair works and identification of any future required maintenance activities.

This annual survey is a monitoring condition of the projects licence to operate and as such the operator is committed to carrying out the work, which will comprise visual means and low intensity geophysical techniques. The survey techniques and equipment have been selected, following the evaluation of a number of alternatives from different prospective contractors, based on their data acquisition performance and low ecological impact. The survey work will aim to be carried out over a short a timescale as possible in order to minimise any disturbance.

The survey work scope and methodology has been developed in order to comply with statutory requirements for offshore working. This will be discussed further in the assessment of likely effects (Sections 5 and 6).

2.5 Consideration of significance

In terms of significance, the NPWS Guidance (2010) uses an EC definition as follows:

"... any element of a plan or project that has the potential to affect the conservation objectives of a Natura 2000 site, including its structure and function, should be considered significant (EC, 2006)".

Other guidance documents also discuss significance criteria, some in more detail than others. The Dutch Guidance⁹ (translated, Neumann, 2004) discusses a number of criteria in relation to habitats and species population.

In general, significance indicators might include:

- impact on Annex I habitat (including loss or reduction in size - percentage relative to the overall area of the habitat in the Natura site; impairment of function);
- fragmentation of habitat or population (depending upon the duration or permanence);
- disturbance (noise, light etc. – distance from disturbance, duration of disturbance);
- effect on species populations (direct or indirect damage to size, breeding patterns etc),

⁹ Translated from Publication of Dutch State Printers in book: 'Praktijkboek Habitattoets', 2004 (F. Neumann en H. Woldendorp, SDU)

and;

- changes in water quality.

To summarise the significance issue, it is useful to quote from Morris (2008) who describes significance in the context of the Habitats Directive as follows:

“...Within the Habitats Regulations, significance is quite different. It is used as a coarse filter and the test is a question over the possibility that there will be a significant effect on a key receptor that determines the conservation status of a European site. Thus, determining whether there will be a ‘likely significant effect’ does not imply that there will be such an effect or even that such an effect is more likely than not; it simply flags the need to test the issues and then make a judgement of the pathways and mechanisms imposed by a project on the designated wildlife interest. This test best equates to the screening and scoping opinions sought for an EIA but is confined to the Natura 2000 and Ramsar interest rather than wider environmental or nature conservation issues”.

2.6 Consideration of integrity

In order to assess the likely impacts and ascertain whether a significant impact on the integrity of the Natura site(s) is likely to occur as a result of the proposed development, should the appropriate assessment process be deemed to apply, it is necessary to consider what constitutes the integrity of a Site as referred to in Article 6(3). The document Managing Natura 2000 Sites, the provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC (2000) (Updated November 2018) gives clear guidance in this regard and states:

“The integrity of the site involves its constitutive characteristics and ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the habitats and species for which the site has been designated and the site’s conservation objectives”.

Integrity has been discussed and defined in various ways in guidance documentation and the literature. For example, Treweek (1999) discusses biological integrity and ecosystem health and refers to three generally accepted criteria: systematic indicators of ecosystem functional and structural integrity; ecological sustainability or resilience (relating to the ability of a system to withstand “natural” or anthropogenic stresses); and absence of detectable symptoms of ecosystem disease or stress. A similar, but less academic, approach is adopted by the various guidance documents with a number of definitions proposed.

3 PROPOSED ACTIVITIES

3.1 Background – an overview of the Corrib Gas Development

The Corrib natural gas field is located approximately 65 km offshore from the closest coast of northwest County Mayo. This gas field has been developed as a subsea ‘tie-back’ facility, connected by a pipeline to an onshore processing terminal (Bellanaboy Bridge Gas Terminal) located approximately 9 km inland.

All of the statutory permits and consents necessary to develop the Corrib gas field and associated facilities and infrastructure were in place at the end of 2004 when construction commenced. By November 2009 the offshore production facilities had been installed and the 83 km offshore section of the Corrib pipeline between the field and the landfall had been laid. To allow the connection of the Corrib development with the national gas distribution network the 150 km Galway to Mayo pipeline was completed in 2006 and is now connected to the terminal. Construction of the 8 km onshore section of the Corrib pipeline from the initial landfall at Glengad to the BBGT was completed in 2015.

Following the approval of the consent to operate in 2015, the development was fully commissioned and went into operation at the end of 2015 when first gas was achieved.

3.2 Overview of work scope – Survey and localised maintenance of the main export pipeline, umbilical, BBGT treated surface water outfall pipeline, and infield flowlines and umbilicals

The proposed 2021 survey programme will include geophysical and visual inspection of the bulk of the Corrib subsea marine infrastructure between the Corrib Field and the landfall at Glengad (see Figure 3-2) and associated repair and maintenance activities.

The proposed work scope will comprise two main components:

- Offshore pipeline and subsea structure inspection and associated repair / maintenance work from the construction / ROV vessel *Edda Sun*. This vessel will be responsible for the survey and maintenance works covering the area of the Corrib offshore field assets as well as seabed infrastructure as far inshore as Broadhaven Bay. Some limited maintenance works will be undertaken where necessary to ensure pipeline integrity and stability on the seabed. This may include localised areas of seabed sediment dredging (using a mini dredge tool) as well as the placement of rock filter bags onto the pipeline.
- Nearshore pipeline inspection using the survey vessel *Leah-C*. This vessel will be responsible for the survey covering the area primarily within Broadhaven Bay as far as the inshore limit of safe navigation.

The offshore and nearshore elements of the work programme will investigate features such as free-spanning and scouring, pipeline burial depth and integrity, as well as cathodic protection measures. The survey will be carried out using a combination of acoustic survey techniques (e.g. multibeam echo sounder, sub-bottom profiler, side-scan sonar). In addition, a visual

survey using underwater video / camera imagery and ROV will be undertaken.

3.2.1 Primary acoustic survey equipment

Details of the proposed acoustic survey equipment is presented in Table 3-1.

For the offshore survey, the majority of geophysical survey equipment will be mounted to an ROV deployed from the *Edda Sun*.

For the nearshore survey equipment will largely be attached directly to the hull of the *Leah-C* (with the exception of the side-scan sonar transducers and the mini ROV).

A range of other equipment for navigation / positioning and calibration will be used that will have an acoustic signature, as follows:

- A sound velocity probe will be deployed occasionally throughout the surveys to provide salinity, conductivity, temperature and sound velocity depth information. These probes operate at an extremely high frequency of around 2.5 MHz at a very low level of intensity. This allows periodic calibration of the primary acoustic survey sensors.
- Both vessels are likely to have single beam depth echosounders (operating at around 50 kHz) and ultra-short baseline acoustic profiling systems (USBL) for maintaining position and communications with any deployed equipment. USBL systems operate at a frequency of between 19 and 34 kHz at a very low intensity.
- The offshore vessel will also utilise a doppler velocity log (DVL) for accurate positioning and speed determination. This operates at an extremely high frequency of 2 MHz at a very low level of intensity.

The following sections provide additional discussion regarding the primary acoustic survey equipment.

3.2.1.1 Multi-beam echosounder (MBES)

MBES are commonly used to create densely-sampled digital terrain models that can be used to further define topography and assist in oil and gas field development phases, when planning the location of wellheads, platforms, and pipelines, and in maintenance activities which require detailed seabed information.

MBES transmit sound energy and analyse the return signal (echo) that has bounced off the seafloor or other objects. This is done by emitting sound waves from directly beneath a ship's hull (or similar) to produce fan-shaped coverage of the seafloor. The MBES system records the time taken for the acoustic signal to travel from the transmitter (transducer) to the seafloor (or object) and back to the receiver. MBES produce a "swath" of soundings (i.e. depths) to ensure full coverage of an area. The coverage area on the seafloor is dependent on the depth of the water, with coverage typically being two to four times the water depth.

The MBES equipment will be hull mounted on the *Leah-C* for the nearshore survey in the confined waters of Broadhaven Bay, while it is likely to be mounted to the ROV of the *Edda Sun* for the offshore section of the survey. ROV mounting for the deeper water sections of the survey will result in a relatively short distance between the acoustic source and the seabed allowing for the acquisition of high-resolution seabed data.

Table 3-1: Proposed principal survey equipment specification and frequency ranges for proposed 2021 survey programme

| Vessel | Specification | Frequency range |
|-------------------------------|---|--|
| <i>Leah-C</i> | Sub bottom profiler Preferred option: Neptune T335 Alternative option: Geoacoustics TR-1075D | 3 - 8 kHz 3 - 8 kHz |
| | Multi-beam echosounder Preferred option: NORBIT WBMS high frequency MBES Alternative option: R2Sonic 2024 Alternative option: R2Sonic 2022 Alternative option: Reson TC2181 single head Alternative option: Teledyne RESON 7125 | 400 kHz (typically operating between 350 - 400 kHz) 200 - 400 kHz (typically operating between 350 - 400 kHz) 200 - 400 kHz (typically operating between 350 - 400 kHz) 190 - 420 kHz (typically operating 400 kHz) 200kHz or 400kHz (dual frequency available), typical operating 350kHz – 400kHz |
| | Side-scan sonar Preferred option: Edgetech 4200-MP Alternative option: Edgetech 4125 Alternative option: Klein 3000H | Dual frequency 300 kHz and 600 kHz Dual frequency 400 kHz and 900 kHz Dual frequency 445 kHz and 900 kHz |
| | Mini ROV inspection class Preferred option: BlueROV2 | No acoustic signature |
| | Sound Velocity Probe Valeport Mini SVP/SVS | 2.5 MHz |
| | | |
| <i>Edda Sun (ROV mounted)</i> | Multibeam echosounder Reson Seabat 7125 dual head | 400 kHz |
| | Obstacle avoidance sonar Kongsberg MS1000 | 675 kHz |
| | Doppler Velocity Log | 1200 kHz |

| Vessel | Specification | Frequency range |
|--------|--|------------------------------------|
| | RDI Workhorse | |
| | Bathymetric system with altimeter Tritech SK704 | 500 kHz |
| | Mini USBL Sonardyne Mini Ranger Transponder and responder | 19-34 kHz |
| | Pipe tracker TSS 440 | Negligible magnetic field strength |

3.2.1.2 Sub-bottom profiler

Sub-bottom profiler systems are used to identify and measure the various marine sediment layers that exist below the sediment / water interface.

These acoustic systems use a technique that is similar to single beam echo sounders and emit an acoustic signal vertically downwards into the water and a receiver monitors the return signal reflected off the seafloor. Some of the acoustic signal will penetrate the seabed and be reflected when it encounters a boundary between two layers that have different acoustic impedance. Acoustic impedance is related to the density of the material and the rate at which sound travels through the material. When there is a change in acoustic impedance, part of the transmitted sound is reflected. The system uses this reflected energy to record a profile of the marine sediment layers beneath.

The sub-bottom profiler will only be used on the nearshore component of the survey, deployed from the *Leah-C*.

3.2.1.3 Side-scan sonar

Side-scan sonar is used to determine the texture, topography and character of the seabed sediments and to detect features such as boulders, outcrops, pipelines, wellheads and other equipment lying on, attached to, or buried immediately beneath the seafloor.

A side-scan sonar transmits sound energy and analyses the return signal (echo) that has bounced off the seafloor or other objects. Side-scan sonar typically consists of three basic components: towfish or hull mounted transducer, transmission cable, and topside processing unit. In a side-scan, the transmitted energy is formed into the shape of a fan that sweeps the seafloor from directly under the towfish or vessel hull to either side, typically to a distance of 100 metres (depending on factors including water depth, and signal strength). The strength of the return echo is continuously recorded, creating a "picture" of the ocean bottom. For example, objects that protrude above the seabed create a dark area (strong return) and shadows from these objects are light areas (little or no return). Side-scan sonar is typically used in conjunction with multibeam to meet full bottom coverage specifications.

Side-scan sonar will only be used for the nearshore component of the survey, deployed from the *Leah-C*.

It should be noted that the acoustic sources proposed for the survey are a number of orders

of magnitude lower in intensity than those used in conventional seismic surveys.

3.2.1.4 *Soft start*

A soft start involves a gradual ramping up of sound intensity from underwater acoustic equipment to allow marine fauna to move away from the area before they are exposed to significant noise levels.

According to the NPWS 'Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters' (2014), soft start for acoustic surveys is required for surveys within bays, inlets or estuaries and within 1,500 m of the entrance of enclosed bays / inlets / estuaries or as advised by the relevant regulatory authority. As such, soft start procedures will be required for survey work within Broadhaven Bay. However, in line with environmental best practice, soft start procedures will be followed throughout the extent of the survey route (both nearshore and offshore).

If the intensity cannot gradually be increased from a low level to operational levels, then the equipment can be switched on and off in a sequential manner for a few seconds at a time for a soft start / ramp up period of 20 minutes prior to the equipment being used for operations (NPWS, 2014).

3.2.2 **Other inspection / maintenance survey equipment**

In addition to the above, the following equipment may be utilised during the survey and maintenance operations:

- Pathfinder laser profiler – ROV with integrated laser and imaging system with stills and video camera for pipeline integrity and seabed inspection works.
- Tracerco Discovery tool or ARTIMIS Halfwave tool – for checking pipeline wall thickness and integrity (uses the same principles as medical CT scanner), deployed using ROV.
- STS 8 Inch E Piranha Dredger – mounted to a standard STS dredge deployment frame, to be used where pipeline spans have been identified using the equipment above. The mini dredger will undertake limited reprofiling of the seabed in those areas required to ensure full pipeline stability. The mini dredge tool will be deployed from the ROV.

3.3 **Schedule**

Total data acquisition period for the offshore and nearshore survey will be approximately 20 days (dependent on weather conditions) with the operations taking place between May and September 2021.

3.4 **Vessels**

A large construction / ROV vessel the *Edda Sun* (see Table 3-2 and Figure 3-1) will provide survey capability for the offshore inspection and maintenance survey.

A smaller multipurpose inshore vessel the *Leah-C* (see Table 3-2 and Figure 3-1) will be used to undertake survey work in nearshore areas.

The determination of 'offshore' and 'nearshore' areas, for the purposes of this document, has

assumed a boundary at a water depth of approximately 20 m below Chart Datum, however, the location of this boundary may be refined closer to the time of the survey. The *Edda Sun* would therefore be responsible for the survey of the subsea infrastructure covering the area of the Corrib Field to within Broadhaven Bay, while the *Leah-C* would limit its survey operations to within the Bay itself in depths of 20 m or less and would cover the section of the route close to the landfall at the limit of safe navigation.

Table 3-2: Survey vessel specifications

| Parameter | Specification | |
|---------------------------|--|---|
| Name | <i>Leah-C</i> | <i>Edda Sun</i> |
| Owner | Michael Callaghan, Killybegs Co. Donegal – operated by Belcross Enterprises | Østensjø Rederi A/S |
| Survey main contractor | Ultrabeam hydrographic | Fugro |
| Type | Multipurpose inshore vessel | Multipurpose survey and construction support vessel |
| Length (overall) | 11 m | 88.8 m |
| Draught (Mean) | 1.2 m | 6.6 m |
| Tonnage (Gross) | 8.5 t | 4953 t |



Leah-C



Edda Sun

Figure 3-1: Proposed survey vessels

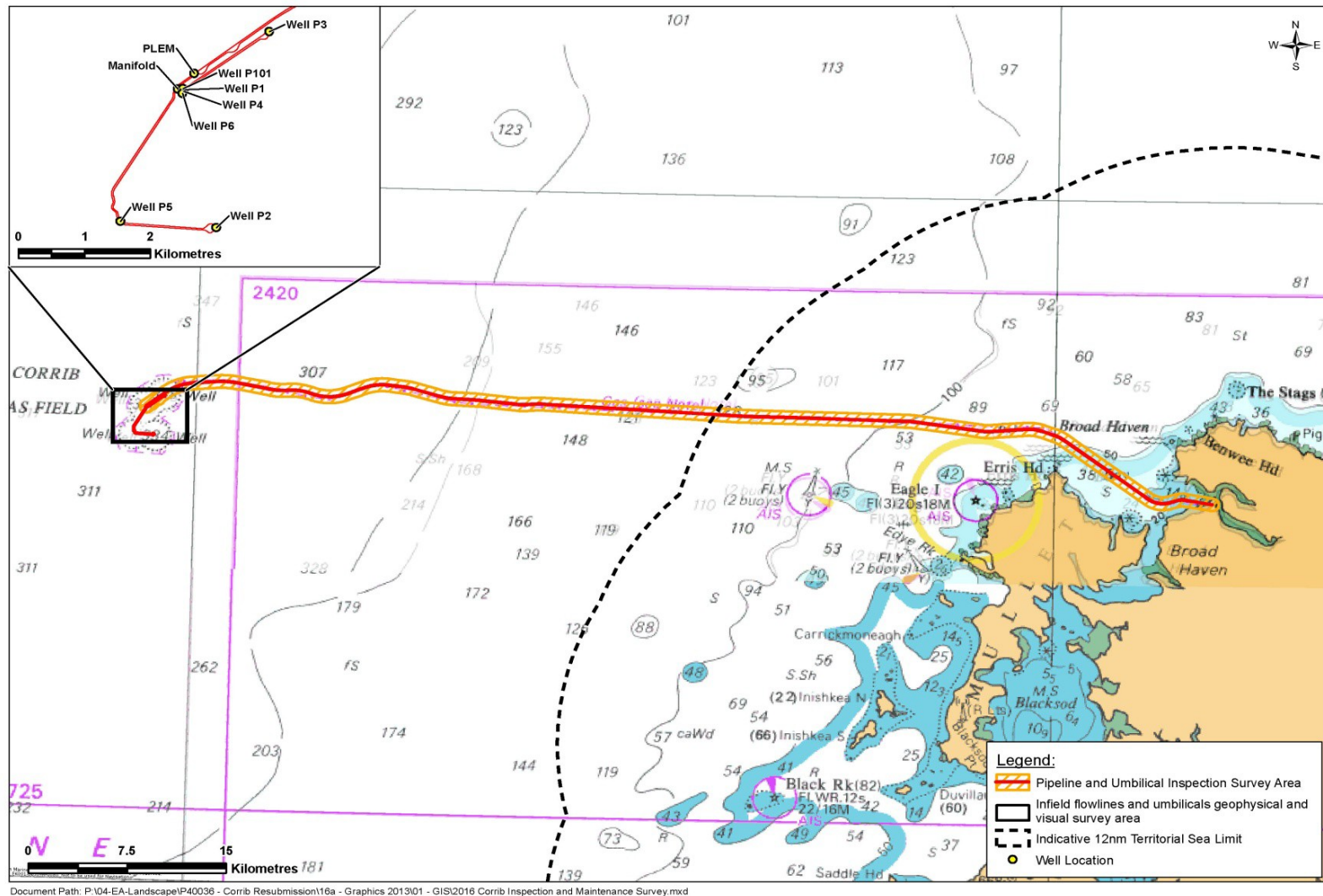


Figure 3-2: Approximate location of the proposed 2021 survey programme, relative to the Corrib Field, main export pipeline and umbilical route

4 EUROPEAN SITES

4.1 Introduction

European sites are a network (Natura 2000) of marine and terrestrial conservation areas established under the 1992 Habitats Directive, with the aim of providing protection to threatened species and habitats throughout Europe. These sites comprise Special Areas of Conservation (SACs), designed for the protection of certain habitats (Annex I) and species (Annex II), and Special Protection Areas (SPAs), for the protection of qualifying bird species. Specific conservation objectives have been developed for European sites in relation to their qualifying interests – habitats and/or species. These are published on the website of the National Parks and Wildlife Service of the Department of Culture, Heritage and the Gaeltacht (DCHG) (<https://www.npws.ie/protected-sites>) and are considered below.

Certain SACs are also designated under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) as Marine Protected Areas (MPAs) for marine biodiversity¹⁰. The legislation in Ireland that confers legal protection to the OSPAR marine protected areas, to which Ireland is committed to establishing to protect biodiversity under the OSPAR Convention, is currently pending. By establishing SACs as OSPAR MPAs, these sites are then afforded the required legal protection. Therefore, OSPAR MPAs are considered as part of the consideration of SACs in this document.

4.2 European sites in the vicinity of the Corrib Development

Appropriate Assessment requires consideration of the European sites in the vicinity of the proposed activities on the Corrib development. The identification of sites to screen into the initial assessment requires consideration of the physical distance of the receptor site / qualifying features from the proposed operations and the likely connectivity (interaction or impact pathway) between the receptor site and qualifying features and the proposed operations). The consideration of connectivity of receptor sites and qualifying features to the proposed operations, as well as between each other and the potential likely significant effects of the proposed activities on these receptors considers species foraging distances and migration routes, and the proximity of the proposed activities to foraging and breeding areas. Also, of importance are the potential for indirect impacts, such as changes in species behaviour and the effects on prey species with the potential for an alteration in predator / prey relationships and associated impacts on foraging success.

The NPWS Guidance for Appropriate Assessment of Plans and Projects in Ireland (NPWS, 2009 (revised 2010)) provides criteria for screening in designated sites within the Natura 2000 network. Typically, a zone of around 15 km from a designated site, but which may be significantly less for projects. It is important however to assess projects on a case by case basis and make reference to the nature and scale of the project and its likely zone of influence, the sensitivity of the sites and receptor species, the existence or absence of pathways and the potential for in combination effects.

¹⁰ <https://www.npws.ie/protected-sites/ospar-sites>

Based on the above guidance, the closest sites with marine receptors as qualifying interests were considered. All sites within 25 km were considered, and then SAC sites over 25 km but within Co. Donegal, Co. Leitrim, Co. Sligo, Co. Mayo, Co. Galway or Co. Clare were considered if marine mammals were qualifying interests due to the foraging distances these species can travel. These sites outside 25 km were included as their locations are all on the west coast of Ireland, within a reasonable study area that would be expected to encompass the typical foraging distances for resident and semi resident species of marine mammals. The sites included also take into consideration the potential connectivity of habitat for the receptor species, as well as likely impact ranges due to underwater noise. As noted in Sections 5 and 6 of this report, the impacts of underwater noise on marine mammal receptor species as a consequence of the proposed activities are extremely localised as the high frequency sound generated by the survey operations attenuate completely within a few kilometres of the source to levels below that which would be expected to cause impacts on receptor species (based on threshold limits in Southall *et al.*, (2019)). As such the likely foraging ranges of these species and the interconnectivity of their habitat is given priority as a more suitable metric for screening in designated sites. Further sites on the west coast of Ireland outside this approximate distance of 200 km were screened out of the assessment. The approximate distances of the European sites from the proposed survey activities are shown in Table 4-1 and Figure 4-1.

SAC sites with migratory fish as qualifying interest were primarily considered within Co. Mayo. Although these migratory fish species can migrate considerable distances, the sites within Co. Mayo are the most likely to be affected as these rivers have aspects or are within distances where these fish species have greatest potential for pathway impacts from operations at the Corrib Field. A number of SACs with migratory fish as qualifying interest were also considered beyond Co. Mayo due to their coastal aspects, habitat connectivity and proximity to the proposed activities. As such a number of designated sites both inland and on the Galway coastline, as well as north and east of the proposed activities into Sligo and Donegal Bays are included. These sites are all within an approximate 200 km direct distance from the Corrib Field and flowline. This distance has been used to screen in or out sites. These European designated sites have been included within the study area due to the connectivity of rivers and lough systems with coastal waters, and their use as important spawning and nursery areas.

All European sites with diving seabirds, and hence those with the potential for direct or pathway impacts from the proposed activities, were screened into the assessment based on their qualifying interests, initially within an approximate range of 200 km. As seabirds are considered to be central-place foragers during the breeding season (Orians and Pearson, 1979), foraging ranges may be used to assess which qualifying seabird features have likely connectivity with the proposed survey activities. For the majority of species of diving seabirds sites were considered within an overall study area limited by the Republic of Ireland / Northern Ireland border at Lough Foyle to the north, and the borders between Co. Clare and Co. Kerry in the south at the Shannon Estuary. These sites all fall within ranges of approximately 200 km of the proposed survey activities, which is considered typical maximum foraging range for the majority of species of diving seabird. It is recognised however that certain species of diving seabirds may forage at distances that are considerably beyond these ranges. These boundaries considered above represent a comprehensive study area based on the typical feeding ranges of diving species of seabird with the potential to be affected by the proposed work scope (around 200 km). This range includes a number of designated sites that had significant breeding populations of these species, such as Tory Island in the north, and Loop Head at the southern extent of the study area.

A number of studies have been carried out to determine typical and maximum foraging ranges for a range of seabirds with the aim of establishing ranges within which to screen in protected sites for environmental assessment projects. Thaxter *et al.* (2012) calculated maximum foraging ranges for a number of breeding seabirds, and this work has been further updated by Woodward *et al.*, (2019). The mean maximum foraging ranges for a number of seabirds have been used as the basis for screening designated sites into the assessment where the foraging ranges exceed 200 km. As discussed above, within approximately 200 km all sites with diving seabirds as qualifying features have been screened into the assessment. With the exception of a total of five species, all ranges are within this range based on typical mean maximum foraging distances as described in Woodward *et al.*, (2019), however additional sites have been screened in for Manx shearwater (*Puffinus puffinus*), fulmar (*Fulmar glacialis*), European storm petrel (*Hydrobates pelagicus*), great skua (*Stercorarius skua*) and northern gannet (*Morus bassanus*). Based on the mean maximum estimated breeding season foraging ranges of these species discussed in Woodward *et al.*, (2019) (Manx shearwater (1347 km), fulmar (542 km), European storm petrel (336 km), great skua (443 km) and gannet (315 km)), additional designated sites where these species are qualifying features have been screened into the assessment. These include sites in Scotland and Wales as well as in Ireland. These sites are shown in Figure 4-2. Screening distances for these additional more distant sites as with all sites, consider the distance as the seabird flies. In most cases this is as a direct line of sight marine distance, however where such sites are on Ireland's east coast or in Wales for example, these take into consideration the fact that these long distant seabird species would not be expected to forage over land.

As discussed above, the sites that have been initially screened into this assessment have been selected within ranges that consider the foraging and migratory ranges for the species being considered as having the potential to be affected by the proposed work scope, as well as considering the overall connectivity distances for the habitats and species, as well as any prey species, where direct and indirect effects could result and in combination with any other planned projects. Such sites are listed below, together with the qualifying features for which they are designated (Table 4-1). The location of these sites in relation to the proposed survey activities are shown in Figure 4-1 and Figure 4-2.

In Table 4-1, those qualifying features that have a potential pathway for effect as a result of the proposed activities are shown in bold font. In certain instances, a particular designated site may not have a qualifying feature highlighted because the sites have been included owing to the known presence or importance to a particular feature that may not necessarily be a qualifying feature of that site. These instances are included in the summary information that accompanies Table 4-1 in Sections 4.3.1 and 4.3.2.

Sites under consideration will be screened in the first stage of the Appropriate Assessment process (Section 5 of this report) based on the receptor species sensitivity and proximity to the proposed survey activities.

Table 4-1: European sites within the vicinity of the survey activities

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------------|--|--|---|
| SAC | Broadhaven Bay (000472) | Mudflats and sandflats not covered by seawater at low tide (habitat) Large shallow inlets and bays (habitat) Reefs (habitat) Atlantic salt-meadows <i>Glauco-Puccinellietalia maritima</i> Submerged or partly submerged sea caves (habitat) | Overlap (0 km) |
| SAC | Glenamoy Bog Complex (000500) | Salmon <i>Salmo salar</i> Vegetated sea cliffs of the Atlantic and Baltic coasts (habitat) Slender green feather-moss <i>Drepanocladus vernicosus</i> Petalwort <i>Petalophyllum ralfsii</i> Marsh saxifrage <i>Saxifraga hirculus</i> Machairs (habitat) Natural dystrophic lakes and ponds (habitat) Northern Atlantic wet heaths with <i>Erica tetralix</i> (habitat) <i>Juniperus communis</i> formations on heaths or calcareous grasslands (habitat) Blanket bog (*active only) (habitat) Transition mires and quaking bogs (habitat) Depressions on peat substrates of the Rhynchosporion (habitat) | Overlap 0 km |
| SAC | West Connacht Coast (002998) | Common Bottlenose dolphin <i>Tursiops truncatus</i> (123 – 219 individuals) | c. 1 km |
| SAC | Erris Head (0001501) | Vegetated sea cliffs of the Atlantic and the Baltic coasts Alpine and Boreal heaths | 2 km |
| SAC and OSPAR MPA | Mullet / Blacksod Bay Complex (000470) (OSPAR site code: O-IE-0002972) | Mudflats and sandflats not covered by seawater at low tide (habitat) Large shallow inlets and bays (habitat) Reefs (habitat) Salicornia and other annuals colonising mud and sand (habitat) Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat) Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat) | c. 10 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--|--|--|
| | | Atlantic decalcified fixed dunes (Calluno- Ulicetea) (habitat) Machairs (habitat) Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation (habitat) Alkaline fens (habitat) Otter <i>Lutra lutra</i> Petalwort <i>Petalophyllum ralfsii</i> | |
| SAC | Owenduff / Nephin Complex (000534) | Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat) Natural dystrophic lakes and ponds (habitat) Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and Callitricho- Batrachion vegetation (habitat) Northern Atlantic wet heaths with <i>Erica tetralix</i> (habitat) Alpine and Boreal heaths (habitat) <i>Juniperus communis</i> formations on heaths or calcareous grasslands (habitat) Blanket bogs (* if active bog) (habitat) Transition mires and quaking bogs (habitat) Salmon <i>Salmo salar</i> Otter <i>Lutra lutra</i> Slender Green Feather-moss <i>Drepanocladus vernicosus</i> Marsh Saxifrage <i>Saxifraga hirculus</i> | 16.5 km |
| SAC | Inishkea Islands (000507) | Grey seal <i>Halichoerus grypus</i> (280 individuals) Petalwort <i>Petalophyllum ralfsii</i> Machairs (habitat) | 19.5 km |
| SAC | Duvillaun Islands (0000495) | Grey seal <i>Halichoerus grypus</i> (648 – 833 individuals) | 26.5 km + |
| SAC | River Moy (002298) | Active raised bogs (habitat) Degraded raised bogs still capable of natural regeneration (habitat) Depressions on peat substrates of the Rhynchosporion (habitat) Alkaline fens (habitat) Old sessile oak woods with Ilex and Blechnum in the British Isles (habitat) Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, <i>Alnion incanae</i> , <i>Salicion albae</i>) (habitat) | 30 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|---------------------------------------|---|--|
| | | White-clawed Crayfish <i>Austropotamobius pallipes</i> Sea Lamprey <i>Petromyzon marinus</i> Brook Lamprey <i>Lampetra planeri</i> Salmon <i>Salmo salar</i> Otter <i>Lutra lutra</i> | |
| SAC | Killala Bay / Moy Estuary (000458) | Estuaries (habitat) Mudflats and sandflats not covered by seawater at low tide (habitat) Annual vegetation of drift lines (habitat) Vegetated sea cliffs of the Atlantic and Baltic coasts (habitat) Salicornia and other annuals colonising mud and sand (habitat) Atlantic salt meadows <i>Glauco-Puccinellietalia maritima</i> (habitat) Embryonic shifting dunes (habitat) Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat) Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat) Humid dune slacks (habitat) Narrow-mouthed Whorl Snail <i>Vertigo angustior</i> Sea Lamprey <i>Petromyzon marinus</i> Harbour Seal <i>Phoca vitulina</i> (108 individuals) | 39 km |
| SAC | Newport River (002144) | Freshwater Pearl Mussel <i>Margaritifera margaritifera</i> Salmon <i>Salmo salar</i> | 40 km |
| SAC | Clew Bay Complex (001482) | Mudflats and sandflats not covered by seawater at low tide (habitat) Coastal lagoons (habitat) Large shallow inlets and bays (habitat) Annual vegetation of drift lines (habitat) Perennial vegetation of stony banks (habitat) Atlantic salt meadows <i>Glauco-Puccinellietalia maritima</i> (habitat) Embryonic shifting dunes (habitat) Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat) Machairs (habitat) Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles (habitat) Geyer's Whorl Snail <i>Vertigo geyeri</i> | 42 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|---|---|--|
| | | <p>Otter <i>Lutra lutra</i></p> <p>Harbour Seal <i>Phoca vitulina</i> (95 individuals)</p> | |
| SAC | Mweelrea / Sheeffry / Erriff Complex (001932) | <p>Coastal lagoons (habitat)</p> <p>Annual vegetation of drift lines (habitat)</p> <p>Atlantic salt meadows <i>Glauco-Puccinellietalia maritimae</i> (habitat)</p> <p>Mediterranean salt meadows <i>Juncetalia maritimi</i> (habitat)</p> <p>Embryonic shifting dunes (habitat)</p> <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat)</p> <p>Atlantic decalcified fixed dunes Calluno-Ulicetea (habitat)</p> <p>Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) (habitat)</p> <p>Machairs (habitat)</p> <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat)</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea (habitat)</p> <p>Natural dystrophic lakes and ponds (habitat)</p> <p>Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and Callitricho-Batrachion vegetation (habitat)</p> <p>Northern Atlantic wet heaths with <i>Erica tetralix</i> (habitat)</p> <p>European dry heaths (habitat)</p> <p>Alpine and Boreal heaths (habitat)</p> <p><i>Juniperus communis</i> formations on heaths or calcareous grasslands (habitat)</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (habitat)</p> <p>Blanket bogs (* if active bog) (habitat)</p> <p>Transition mires and quaking bogs (habitat)</p> <p>Depressions on peat substrates of the Rhynchosporion (habitat)</p> <p>Petrifying springs with tufa formation (Cratoneurion) (habitat)</p> <p>Alkaline fens (habitat)</p> <p>Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) (habitat)</p> <p>Calcareous rocky slopes with chasmophytic vegetation (habitat)</p> | 61 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------------|--|---|--|
| | | <p>Siliceous rocky slopes with chasmophytic vegetation (habitat)</p> <p>Geyer's Whorl Snail <i>Vertigo geyeri</i></p> <p>Narrow-mouthed Whorl Snail <i>Vertigo angustior</i></p> <p>Freshwater Pearl Mussel <i>Margaritifera margaritifera</i></p> <p>Salmon <i>Salmo salar</i></p> <p>Otter <i>Lutra lutra</i></p> <p>Petalwort <i>Petalophyllum ralfsii</i></p> <p>Slender Naiad <i>Najas flexilis</i></p> | |
| SAC and OSPAR MPA | <p>Cummeen Strand / Drumcliff Bay (Sligo Bay)</p> <p>(000627)</p> <p>(OSPAR site code: O-IE-0002973)</p> | <p>Estuaries (habitat)</p> <p>Mudflats and sandflats not covered by seawater at low tide (habitat)</p> <p>Embryonic shifting dunes (habitat)</p> <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat)</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat)</p> <p><i>Juniperus communis</i> formations on heaths or calcareous grasslands (habitat)</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) (habitat)</p> <p>Petrifying springs with tufa formation (Cratoneurion) (habitat)</p> <p>Narrow-mouthed Whorl Snail <i>Vertigo angustior</i></p> <p>Sea Lamprey <i>Petromyzon marinus</i></p> <p>River Lamprey <i>Lampetra fluviatilis</i></p> <p>Harbour Seal <i>Phoca vitulina</i> (12-15 individuals)</p> | 73 km |
| SAC | <p>Inishbofin and Inishshark</p> <p>(000278)</p> | <p>Coastal lagoons (habitat)</p> <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat)</p> <p>Northern Atlantic wet heaths with <i>Erica tetralix</i> (habitat)</p> <p>European dry heaths (habitat)</p> <p>Grey Seal <i>Halichoerus grypus</i> (270 individuals)</p> | 74 km |
| SAC | <p>The Twelve Bens / Garraun Complex</p> <p>(002031)</p> | <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat)</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea (habitat)</p> <p>Alpine and Boreal heaths (habitat)</p> | 74 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|---|---|--|
| | | Blanket bogs (* if active bog) (habitat) Depressions on peat substrates of the Rhynchosporion (habitat) Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) (habitat) Calcareous rocky slopes with chasmophytic vegetation (habitat) Siliceous rocky slopes with chasmophytic vegetation (habitat) Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles (habitat) Freshwater Pearl Mussel <i>Margaritifera margaritifera</i> Salmon <i>Salmo salar</i> Otter <i>Lutra lutra</i> Slender Naiad <i>Najas flexilis</i> | |
| SAC | Ballysadare Bay (000622) | Estuaries (habitat) Mudflats and sandflats not covered by seawater at low tide (habitat) Embryonic shifting dunes (habitat) Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat) Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat) Humid dune slacks (habitat) Narrow-mouthed Whorl Snail <i>Vertigo angustior</i> Harbour Seal <i>Phoca vitulina</i> (257 individuals) | 76 km |
| SAC | Maumturk Mountains (002008) | Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat) Northern Atlantic wet heaths with <i>Erica tetralix</i> (habitat) Alpine and Boreal heaths (habitat) Blanket bogs (* if active bog) (habitat) Depressions on peat substrates of the Rhynchosporion (habitat) Siliceous rocky slopes with chasmophytic vegetation (habitat) Salmon <i>Salmo salar</i> Slender Naiad <i>Najas flexilis</i> | 76 km |
| SAC | Slieve Tooley / Tormore Island / Loughros Beg Bay (000190) | Vegetated sea cliffs of the Atlantic and Baltic coasts (habitat) Embryonic shifting dunes (habitat) | 82.5 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--------------------------|---|--|
| | | <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat)</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat)</p> <p>Decalcified fixed dunes with <i>Empetrum nigrum</i> (habitat)</p> <p>Atlantic decalcified fixed dunes (Calluno-Ulicetea) (habitat)</p> <p>Alpine and Boreal heaths (habitat)</p> <p>Blanket bogs (* if active bog) (habitat)</p> <p>Narrow-mouthed Whorl Snail <i>Vertigo angustior</i></p> <p>Otter <i>Lutra lutra</i></p> <p>Grey Seal <i>Halichoerus grypus</i> (300 – 400 individuals)</p> | |
| SAC | Lough Corrib (00297) | <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat)</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea (habitat)</p> <p>Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. (habitat)</p> <p>Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and Callitricho-Batrachion vegetation (habitat)</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) (habitat)</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) (habitat)</p> <p>Active raised bogs (habitat)</p> <p>Degraded raised bogs still capable of natural regeneration (habitat)</p> <p>Depressions on peat substrates of the Rhynchosporion (habitat)</p> <p>Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> (habitat)</p> <p>Petrifying springs with tufa formation (Cratoneurion) (habitat)</p> <p>Alkaline fens (habitat)</p> <p>Limestone pavements (habitat)</p> <p>Old sessile oak woods with Ilex and Blechnum in the British Isles (habitat)</p> <p>Bog woodland (habitat)</p> <p>Freshwater Pearl Mussel <i>Margaritifera margaritifera</i></p> <p>White-clawed Crayfish <i>Austropotamobius</i></p> | 86 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|-----------------------------------|--|--|
| | | <p><i>pallipes</i></p> <p>Sea Lamprey <i>Petromyzon marinus</i></p> <p>Salmon <i>Salmo salar</i></p> <p>Otter <i>Lutra lutra</i></p> <p>Lesser Horseshoe Bat <i>Rhinolophus hipposideros</i></p> <p>Slender green feather-moss <i>Drepanocladus vernicosus</i></p> <p>Slender Naiad <i>Najas flexilis</i></p> | |
| SAC | Lough Gill (001976) | <p>Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation (habitat)</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) (habitat)</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles (habitat)</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, <i>Alnion incanae</i>, <i>Salicion albae</i>) (habitat)</p> <p>White-clawed Crayfish <i>Austropotamobius pallipes</i></p> <p>Sea Lamprey <i>Petromyzon marinus</i></p> <p>Brook Lamprey <i>Lampetra planeri</i></p> <p>River Lamprey <i>Lampetra fluviatilis</i></p> <p>Salmon <i>Salmo salar</i></p> <p>Otter <i>Lutra lutra</i></p> | 87 km |
| SAC | Connemara Bog Complex (002034) | <p>Coastal lagoons (habitat)</p> <p>Reefs (habitat)</p> <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat)</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea (habitat)</p> <p>Natural dystrophic lakes and ponds (habitat)</p> <p>Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and Callitricho-Batrachion vegetation (habitat)</p> <p>Northern Atlantic wet heaths with <i>Erica tetralix</i> (habitat)</p> <p>European dry heaths (habitat)</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) (habitat)</p> <p>Blanket bogs (* if active bog) (habitat)</p> <p>Transition mires and quaking bogs (habitat)</p> <p>Depressions on peat substrates of the</p> | 89 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------------|--|---|--|
| | | Rhynchosporion (habitat) Alkaline fens (habitat) Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles (habitat) Marsh Fritillary <i>Euphydryas aurinia</i> Salmon <i>Salmo salar</i> Otter <i>Lutra lutra</i> Slender Naiad <i>Najas flexilis</i> | |
| SAC | Slyne Head Islands (000328) | Reefs (habitat) Grey Seal <i>Halichoerus grypus</i> (32 – 41 individuals) | 94 km |
| SAC and OSPAR MPA | Kilkieran Bay and Islands (002111) (OSPAR site code: O-IE-0002979) | Mudflats and sandflats not covered by seawater at low tide (habitat) Coastal lagoons (habitat) Large shallow inlets and bays (habitat) Atlantic salt meadows <i>Glauco-Puccinellietalia maritimae</i> (habitat) Mediterranean salt meadows <i>Juncetalia maritimi</i> (habitat) Machairs (habitat) Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea (habitat) Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>) (habitat) Otter <i>Lutra lutra</i> Harbour Seal <i>Phoca vitulina</i> (116 individuals) Slender Naiad <i>Najas flexilis</i> | 100 km |
| SAC | Lough Melvin (000428) | Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea (habitat) Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) (habitat) Salmon <i>Salmo salar</i> Otter <i>Lutra lutra</i> | 99 km |
| SAC | West of Ardara / Maas Road (000197) | Estuaries (habitat) Mudflats and sandflats not covered by seawater at low tide (habitat) Large shallow inlets and bays (habitat) Annual vegetation of drift lines (habitat) Atlantic salt meadows <i>Glauco-Puccinellietalia maritimae</i> (habitat) | 101 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--------------------------|--|--|
| | | <p>Mediterranean salt meadows <i>Juncetalia maritimi</i> (habitat)</p> <p>Embryonic shifting dunes (habitat)</p> <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat)</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat)</p> <p>Decalcified fixed dunes with <i>Empetrum nigrum</i> (habitat)</p> <p>Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) (habitat)</p> <p>Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) (habitat)</p> <p>Humid dune slacks (habitat)</p> <p>Machairs (habitat)</p> <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat)</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea (habitat)</p> <p>Northern Atlantic wet heaths with <i>Erica tetralix</i> (habitat)</p> <p>European dry heaths (habitat)</p> <p>Alpine and Boreal heaths (habitat)</p> <p><i>Juniperus communis</i> formations on heaths or calcareous grasslands (habitat)</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) (habitat)</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) (habitat)</p> <p>Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) (habitat)</p> <p>Blanket bogs (* if active bog) (habitat)</p> <p>Depressions on peat substrates of the Rhynchosporion (habitat)</p> <p>Alkaline fens (habitat)</p> <p>Geyer's Whorl Snail <i>Vertigo geyeri</i></p> <p>Freshwater Pearl Mussel <i>Margaritifera margaritifera</i></p> <p>Marsh Fritillary <i>Euphydryas aurinia</i></p> <p>Salmon <i>Salmo salar</i> Otter <i>Lutra lutra</i></p> <p>Harbour Seal <i>Phoca vitulina</i> (59 individuals)</p> <p>Petalwort <i>Petalophyllum ralfsii</i></p> <p>Slender Naiad <i>Najas flexilis</i></p> | |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------------|---|--|--|
| SAC | Donegal Bay (Murvagh) (000133) | Mudflats and sandflats not covered by seawater at low tide (habitat) Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat) Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) (habitat) Humid dune slacks (habitat) Harbour Seal <i>Phoca vitulina</i> (148 individuals) | 111 km |
| SAC | Rutland Island and Sound (002283) | Coastal lagoons (habitat) Large shallow inlets and bays (habitat) Reefs (habitats) Embryonic shifting dunes (habitat) Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat) Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat) Humid dune slacks (habitat) Harbour Seal <i>Phoca vitulina</i> (202 individuals) | 112 km |
| SAC | Lough Eske and Ardnamona Wood (000163) | Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) (habitat) Petrifying springs with tufa formation (Cratoneurion) (habitat) Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles (habitat) Freshwater Pearl Mussel <i>Margaritifera margaritifera</i> Salmon <i>Salmo salar</i> Killarney Fern <i>Trichomanes speciosum</i> | 118 km |
| SAC and OSPAR MPA | Galway Bay Complex (000268) (OSPAR site code: O-IE-0002969) | Mudflats and sandflats not covered by seawater at low tide (habitat) Coastal lagoons (habitat) Large shallow inlets and bays (habitat) Reefs (habitat) Perennial vegetation of stony banks (habitat) Vegetated sea cliffs of the Atlantic and Baltic coasts (habitat) Salicornia and other annuals colonising mud and sand (habitat) Atlantic salt meadows <i>Glauco-Puccinellietalia maritimae</i> (habitat) Mediterranean salt meadows <i>Juncetalia maritimi</i> (habitat) Turloughs (habitat) | 130 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|-------------------------------------|--|--|
| | | <i>Juniperus communis</i> formations on heaths or calcareous grasslands (habitat) Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) (habitat) Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> (habitat) Alkaline fens (habitat) Limestone pavements (habitat) Otter <i>Lutra lutra</i> Harbour Seal <i>Phoca vitulina</i> (317 individuals) | |
| SAC | Horn Head and Rinclevan (000147) | Embryonic shifting dunes (habitat) Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) (habitat) Fixed coastal dunes with herbaceous vegetation (grey dunes) (habitat) Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) (habitat) Humid dune slacks (habitat) Machairs (habitat) Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or Isoeto-Nanojuncetea (habitat) Geyer's Whorl Snail <i>Vertigo geyeri</i> Grey Seal <i>Halichoerus grypus</i> (20 – 30 individuals) Petalwort <i>Petalophyllum ralfsii</i> Slender Naiad <i>Najas flexilis</i> | 150 km |
| SAC | Lower River Shannon (002165) | Sandbanks which are slightly covered by seawater all the time (habitat) Estuaries (habitat) Mudflats and sandflats not covered by seawater at low tide (habitat) Coastal lagoons (habitat) Large shallow inlets and bays (habitat) Reefs (habitats) Atlantic salt meadows <i>Glauco-Puccinellietalia maritima</i> (habitat) Mediterranean salt meadows <i>Juncetalia maritimi</i> (habitat) Vegetated sea cliffs of the Atlantic and Baltic coasts (habitat) Perennial vegetation of stony banks (habitat) Salicornia and other annuals colonising mud and sand (habitat) | 166 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--|---|--|
| | | <p>Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and Callitricho-Batrachion vegetation (habitat)</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) (habitat)</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, <i>Alnion incanae</i>, <i>Salicion albae</i>) (habitat)</p> <p>Freshwater Pearl Mussel <i>Margaritifera margaritifera</i></p> <p>Sea Lamprey <i>Petromyzon marinus</i></p> <p>Brook Lamprey <i>Lampetra planeri</i></p> <p>River Lamprey <i>Lampetra fluviatilis</i></p> <p>Salmon <i>Salmo salar</i></p> <p>Otter <i>Lutra lutra</i></p> <p>Bottlenose dolphin <i>Tursiops truncatus</i> (128 – 152 individuals)</p> | |
| SPA | Blacksod Bay / Broadhaven (004037) | <p>Great Northern Diver <i>Gavia immer</i> (67 individuals)</p> <p>Light-bellied Brent Goose <i>Branta bernicla hrota</i></p> <p>Common Scoter <i>Melanitta nigra</i> (510 individuals)</p> <p>Red-breasted Merganser <i>Mergus serrator</i> (83 individuals)</p> <p>Ringed Plover <i>Charadrius hiaticula</i></p> <p>Sanderling <i>Calidris alba</i></p> <p>Dunlin <i>Calidris alpina</i></p> <p>Bar-tailed Godwit <i>Limosa lapponica</i></p> <p>Curlew <i>Numenius arquata</i></p> <p>Sandwich Tern <i>Sterna sandvicensis</i> (81 pairs)</p> <p>Dunlin <i>Calidris alpina schinzii</i></p> <p>Wetland and Wintering Waterbirds</p> | 0 km |
| SPA | Termoncarragh Lough and Annagh Machair (004093) | <p>Corncrake <i>Crex crex</i></p> <p>Greenland White-fronted Goose <i>Anser albifrons flavirostris</i></p> <p>Barnacle Goose <i>Branta leucopsis</i></p> <p>Whooper Swan <i>Cygnus cygnus</i></p> <p>Lapwing <i>Vanellus vanellus</i></p> <p>Chough <i>Pyrrhocorax pyrrhocorax</i></p> <p>Dunlin <i>Calidris alpina schinzii</i></p> <p>Wetland and Waterbirds</p> | 9 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--|---|--|
| SPA | Mullet Peninsula (004227) | Corncrake <i>Crex crex</i> | 9 km |
| SPA | Stags of Broadhaven (004072) | Storm Petrel <i>Hydrobates pelagicus</i> (1912 pairs) Leach's Storm-petrel <i>Oceanodroma leucorhoa</i> (310 pairs) | 9 km |
| SPA | Illanmaster (004074) | Storm Petrel <i>Hydrobates pelagicus</i> (7500 pairs) | 11.5 km |
| SPA | Inishglora and inishkeeragh (004084) | Storm Petrel <i>Hydrobates pelagicus</i> (3405 pairs) Cormorant <i>Phalacrocorax carbo</i> (57 pairs) Shag <i>Phalacrocorax aristotelis</i> (61 pairs) Lesser Black-backed Gull <i>Larus fuscus</i> (66 pairs) Herring Gull <i>Larus argentatus</i> (78 pairs) Arctic Tern <i>Sterna paradisaea</i> (105 pairs) Barnacle Goose <i>Branta leucopsis</i> | 13 km |
| SPA | Inishkea Islands (004004) | Shag <i>Phalacrocorax aristotelis</i> (90 pairs) Ringed Plover <i>Charadrius hiaticula</i> Sanderling <i>Calidris alba</i> Purple Sandpiper <i>Calidris maritima</i> Turnstone <i>Arenaria interpres</i> Common Gull <i>Larus canus</i> (47 pairs) Herring Gull <i>Larus argentatus</i> (81 pairs) Arctic Tern <i>Sterna paradisaea</i> (182 pairs) Little Tern <i>Sterna albifrons</i> (50 pairs) Barnacle Goose <i>Branta leucopsis</i> Dunlin <i>Calidris alpina schinzii</i> | 19 km |
| SPA | Duvillaun Islands (004111) | Fulmar <i>Fulmarus glacialis</i> (638 pairs) Storm Petrel <i>Hydrobates pelagicus</i> (1150 pairs) Barnacle Goose <i>Branta leucopsis</i> | 22 km+ |
| SPA | Clare Island (004136) | Shag <i>Phalacrocorax aristotelis</i> (89 pairs) Common Gull <i>Larus canus</i> (39 pairs) Fulmar <i>Fulmarus glacialis</i> (4029 pairs) Kittiwake <i>Rissa triadactyla</i> (1785 pairs) Guillemot <i>Uria aalge</i> (1528 pairs) Razorbill <i>Alca torda</i> (354 pairs) Chough <i>Pyrrhocorax pyrrhocorax</i> | 50 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--|---|--|
| SPA | Bills Rocks (004177) | Storm Petrel <i>Hydrobates pelagicus</i> (500 pairs) Puffin <i>Fratercula arctica</i> (1500 pairs) | 50 km |
| SPA | Ardboline Island and Horse Island (004135) | Cormorant <i>Phalacrocorax carbo</i> Barnacle Goose <i>Branta leucopsis</i> | 73 km |
| SPA | Inishmurray (004068) | Shag <i>Phalacrocorax aristotelis</i> Barnacle Goose <i>Branta leucopsis</i> Herring Gull <i>Larus argentatus</i> Arctic Tern <i>Sterna paradisaea</i> | 76 km |
| SPA | West Donegal Coast (004150) | Fulmar <i>Fulmarus glacialis</i> Cormorant <i>Phalacrocorax carbo</i> Shag <i>Phalacrocorax aristotelis</i> Peregrine <i>Falco peregrinus</i> Herring Gull <i>Larus argentatus</i> Kittiwake <i>Rissa triadactyla</i> Razorbill <i>Alca torda</i> Chough <i>Pyrhacorax pyrrhacorax</i> | 78 km |
| SPA | Cruagh Island (004170) | Manx Shearwater <i>Puffinus puffinus</i> (3286 pairs) Barnacle Goose <i>Branta leucopsis</i> | 86 km |
| SPA | Inishduff (004115) | Shag <i>Phalacrocorax aristotelis</i> | 89 km |
| SPA | Connemara Bog Complex (004181) | Cormorant <i>Phalacrocorax carbo</i> (160 pairs) Merlin <i>Falco columbarius</i> Golden Plover <i>Pluvialis apricaria</i> Common Gull <i>Larus canus</i> | 89 km |
| SPA | Donegal Bay (004151) | Great Northern Diver <i>Gavia immer</i> Light-bellied Brent Goose <i>Branta bernicla hrota</i> Common Scoter <i>Melanitta nigra</i> Sanderling <i>Calidris alba</i> Wetland and Waterbirds | 98 km |
| SPA | Inner Galway Bay (004031) | Great Northern Diver <i>Gavia immer</i> Cormorant <i>Phalacrocorax carbo</i> Grey Heron <i>Ardea cinerea</i> Light-bellied Brent Goose <i>Branta bernicla hrota</i> Wigeon <i>Anas penelope</i> Teal <i>Anas crecca</i> | 123 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--|---|--|
| | | Shoveler <i>Anas clypeata</i> Red-breasted Merganser <i>Mergus serrator</i> (249 individuals) Ringed Plover <i>Charadrius hiaticula</i> Golden Plover <i>Pluvialis apricaria</i> Lapwing <i>Vanellus vanellus</i> Dunlin <i>Calidris alpina</i> Bar-tailed Godwit <i>Limosa lapponica</i> Curlew <i>Numenius arquata</i> Redshank <i>Tringa totanus</i> Turnstone <i>Arenaria interpres</i> Black-headed Gull <i>Chroicocephalus</i> <i>ridibundus</i> (1815 individuals) Common Gull <i>Larus canus</i> (1011 individuals) Sandwich Tern <i>Sterna sandvicensis</i> (81 pairs) Common Tern <i>Sterna hirundo</i> (99 pairs) Wetland and Waterbirds | |
| SPA | Inishmore (004152) | Kittiwake <i>Rissa triadactyla</i> (587 pairs) Arctic Tern <i>Sterna paradisaea</i> (338 pairs) Little Tern <i>Sterna albifrons</i> (13 pairs) Guillemot <i>Uria aalge</i> (2312 pairs) | 125 km |
| SPA | Cliffs of Moher (004005) | Fulmar <i>Fulmarus glacialis</i> (3566 pairs) Kittiwake <i>Rissa triadactyla</i> (8063 pairs) Razorbill <i>Alca torda</i> (7835 individuals) Guillemot <i>Uria aalge</i> (20402 individuals) Puffin <i>Fratercula arctica</i> (1362 pairs) Chough <i>Pyrrhocorax pyrrhocorax</i> | 145 km |
| SPA | Tory Island (004073) | Corncrake <i>Crex crex</i> Fulmar <i>Fulmarus glacialis</i> (641 pairs) Razorbill <i>Alca torda</i> (671 pairs) Puffin <i>Fratercula arctica</i> (1402 pairs) | 148 km |
| SPA | Horn Head to Fanad Head (004194) | Fulmar <i>Fulmarus glacialis</i> (1974 pairs) Cormorant <i>Phalacrocorax carbo</i> (79 pairs) Shag <i>Phalacrocorax aristotelis</i> (110 pairs) Barnacle Goose <i>Branta leucopsis</i> Peregrine <i>Falco peregrinus</i> Kittiwake <i>Rissa triadactyla</i> (3853 pairs) Razorbill <i>Alca torda</i> (4515 pairs) | 150 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--|--|--|
| | | Guillemot <i>Uria aalge</i> (4387 pairs) Chough <i>Pyrhocorax pyrrhocorax</i> Greenland White-fronted Goose <i>Anser albifrons flavirostris</i> | |
| SPA | Mid-Clare Coast (004182) | Cormorant <i>Phalacrocorax carbo</i> (60 pairs) Barnacle Goose <i>Branta leucopsis</i> Ringed Plover <i>Charadrius hiaticula</i> Purple Sandpiper <i>Calidris maritima</i> Sanderling <i>Calidris alba</i> Dunlin <i>Calidris alpina</i> Turnstone <i>Arenaria interpres</i> Wetland and Waterbirds | 160 km |
| SPA | River Shannon and River Fergus Estuaries (004077) | Cormorant <i>Phalacrocorax carbo</i> (148 individuals) Whooper Swan <i>Cygnus cygnus</i> Light-bellied Brent Goose <i>Branta bernicla hrota</i> Shelduck <i>Tadorna tadorna</i> Wigeon <i>Anas penelope</i> Teal <i>Anas crecca</i> Pintail <i>Anas acuta</i> Shoveler <i>Anas clypeata</i> Scaup <i>Aythya marila</i> Ringed Plover <i>Charadrius hiaticula</i> Golden Plover <i>Pluvialis apricaria</i> Grey Plover <i>Pluvialis squatarola</i> Lapwing <i>Vanellus vanellus</i> Knot <i>Calidris canutus</i> Dunlin <i>Calidris alpina</i> Black-tailed Godwit <i>Limosa limosa</i> Bar-tailed Godwit <i>Limosa lapponica</i> Curlew <i>Numenius arquata</i> Redshank <i>Tringa totanus</i> Greenshank <i>Tringa nebularia</i> Black-headed Gull <i>Chroicocephalus ridibundus</i> (1233 individuals) Wetland and Waterbirds | 188 km |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|-------------------------------|--|--|
| SPA | Loop Head (004119) | Kittiwake <i>Rissa triadactyla</i> (690 pairs) Guillemot <i>Uria aalge</i> (3350 pairs) | 189 km |
| SPA | Kerry Head (004153) | Fulmar <i>Fulmarus glacialis</i> (421 pairs) Chough <i>Pyrrhocorax pyrrhocorax</i> | 201 km |
| SPA | Inishtrahull (004100) | Shag <i>Phalacrocorax aristotelis</i> Barnacle Goose <i>Branta leucopsis</i> Common Gull <i>Larus canus</i> | 208 km |
| SPA | Dingle Peninsula (004153) | Fulmar <i>Fulmarus glacialis</i> (1016 pairs) Peregrine <i>Falco peregrinus</i> Chough <i>Pyrrhocorax pyrrhocorax</i> | 220 km |
| SPA | Blasket Islands (004008) | Fulmar <i>Fulmarus glacialis</i> (3000 pairs) Manx Shearwater <i>Puffinus puffinus</i> (23500 pairs) Storm Petrel <i>Hydrobates pelagicus</i> (51965 pairs) Shag <i>Phalacrocorax aristotelis</i> Lesser Black-backed Gull <i>Larus fuscus</i> Herring Gull <i>Larus argentatus</i> Kittiwake <i>Rissa tridactyla</i> Arctic Tern <i>Sterna paradisaea</i> Razorbill <i>Alca torda</i> Puffin <i>Fratercula arctica</i> Chough <i>Pyrrhocorax pyrrhocorax</i> | 243 |
| SPA | Iveragh Peninsula (004154) | Fulmar <i>Fulmarus glacialis</i> (766 pairs) Peregrine <i>Falco peregrinus</i> Kittiwake <i>Rissa tridactyla</i> Guillemot <i>Uria aalge</i> Chough <i>Pyrrhocorax pyrrhocorax</i> | 248.5 |
| SPA | Puffin Island (00403) | Fulmar <i>Fulmarus glacialis</i> (447 pairs) Manx Shearwater <i>Puffinus puffinus</i> (6329 pairs) Storm Petrel <i>Hydrobates pelagicus</i> (5177 pairs) Lesser Black-backed Gull <i>Larus fuscus</i> Razorbill <i>Alca torda</i> | 273 |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--|---|--|
| | | Puffin <i>Fratercula arctica</i> | |
| SPA | Skelligs (004007) | Fulmar <i>Fulmarus glacialis</i> (806 pairs) Manx Shearwater <i>Puffinus puffinus</i> (738 pairs) Storm Petrel <i>Hydrobates pelagicus</i> (9994 pairs) Gannet <i>Morus bassanus</i> (29683 pairs) Kittiwake <i>Rissa tridactyla</i> Guillemot <i>Uria aalge</i> Puffin <i>Fratercula arctica</i> | 281 |
| SPA | Deenish Island and Scariff Island (004175) | Fulmar <i>Fulmarus glacialis</i> (385 pairs) Manx Shearwater <i>Puffinus puffinus</i> (2311 pairs) Storm Petrel <i>Hydrobates pelagicus</i> (1400 pairs) Lesser Black-backed Gull <i>Larus fuscus</i> Arctic Tern <i>Sterna paradisaea</i> | 283 |
| SPA | Beara Peninsula (004155) | Fulmar <i>Fulmarus glacialis</i> (575 pairs) Chough <i>Pyrrhocorax pyrrhocorax</i> | 289 |
| SPA | The Bull and The Cow Rocks (004066) | Storm Petrel <i>Hydrobates pelagicus</i> (3500 pairs) Gannet <i>Morus bassanus</i> (3694 pairs) Puffin <i>Fratercula arctica</i> | 300 |
| SPA | Irish Sea Front (UK9020328) | Manx Shearwater <i>Puffinus puffinus</i> (12039 pairs) | 308 |
| SPA | Treshnish Isles (UK9003041) | Greenland Barnacle Goose <i>Branta leucopsis</i> Storm petrel <i>Hydrobates pelagicus</i> (5040 pairs) | 321 |
| SPA | Rum (UK9001341) | Golden eagle <i>Aquila chrysaetos</i> Manx shearwater <i>Puffinus puffinus</i> (61000) Red-throated diver <i>Gavia arctica</i> Seabird assemblage | 358 |

| Designation | Site name (site code) | Qualifying interests | Approximate distance from site to survey area at closest point (km) |
|-------------|--|---|--|
| SPA | Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island (UK901321) | Manx Shearwater <i>Puffinus puffinus</i> (6930 pairs) Chough <i>Pyrrhonorax pyrrhonorax</i> | 364 |
| SPA | Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro (UK9014051) | Storm Petrel <i>Hydrobates pelagicus</i> Chough <i>Pyrrhonorax pyrrhonorax</i> Short-eared owl <i>Asio flammeus</i> Lesser Black-backed Gull <i>Larus fuscus</i> Manx Shearwater <i>Puffinus puffinus</i> (6930 pairs) Puffin <i>Fratercula arctica</i> Seabird assemblage | 397 |

Sources: NPWS (2009, 2012, 2014, 2017, 2018); JNCC (2015, 2017)

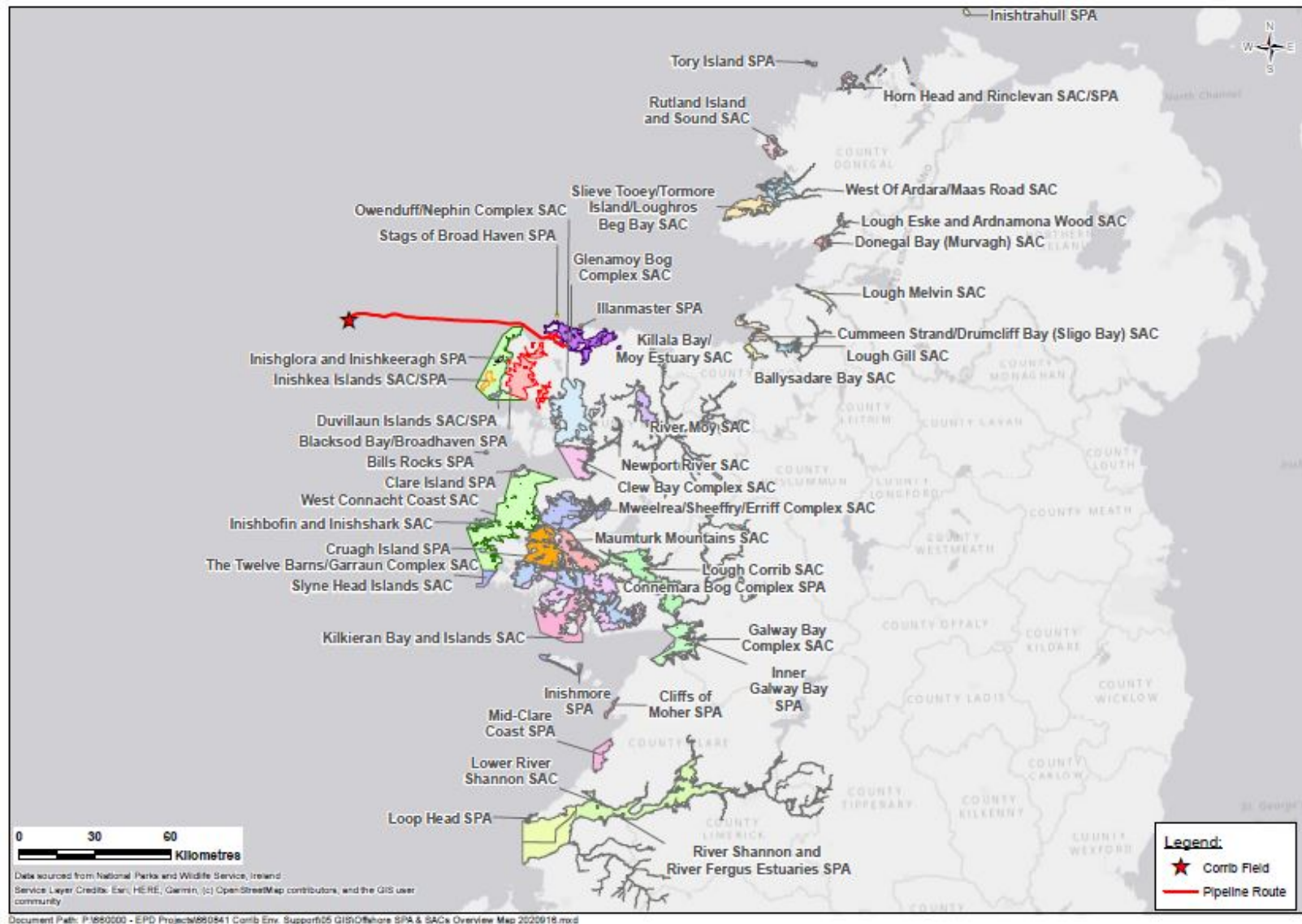


Figure 4-1: European sites in proximity to the proposed infrastructure inspection and maintenance survey programme (within 200 km), as defined in Section 4.2.

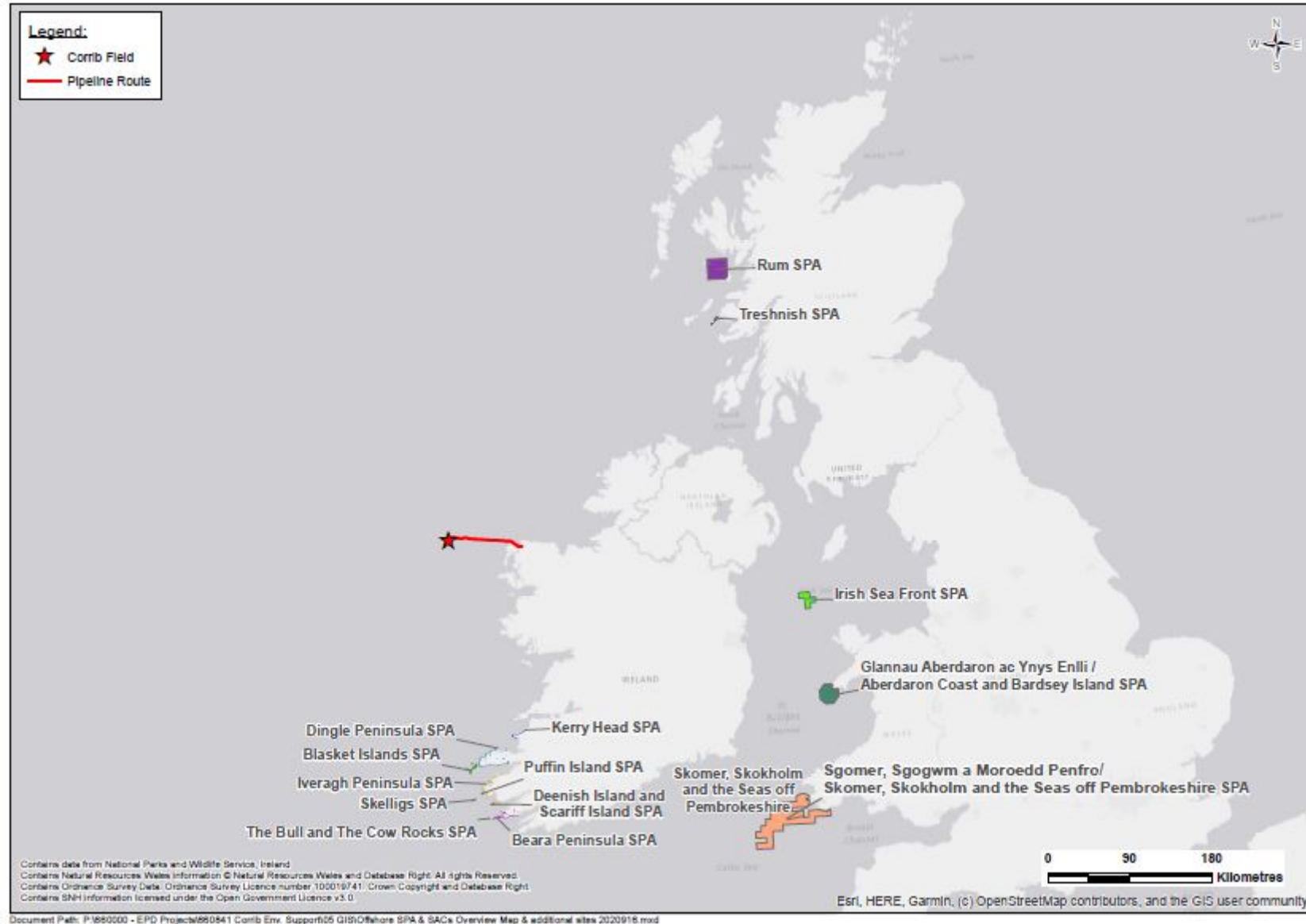


Figure 4-2: Additional European sites included in the wider area of search for the proposed infrastructure inspection and maintenance survey programme

4.3 Characteristics of European sites

The following sections describe the ecological features of the European sites in the vicinity of the Corrib Development. The following conservation objectives apply to all sites:

“The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

its natural range, and area it covers within that range, are stable or increasing, and the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable.

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.”

Conservation objectives for the European sites in the Natura 2000 network are published on the website of the National Parks and Wildlife Service of the Department of Culture, Heritage and the Gaeltacht (DCHG) (<https://www.npws.ie/protected-sites>). A summary of each of the European sites is set out below along with the conservation objectives identified for each site.

4.3.1 Special Areas of Conservation (SACs)

4.3.1.1 Broadhaven Bay SAC

In addition to the qualifying interests listed in Table 4-1, the site synopsis for Broadhaven Bay SAC notes the presence of a number of breeding and wintering bird populations, including golden plover, bar tailed godwit, sandwich tern, common tern and arctic tern.

Nine cetacean species have been recorded in the SAC during dedicated monitoring studies undertaken since 2001 (Anderwald *et al.*, 2012; Culloch *et al.*, 2014).

The conservation objectives for this site (NPWS, 2014 a) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species (as detailed in Table 4-1) for which the SAC has been selected. The main conservation objectives

for the pertinent qualifying habitat *Large shallow inlets and bays* [1160] are to ensure the stability or growth of the permanent habitat as well as to maintain the favourable conservation condition of a number of community complexes in a natural condition, as described below:

- Coarse sediment to sandy mud with *Pygospio elegans*
- Sand with *Angulus tenuis*
- Sand to coarse sediment with crustaceans and *Polyophthalmus pictus*
- Subtidal sand with polychaetes
- Fucoid dominated reef
- Subtidal reef.

In addition to maintaining the above community complexes in their natural condition, there is the potential for *Zostera* dominated seabed communities within Broadhaven Bay, and potentially within the qualifying feature *Large shallow inlets and bays* (limited to the area to the south of the pipeline route, within the shelter of Ballyglass (as shown in Figure 4-1), The *Zostera* communities within Broadhaven Bay have the following conservation objectives:

- Maintain the extent of the *Zostera* dominated community, subject to natural processes
- Conserve the high quality of *Zostera* dominated community, subject to natural processes.

A number of species are present in Broadhaven Bay which, although not qualifying features for this site, but are for other sites in the vicinity, so that this site holds some importance for these. An example of such a species is bottlenose dolphin and both grey and harbour seals. This site has connectivity to other sites in close proximity and owing to this and its relatively close proximity to the proposed activities, it is included as a site of importance to be screened into the assessment.

4.3.1.2 Glenamoy Bog Complex SAC

The Glenamoy Bog Complex is an extensive, mainly terrestrial, site dominated by low- level undulating blanket bog and a fringe of high sea-cliffs. The SAC includes Sruwaddacon Bay and Rosspoint Bay to the north, which are also within the Blacksod Bay / Broadhaven SPA. Sruwaddacon Bay is a shallow tidal inlet which forms an integral part of the Glenamoy River salmonid fishery.

As well as being designated for a number of terrestrial features (Table 4-1), the SAC is designated for salmon *Salmo salar*, which migrates annually through Sruwaddacon Bay to and from the Glenamoy River catchment. Downstream migration of salmon smolts occurs between mid-April and early May, while the upstream migration of adult salmon occurs after late July.

The conservation objectives (NPWS, 2017 a) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

4.3.1.3 West Connacht Coast SAC

The West Connacht Coast SAC is a large marine SAC (66,016 ha) adjacent to the Mullet peninsula and Mayo coastline. The SAC is situated approximately 1 km from the proposed operations area at its closest point and is designated on the basis of its importance for bottlenose dolphin.

Bottlenose dolphin *Tursiops truncatus* occur within the site throughout the year and the area comprises a key habitat for the species both regionally and within Irish waters as a whole. The

NPWS site synopsis notes that the SAC may contain a minimum of 123, and possibly up to 150-200, individuals. The SAC is known to be used for a variety of activities including foraging and resting. Adults closely accompanying calves are commonly observed in summer and autumn months.

The conservation objectives (NPWS, 2015 a) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

4.3.1.4 *Erris Head SAC*

The Erris Head SAC is an approximately 15 km area of sea cliffs, plus adjoining habitats, which are mainly terrestrial but also includes 200 m of sea at the base of the cliffs. In addition to the qualifying interests in Table 4-1, the site synopsis notes the site is of conservation interest due to the presence of several Annex I EU Birds Directive species and some breeding seabirds.

The conservation objectives (NPWS, 2016 a) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) for which the SAC has been designated (as described in Table 4-1).

The site overlaps with Mullet Peninsula SPA and Termoncarragh Lake and Annagh Machair SPA. It also adjoins Broadhaven Bay SAC and West Connacht Coast SAC. The conservation objectives for these sites ought also to be taken into consideration when considering this site as required.

4.3.1.5 *Mullet / Blacksod Bay Complex SAC*

The Mullet / Blacksod Bay Complex SAC is a large coastal site that comprises much of the Mullet Peninsula, the sheltered waters of Blacksod Bay and the low-lying sandy coastline from Belmullet to Kinrovar. The site is also designated as an OSPAR MPA. The site character is strongly influenced by the Atlantic Ocean and the exposed location of much of the site results in a terrestrial landscape dominated by blown sand and largely devoid of trees. The underlying bedrock is principally metamorphic schist and gneiss. The site displays an excellent range of coastal and marine habitats.

The conservation objectives (NPWS, 2014 b) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

The site overlaps with the Blacksod Bay / Broadhaven SPA, Termoncarragh Lake and Annagh Machair SPA and Mullet Peninsula SPA. It also adjoins West Connacht Coast SAC. The conservation objectives for these sites ought also to be taken into consideration when considering this site as required.

4.3.1.6 *Owenduff / Nephin Complex SAC*

The Owenduff / Nephin Complex SAC is a mainly terrestrial site situated in Co. Mayo, with a large area of relatively intact blanket bog and mountains incorporating the catchment of the Owenduff River and much of the Nephin Beg Mountain range. There is an important population of salmon, a qualifying species, that spawns in the Owenduff River system.

The conservation objectives (NPWS, 2017 b) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) and resting sites within the SAC in a natural condition.

4.3.1.7 *Inishkea Islands SAC*

The Inishkea islands are two large islands situated off the coast of the Mullet Peninsula, Co. Mayo. The islands are recognised for terrestrial habitats and ornithological interest. In addition, the grey seal *Halichoerus grypus* is a qualifying interest for the SAC owing to the importance of the islands as a breeding site. It has been estimated by O' Cadhla & Strong (2007) that the grey seal population using Inishkea North may be greater than 900 animals, which contributed to over 20% of all animals recorded during the nationwide survey.

The conservation objectives (NPWS, 2015 b) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.8 *Duvillaun Islands SAC*

The Duvillaun Islands SAC comprises a group of uninhabited marine islands, rocks and reefs, located approximately 3 km off the southern tip of the Mullet Peninsula in Co. Mayo. The islands are recognised for their ornithological interest. In addition, the grey seal is a qualifying interest for the SAC owing to the importance of the islands as a breeding site in combination with the Inishkea Islands.

The conservation objectives (NPWS, 2013 a) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.9 *River Moy SAC*

The River Moy SAC is the terrestrial SAC adjacent to the Killala Bay / Moy Estuary SAC. It comprises almost the entire freshwater element of the River Moy and its tributaries and contains examples of important terrestrial habitats (Table 4-1). The Moy system is one of Ireland's premier salmon waters and is a highly productive salmonid nursery. Salmon is a qualifying interest of the SAC and runs the river every month of the year. Sea lamprey, another qualifying interest, is regularly encountered in the lower stretches of the river around Ballina.

The conservation objectives (NPWS, 2016 b) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) and resting sites within the SAC in a natural condition.

4.3.1.10 Killala Bay / Moy Estuary SAC

The Killala Bay / Moy Estuary SAC comprises the long narrow estuarine channel and a north-facing triangular bay on the border between Co. Mayo and Co. Sligo. A long sandy island (Bartragh Island) separates the south-western side of the bay from the open water and much of the inner part of the bay is intertidal. The site supports a population of harbour seals *Phoca vitulina*, a qualifying interest, with the site synopsis reporting 108 individuals in 2003. Sea lamprey is also supported within the site.

The conservation objectives (NPWS, 2012 a) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.11 Newport River SAC

The Newport River SAC comprises the River itself, Lough Beltra and the tributaries the Skerdagh, Glenisland Crumpaun/Boghadoon and Bracklagh/Cloondaff. It is mainly a terrestrial site. The Newport River is a renowned salmonid river and supports salmon, a qualifying interest.

The conservation objectives (NPWS, 2018 a) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) sites within the SAC in a natural condition.

4.3.1.12 Clew Bay Complex SAC

The Clew Bay Complex SAC comprises of Clew Bay, a wide, west-facing bay on the west coast of Co. Mayo and Clare Island. The geomorphology of the bay results in a series of interlocking bays giving rise to a variety of marine and terrestrial habitats. The SAC supports an important population of harbour seals, a qualifying interest. The site synopsis notes that land-based monitoring in August 2010 recorded 118 seals ashore.

The conservation objectives (NPWS, 2011) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.13 Mweelrea / Sheeffry / Erriff Complex SAC

The Mweelrea / Sheeffry / Erriff Complex SAC is an extremely large site and covers a large area of the hill of south Co. Mayo, encompassing several river catchments. The SAC contains a wide range of habitats, including five with priority status on Annex I of the EU Habitats Directive. An important population of salmon, a qualifying species, spawns in the Erriff River system.

The conservation objectives (NPWS, 2017 c) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) and resting sites within the SAC in a natural condition.

4.3.1.14 *Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC*

The Cummeen Strand / Drumcliff Bay SAC is a large coastal site comprising two large, shallow bays, Drumcliff Bay and Sligo Harbour, and two island, Ardboline and Horse Island. The site is also designated as an OSPAR MPA. The dominant habitats of the SAC are estuaries and intertidal sand and mudflats. In addition to the qualifying interests in Table 4-1, the site synopsis notes the site is of conservation interest due to the presence of wintering waterfowl and breeding seabirds. Drumcliff Bay supports a breeding population of harbour seals, while the Ardboline and Horse Island are important haul out sites for the species, with a minimum population of 12-15 individuals estimated from 2007 and 2008 counts. Sea and river lamprey have been recorded in the Garavogue River, which is included within the site.

The conservation objectives (NPWS, 2013 b) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.15 *Inishbofin and Inishshark SAC*

The Inishbofin and Inishshark SAC comprises the two named islands and several islets and stacks, with part of the surrounding marine waters including in the site. It is located about 5.5 km off the Co. Galway coast. The site is important for terrestrial habitats (Table 4-1) and is also an important ornithological site. The SAC also supports a breeding colony of grey seals, with the site synopsis reporting an estimated population of 749-963 individuals in 2005.

The conservation objectives (NPWS, 2015 c) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.16 *The Twelve Bens / Garraun Complex SAC*

The Twelve Bens / Garraun Complex SAC is an extensive site dominated by mountainous terrain. It is bounded by the Connemara Bog Complex in the south, the Maumturk Mountains in the east and Killary Harbour in the north. The site includes a wide variety of habitat types, with nine listed on Annex I of the EU Habitats Directive and is one of the largest and most varied protected sites in Ireland. The Owenglin River, which is included with the site, supports an important population of salmon, a qualifying species.

The conservation objectives (NPWS, 2017 d) are to maintain or restore the favourable

conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve important sites within the SAC in a natural condition.

4.3.1.17 *Ballysadare Bay SAC*

The Ballysadare Bay SAC is the most southerly of three inlets of the larger Sligo Bay, extending 10 km westwards of the town of Ballysadare, C. Sligo. The SAC contains extensive intertidal sand and mudflats and supports a colony of harbour seals. The site synopsis reports a maximum of 257 seals in 2003.

The conservation objectives (NPWS, 2013 c) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.18 *Maumturk Mountains SAC*

The Maumturk Mountains SAC comprises the area between Killary Harbour to the north and the Galway / Clifden road in the south. The site is a good example of an extensive mountain landscape, containing blanket bog, large areas of heath, siliceous rocky vegetation, oligotrophic lakes and upland grassland. It is an important site for salmon with the rivers and lakes, particularly the Bealnabrack system, providing high quality spawning and nursery rivers.

The conservation objectives (NPWS, 2017 e) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve spawning and nursery sites within the SAC in a natural condition.

4.3.1.19 *Slieve Tooey / Tormore Island / Loughros Beg Bay SAC*

The Slieve Tooey / Tormore Island / Loughros Beg Bay SAC is a large site stretching from Ardara in the east to Glencolumbkille and Glen Bay in the west. The northern coast of the site is fringed with coastal habitats, while inland it is mainly mountainous, with a variety of terrestrial habitats (Table 4-1). The cliffs and rocky islets of the SAC, particularly Tormore Island, are of ornithological interest as breeding habitat for seabirds. In addition, the grey seal breeds in sea caves in this SAC, the breeding population estimated at 868-1116 individuals in 2005, according to the site synopsis.

The conservation objectives (NPWS, 2015 d) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.20 Lough Corrib SAC

The Lough Corrib SAC encompasses the Lough Corrib basin, the rivers Clare, Grange, Abbert, Sinking, Dalgan and Black to the east and the Cong, Bealanabrack, Failmore, Cornamona, Drimneen and Owenriff to the west, as well as adjoining areas of conservation interest, including raised bog, woodland, grassland and limestone pavement. Lough Corrib is the second largest lake in Ireland and as well as supporting the qualifying species listed in Table 4-1, is of ornithological interest. Salmon spawn in the lake and rivers, while the site also supports a population of sea lamprey.

The conservation objectives (NPWS, 2017 f) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) and resting sites within the SAC in a natural condition.

4.3.1.21 Lough Gill SAC

The Lough Gill SAC includes Lough Gill, Doon Lough, the Bonet River and a stretch of Owenmore River. The SAC contains four Annex I habitats, including two with priority status, and supports a high number of rare or scarce animal and plant species. The Lough Gill system connects with Cummeen Strand / Drumcliff Bay SAC, and the site is of considerable importance for brook, sea and river lamprey and salmon.

The conservation objectives (NPWS, 2018 b) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) and resting sites within the SAC in a natural condition.

4.3.1.22 Connemara Bog Complex SAC

The Connemara Bog Complex SAC is a large site encompassing much of the south Connemara lowlands of Co. Galway. It encompasses a large area of relatively undamaged lowland Atlantic blanket bog of high conservation significance and is of ornithological interest, illustrated by the corresponding SPA. Many of the rivers within the site support salmon, with good spawning and nursery grounds occurring within the Cashla and Ballynahinch systems.

The conservation objectives (NPWS, 2015 e) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) and resting sites within the SAC in a natural condition.

4.3.1.23 Slyne Head Islands SAC

The Slyne Head Islands SAC comprises a long archipelago of islands, islets, rocks and reefs located off the western shores and south-western tip of the Slyne Head Peninsula in Co. Galway. The islands are low-lying and covered in grassy maritime turf. The SAC contains

excellent examples of reefs and supports an important breeding colony of grey seals. The site synopsis estimates the 2005 breeding population as 238-306 seals.

The conservation objectives (NPWS, 2012 b) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.24 *Kilkieran Bay and Islands SAC*

The Kilkieran Bay and Islands SAC is an extensive coastal complex situated just north of Galway Bay. It contains a large area of open marine water, many islands and rocky islets and a coastline indented with a series of bays. The site is also designated as an OSPAR MPA. The site is of ornithological interest and supports a population of harbour seal, a qualifying interest, with 112 individuals counted in 2003. The grey seal is also a qualifying interest and is a regular visitor to the SAC and may breed.

The conservation objectives (NPWS, 2014 c) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.25 *Lough Melvin SAC*

The Lough Melvin SAC is located in the north-west of Co. Leitrim. The lake is oligo-mesotrophic, and the site includes a number of river and streams, including the Drowes River, which links Lough Melvin to Donegal Bay. The unique fish community of the lake is the main feature of interest, as Lough Melvin is an excellent example of a natural, post-glacial salmonid lake. Salmon is a qualifying interest of the site.

The conservation objectives (NPWS, 2018 c) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) and resting sites within the SAC in a natural condition.

4.3.1.26 *West of Ardara/Maas Road SAC*

The West of Adara/Maas Road SAC is an extensive coastal site situated in south-west Co. Donegal. The SAC has a diverse range of coastal and terrestrial habitats, with qualifying interests (Table 4-1) of great ecological interest. The estuaries of the Gweebarra, Owentocker and Owena Rivers are the most extensive habitats of the site. The SAC is also of ornithological interest. In addition, the harbour seal is a qualifying interest, with the site synopsis reporting the site supporting a maximum of 59 in 2003. The site also supports populations of salmon, which is included as a qualifying species.

The conservation objectives (NPWS, 2015 f) are to maintain or restore the favourable

conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.27 *Donegal Bay (Murvagh) SAC*

The Donegal Bay (Murvagh) SAC occupies the inner part of Donegal Bay, south-west of Donegal Town. The site contains the estuary of the River Eske and a number of other rivers and consists mainly of intertidal habitats. It is recognised for its ornithological interest, particularly as a wintering ground for common scoter. In addition, the harbour seal is a qualifying interest for the SAC, supporting a population of approximately 150 seals in 2003 according to the site synopsis.

The conservation objectives (NPWS, 2012 c) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.28 *Rutland Island and Sound SAC*

The Rutland Island and Sound SAC lies between Aran Island and Burtonport in north-west Donegal. It contains important examples of the qualifying interest habitats listed in Table 4-1. The SAC also supports a population of harbour seal, the species included as a qualifying interest, with the site synopsis noting a count of 202 in 2003.

The conservation objectives (NPWS, 2013 d) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.29 *Lough Eske and Ardnamona Wood SAC*

The Lough Eske and Ardnamona Wood SAC encompasses the Lough Eske (a large lowland oligotrophic lake), the Eske River, short stretches of the Lowerymore, Clogher and Drummenny Rivers and other smaller tributaries. Ardnamona Wood, situated on the west side of the lake, is an old oak woodland of great scientific interest due to its size, naturalness and flora. The Eske system supports an important multi-sea-winter (spring) stock of salmon, and is one of the few rivers nationally to hold 3-sea-winter fish over 20 lbs.

The conservation objectives (NPWS, 2018 d) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding (spawning in the case of fish species) sites within the SAC in a natural condition.

4.3.1.30 Galway Bay Complex SAC

The Galway Bay Complex SAC comprises the inner shallow part of the large Galway Bay on the west coast. The site is also designated as an OSPAR MPA. The SAC contains a diverse range of marine, coastal and terrestrial habitats, including numerous small islands composed of glacial deposits, and the rarer soft type of sea cliffs. For one of the qualifying interests, the harbour seal, the site provides extensive good quality habitat, with the seals using a variety of haul out sites throughout the bay. According to the site synopsis a maximum of 317 individuals were counted in 2003. The site is also of ornithological interest.

The conservation objectives (NPWS, 2013 e) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.31 Horn Head and Rinclevan SAC

The Horn Head and Rinclevan SAC is a diverse coastal site, containing a wide range of habitats and ranging northwards from Dunfanaghy in Co. Donegal and westwards reaching just beyond Dooros Point. The grey seal is also a qualifying interest for the SAC, with a small breeding population estimated at four or five individuals in 2005. In addition to the other qualifying interests in Table 4-1, the site synopsis notes the site is of conservation interest due to the presence of several Annex I EU Birds Directive species and breeding seabirds on the cliffs of Horn Head.

The conservation objectives (NPWS, 2014 d) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.1.32 Lower River Shannon SAC

The Lower River Shannon SAC is an extremely large site, with a high number of qualifying interest habitats and species (Table 4-1). It stretches along the Shannon valley and encompasses the Shannon, Feale, Mulkear and Fergus estuaries, and parts of their catchments. The site is of ornithological importance for wintering waterfowl. There is a resident population of bottlenose dolphins, a qualifying interest of the SAC, in the Shannon Estuary, with site synopsis noting an estimated population of 140 individuals in 2006. Sea lamprey, River lamprey, and salmon are qualifying interests and all three have been observed spawning in the lower Shannon or its tributaries.

The conservation objectives (NPWS, 2012 d) are to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been designated (as described in Table 4-1).

This will be achieved by ensuring that there are no restrictions to the animals range within the SAC, and also to conserve their breeding and resting and moulting haul out sites within the SAC in a natural condition.

4.3.2 Special Protection Areas (SPAs)

A number of coastal SPAs, designated for a range of qualifying bird species, are located within the vicinity of the survey area. Given the ability to fly, and the large foraging distances of some species (e.g. gannet), it is possible that birds contributing to SPAs beyond the immediate survey area (and that shown in Figure 4-2) have the potential to be impacted. Designated European sites for diving seabirds (SPAs) in the wider area of search are presented in Figure 4-1. The rationale for the definition of the area of search for SPAs is detailed in Section 4.2. The rationale for the definition of the area of search for SPAs is detailed in Section 4.2. Further consideration of birds and SPAs is made in Sections 5 and 6. All coastal SPA's share the same primary conservation objective, which is to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for the respective SPA sites.

4.3.2.1 Blacksod Bay / Broadhaven Bay SPA

This SPA comprises all the inner parts of Broadhaven Bay and includes various sheltered bays of Blacksod Bay. Both these regions are situated in the extreme north- west of Co. Mayo. Interstitial sand and mudflats are exposed during low tide, supporting a well-developed ecosystem that includes polychaetes, bivalves and crustaceans. Open sand flats are present at the low-lying margin of the saltmarshes supporting flora such as glasswort and seablite. Sandy and shingle beaches are also present.

The site contains salt marshes that are situated on a peat substrate, providing roosts for a high diversity of wintering waterfowl and has been described as one of the most important wetland complexes in the west. The environment supports five nationally important waterfowl populations, including:

- great northern diver (*Gavia immer*)
- red-breasted merganser (*Mergus serrator*)
- bar-tailed godwit (*Limosa lapponica*)
- ringed plover (*Charadrius hiaticula*) – 3% of the national population
- dunlin (*Calidris alpina*).

On Inishderry Island, there is a nationally important colony of Sandwich Tern located on the site, as well as common tern, Arctic tern. Localised populations of little tern have been documented in the past. a colony of black-headed gulls also lives in this area.

Seven of the regular species that occur at the site are listed on Annex I of the EU Birds Directive. These are:

- great northern diver
- red-throated diver
- golden plover
- bar-tailed godwit
- sandwich tern (*Sterna sandvicensis*)
- common tern
- Arctic tern.

The conservation objective (NPWS, 2014 e) is to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

- Wintering populations of great northern diver, light-bellied brent goose (*Branta bernicla hrota*), common scoter (*Melanitta nigra*), red-breasted merganser (*Mergus serrator*), ringed plover (*Charadrius hiaticula*), sanderling (*Calidris alba*), dunlin (*Calidris alpina*), bar-tailed godwit (*Limosa lapponica*), curlew (*Numenius arquata*)
- Breeding populations of sandwich tern
- Wetlands.

4.3.2.2 Termoncarragh Lough and Annagh Machair SPA

Termoncarragh Lough is a shallow, coastal lake on the north-west side of Mullet Peninsula that is fringed with swamp vegetation and sporadically edged with marsh and fen. The site is particularly important with regards to wetlands and wetland bird species, and the area is a SPA under Annex I of the EU Birds Directive for the following species:

- barnacle goose (*Branta leucopsis*)
- whooper swan (*Cygnus cygnus*)
- greenland white-fronted goose (*Anser albifrons flavirostris*)
- corncrake (*Crex crex*)
- chough (*Pyrrhocorax pyrrhocorax*)
- lapwing (*Vanellus vanellus*)
- dunlin (*Calidris alpina schinzii*).

The lake and surrounding area are particularly important as a wintering ground, supporting the largest barnacle goose population in the country. Whooper swan visit the site during autumn and spring, with approximately 300 individuals overall. Other wintering species in the area include greenland white-fronted goose, golden plover, teal, mallard and ringed plover, as well as the mute swan.

The conservation objectives (NPWS, 2018 e) are to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (eight species listed above) and to maintain or restore the favourable conservation condition of the wetland habitat at Termoncarragh Lake and Annagh Machair SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

4.3.2.3 Mullet Peninsula SPA

The Mullet Peninsula SPA consists of three separate areas within the peninsula, which is low-lying and exposed. The main habitat consists of grassland. The site is designated a SPA because of the population of breeding corncrake (*Crex crex*). Furthermore, it is one of the few sites along the coast that is regularly utilised by the species. Corncrake is listed on the 2010 International Union for Conservation of Nature (IUCN) Red List of Threatened Species, as well as listed under Annex I of the EU Birds Directive.

The objectives (NPWS, 2018 f) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- corncrake (*Crex crex*).

4.3.2.4 Stags of Broadhaven SPA

The Stags of Broad Haven are a group of four precipitous rocky islets, rising to almost 100 m, located about 2 km north of Benwee Head, Co. Mayo. The surrounding seas to a distance of 500 m are included in the site.

The site is a SPA under the EU Birds Directive for the following species:

- storm petrel (*Hydrobates pelagicus*)
- Leach's storm-petrel (*Oceanodroma leucorhoa*).

The Stags are of particular importance owing to the presence of the only known colony of Leach's petrel in Ireland, as well as a nationally important population of storm petrel. Both Leach's petrel and storm petrel are listed on Annex I of the E.U. Birds Directive. Other species that breed at the site include fulmar, kittiwake, puffin, herring gull and great black-backed gull.

The objectives (NPWS, 2018 g) are to maintain or restore the favourable conservation conditions of the bird species listed as Special Conservation Interests for this SPA:

- storm petrel (*Hydrobates pelagicus*)
- Leach's storm-petrel (*Oceanodroma leucorhoa*).

4.3.2.5 Illanmaster SPA

Illanmaster is a steep, rocky island, rising to 107 m and topped with a maritime grassy sward, situated just off the north Co. Mayo coast. The SPA site comprises the island and the surrounding seas to a distance of 500 m, with the southern boundary of the site adjoining the mainland shoreline.

The site is a SPA under the EU Birds Directive due to the presence of an internationally important population of storm petrel (*Hydrobates pelagicus*), which is one of the largest populations in the region. Other species that have been recorded breeding at the site are fulmar, puffin, great black-backed gull and black guillemot. The site is also visited by a small flock of wintering barnacle geese (*Branta leucopsis*), which, along with the storm petrel, is listed on Annex I of the EU Birds Directive.

The objectives (NPWS, 2018 h) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- storm petrel (*Hydrobates pelagicus*).

4.3.2.6 Inishglora and Inishkeeragh SPA

Inishglora and Inishkeeragh are two islands approximately 1.5-3 km west of the Mullet Peninsula and are part of a larger group of islands that consist of the Inishkeas and the Duvillauns. Both islands are low-lying and support maritime grassland vegetation and serve as a wintering site for barnacle geese.

The site is a SPA under Annex I of the EU Birds Directive for the following species:

- storm petrel (*Hydrobates pelagicus*)
- barnacle goose (*Branta leucopsis*)
- Arctic tern (*Sterna paradisaea*)

- cormorant (*Phalacrocorax carbo*)
- shag (*Phalacrocorax aristotelis*)
- lesser black-backed gull (*Larus fuscus*)
- herring gull (*Larus argentatus*).

Storm petrel uses the islands as an established breeding site, and the islands are of national importance with regards to Arctic tern. Other bird species (not listed) include herring gull, greater black-backed gull, common gull and black guillemot. Barnacle geese are also present, as they use the islands as a good feeding habitat as well as for protection.

Aside from the ornithological interest, the islands are also an important breeding site for grey seals (which are listed under Annex II of the EU Habitat Directive).

The objectives (NPWS, 2018 i) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- storm petrel (*Hydrobates pelagicus*) - breeding
- cormorant (*Phalacrocorax carbo*) – breeding
- shag (*Phalacrocorax aristotelis*) – breeding
- lesser black-backed gull (*Larus fuscus*) – breeding
- Herring Gull (*Larus argentatus*) – breeding
- Arctic Tern (*Sterna paradisaea*) – breeding
- Barnacle Goose (*Branta leucopsis*) – wintering.

4.3.2.7 Inishkea islands SPA

The Inishkea Islands also has great ornithological importance, as it serves as a main breeding ground for seabirds, some of which are listed on Annex I of the EU Birds Directive. The conservation objectives (NPWS, 2018 j) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- shag (*Phalacrocorax aristotelis*)
- ringed plover (*Charadrius hiaticula*)
- sanderling (*Calidris alba*)
- purple sandpiper (*Calidris maritima*)
- turnstone (*Arenaria interpres*)
- common gull (*Larus canus*)
- herring gull (*Larus argentatus*)
- Arctic tern (*Sterna paradisaea*)
- little tern (*Sterna albifrons*)
- barnacle goose (*Branta leucopsis*)
- dunlin (*Calidris alpina schinzii*).

Other, non-listed bird species include great black-backed gull, black-headed gull and black guillemot. The Islands also support important concentrations of breeding oystercatcher, and

lapwing.

Furthermore, the Islands act as a main wintering site for barnacle goose and hold internationally important numbers. Nationally important concentrations of golden plover have also been recorded.

4.3.2.8 Duvillaun Islands SPA

The Duvillaun Islands SPA comprises a group of uninhabited marine islands, rocks and reefs, located approximately 3 km off the southern tip of the Mullet Peninsula in Co. Mayo. The surrounding seas, where seabirds forage, bathe and socialise are included within the designated site boundaries.

The Duvillaun Islands are of importance for both breeding and wintering birds, some of which are listed on Annex I of the EU Birds Directive. The conservation objectives (NPWS, 2018 k) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- storm petrel (*Hydrobates pelagicus*) – breeding
- Fulmar (*Fulmaris glacialis*) – breeding
- barnacle goose (*Branta leucopsis*) – wintering.

Other bird species that are supported within the Duvillaun Islands include peregrine falcon, ringed plover, oystercatcher, rock pipit, skylark, wheatear, raven, shag, herring gull, great black-backed gull and common gull.

4.3.2.9 Clare Island SPA

The Clare Island SPA comprises the cliffs around Clare Island and the adjacent marine waters. Clare Island lies at the entrance to Clew Bay, Co. Mayo, approximately 5 km from the mainland. It is one of the top seabird sites in Ireland, hosting nationally important populations of seven species, particularly fulmar.

The site is a SPA under Annex I of the EU Birds Directive. The conservation objectives (NPWS, 2018 l) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- chough (*Pyrrhocorax pyrrhocorax*)
- fulmar (*Fulmaris glacialis*)
- shag (*Phalacrocorax aristotelis*)
- kittiwake (*Rissa triadactyla*)
- common gull (*Larus canus*)
- guillemot (*Uria aalge*)
- razorbill (*Alca torda*).

Other seabird species breed regularly on the island including black guillemot, gannet, puffin, cormorant, great black-backed gull, lesser black-backed gull and herring gull. The site also is a traditional nesting site for peregrine.

4.3.2.10 Bills Rocks SPA

The Bills Rocks SPA comprises the cliffs around Clare Island and the adjacent marine waters. Clare Island lies at the entrance to Clew Bay, Co. Mayo, approximately 5 km from the mainland. It is one of the top seabird sites in Ireland, hosting nationally important populations of seven species, particularly Fulmar.

The site is a SPA under Annex I of the EU Birds Directive. The conservation objectives (NPWS, 2018 m) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- storm petrel (*Hydrobates pelagicus*)
- puffin (*Fratercula arctica*).

Other seabird species breed regularly on the island including black guillemot, gannet, puffin, cormorant, great black-backed gull, lesser black-backed gull and herring gull. The site also is a traditional nesting site for peregrine.

4.3.2.11 Ardboline Island and Horse Island SPA

The Ardboline Island and Horse Island SPA comprises of the named two small marine islands and the surround marine waters where seabirds forage, bathe and socialise. The site is located approximately 500 m from the mainland as Dooneragh Point, Co. Sligo. The islands are an important breeding site for seabirds, with a population of Cormorant of national importance, and breeding herring gulls and great black-backed gulls. breeding eider and shelducks have also been recorded. An internationally important flock of barnacle goose also winter on the site.

In addition to the ornithological interest, the islands are also an important haul out site for grey seals, which are listed under Annex II of the EU Habitat Directive, and also breed at the site.

The site is a SPA under the EU Birds Directive and the conservation objectives (NPWS, 2018 n) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- cormorant (*Phalacrocorax carbo*) – breeding
- barnacle goose (*Branta leucopsis*) – wintering.

4.3.2.12 Inishmurray SPA

The Inishmurray SPA is a low flat, exposed island located in Donegal Bay, approximately 6 km north-west of Steerdagh Point, Co. Mayo. The site includes the surrounding seas to a distance of 200 m from the shoreline. The island is important for breeding seabirds, including three Annex I Species of the EU Birds Directive, the common tern, Arctic tern and storm petrel. Other breeding species include shag, herring gull, common gull, great black-backed gull, lesser black-backed gull, fulmar, black guillemot, and eider duck. The site is also a regular roost site for a wintering population of Barnacle Goose, another Annex I species.

The site is a SPA under the EU Birds Directive and the conservation objectives (NPWS, 2018 o) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- shag (*Phalacrocorax aristotelis*) – breeding
- herring gull (*Larus argentatus*) – breeding

- Arctic tern (*Sterna paradisaea*) – breeding
- barnacle goose (*Branta leucopsis*) – wintering.

4.3.2.13 West Donegal Coast SPA

The West Donegal Coast SPA comprises separate sections of the Co. Donegal coastline, including Aran Island. The most important seabird breeding colony is at Tormore Island, a small sea stack on the north of the Glencolumbkille Peninsula, while Chough breeding pairs concentrate on the Glencolumbkille Peninsula, from Kilybegs in the south to Loughros Beg Bay in the North and on Aran Island.

The site is a SPA under the EU Birds Directive and the conservation objectives (NPWS, 2018 p) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- fulmar (*Fulmarus glacialis*)
- cormorant (*Phalacrocorax carbo*)
- shag (*Phalacrocorax aristotelis*)
- peregrine (*Falco peregrinus*)
- herring gull (*Larus argentatus*)
- kittiwake (*Rissa tridactyla*)
- razorbill (*Alca torda*)
- chough (*Pyrrhocorax pyrrhocorax*).

Other breeding seabird species include black guillemot, guillemot, great black-backed gull and lesser black-backed gull. The barnacle goose is known to occasionally graze in small groups on the top of Tormore Island, while twite and ring ouzel are also known to occur.

4.3.2.14 Cruagh Island SPA

The Cruagh Island SPA comprises a small to medium sized, low-lying island and the sea surrounding it to a distance of 500 m to accommodate 'rafting' shearwaters. The site is of ornithological importance on account of its internationally important population of nesting Manx shearwater and nationally important population of wintering barnacle goose. There is also a nationally important colony of resident great black-backed gulls, and a small number of fulmars on the island.

The site is a SPA under the EU Birds Directive and the conservation objectives (NPWS, 2018 q) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- Manx shearwater (*Puffinus puffinus*) – breeding
- barnacle goose (*Branta leucopsis*) – wintering.

4.3.2.15 Inishduff SPA

The Inishduff SPA comprises a small rocky island and the sea surrounding it to a distance of 200 m, approximately 2 km off the south Co. Donegal coast. The site is a designated a SPA under the EU Birds Directive due to the nationally important breeding population of Sshag. The

island is an important breeding site for a number of other seabirds, including the storm petrel, which is listed on Annex I of the EU Birds Directive, great black-backed gull, herring gull and eider duck. Another Annex I species, the barnacle goose, also uses the site as a wintering ground.

The conservation objectives (NPWS, 2018 r) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- shag (*Phalacrocorax aristotelis*).

4.3.2.16 Connemara Bog Complex SPA

The Connemara Bog Complex SPA is a large site encompassing much of the south Connemara lowlands of Co. Galway. There are three separate areas and the site is characterised by areas of deep peat surrounded by heath-covered rocky outcrops.

The site is a SPA under the EU Birds Directive, supporting nationally important breeding populations of the bird species listed as Special Conservation Interests. The conservation objectives (NPWS, 2018 s) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- cormorant (*Phalacrocorax carbo*)
- merlin (*Falco columbarius*)
- golden plover (*Pluvialis apricaria*)
- common gull (*Larus canus*).

Wintering greenland white-fronted goose also utilise the site.

4.3.2.17 Donegal Bay SPA

The Donegal Bay SPA is a very large, marine-dominated site that overlaps with Donegal Bay (Murvagh) SAC. It extends from Doorin Point, to the west of Donegal Town, to Tullaghan Point in Co. Leitrim and varies in width from approximately 3 km to over 8 km.

The Bay supports a large diversity of wintering waterbirds and the SPA is partially designated under the the EU Birds Directive for its wetlands and associated waterbirds. The conservation objectives (NPWS, 2012 e) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- great northern diver (*Gavia immer*) – wintering
- light-bellied brent goose (*Branta bernicla hrota*) – wintering
- common scoter (*Melanitta nigra*) – wintering
- peregrine (*Falco peregrinus*) – wintering
- sanderling (*Calidris alba*) – wintering.

The wintering populations of great northern diver and light-bellied brent goose are internationally important, while the wintering populations of common scoter and sanderling are nationally important. Four more of the regularly occurring species are listed on Annex I of the EU Birds Directive: black-throated diver, red-throated diver, golden plover, and bar-tailed godwit.

4.3.2.18 Inner Galway Bay SPA

The Inner Galway Bay SPA is a very large, marine-dominated site that overlaps with Galway Bay Complex SAC. The inner bay is protected from Atlantic swells by the Aran Islands and Black Head. The SPA is of high ornithological importance with two wintering species having populations of international importance (great northern diver and light-bellied brent goose) and a further sixteen of national importance. There is a high diversity of waterbirds. Three of the breeding seabird colonies (common tern, sandwich tern and cormorant) are also of national importance.

Part of the site is formed of wetlands and the SPA is partially designated under the EU Birds Directive for its wetlands and associated waterbirds. The conservation objectives (NPWS, 2013 f) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- Wintering populations of great northern diver (*Gavia immer*), light-bellied brent goose (*Branta bernicla hrota*), cormorant (*Phalacrocorax carbo*), grey heron (*Ardea cinerea*), wigeon (*Anas Penelope*), teal (*Anas crecca*), shoveler (*Anas clypeata*), red-breasted merganser (*Mergus serrator*), ringed plover (*Charadrius hiaticula*), golden plover (*Pluvialis apricaria*), lapwing (*Vanellus vanellus*), dunlin (*Calidris alpina*), bar-tailed godwit (*Limosa lapponica*), curlew (*Numenius arquata*), redshank (*Tringa totanus*), turnstone (*Arenaria interpres*), black-headed gull (*Chroicocephalus ridibundus*), and common gull (*Larus canus*)
- breeding populations of sandwich tern (*Sterna sandvicensis*) and cormorant.

The Inner Galway Bay is also a Ramsar Convention site and part of the Inner Galway Bay SPA is a Wildfowl Sanctuary.

4.3.2.19 Inishmore SPA

The Inishmore SPA comprises all the cliffs and rocky shore of along the southern side of the Inishmore Island, the largest of the three Aran Islands, part of the low cliffs/rocky shore at the west end, the low cliffs/rocky shore at the east end, the two islands west of Inishmore (Brannock Island and Rock Island), Straw Island at the east end of Inishmore, the dune system at Barr na Coise, and the adjacent seas out to 500 m.

The SPA is an important site for breeding seabirds, especially cliff-nesting species, and the site is designated under the EU Birds Directive for four migratory species with populations of national importance. other breeding seabird species include fulmar, razorbill, shag, black guillemot, great black-backed gull and herring gull. The black guillemot colony is one of the largest in Ireland.

Inishmore is also important for peregrine, and chough breed on the cliffs. Some of the species listed on Annex I of the EU Birds Directive.

The conservation objectives (NPWS, 2018 t) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- kittiwake (*Rissa tridactyla*)
- Arctic tern (*Sterna paradisaea*)
- little tern (*Sterna albifrons*)
- guillemot (*Uria aalge*).

4.3.2.20 Cliffs of Moher SPA

The Cliffs of Moher SPA comprises the cliffs, the land adjacent to the cliffs and the adjacent sea up to 500 m from the cliff base, along the north Clare coast from Faunmore to just south of Cancreggia Point. The SPA is one of the most important seabird colonies in Ireland and is of special conservation interest as the breeding assemblage is over 20,000 seabirds.

The conservation objectives (NPWS, 2018 u) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- fulmar (*Fulmarus glacialis*)
- kittiwake (*Rissa tridactyla*)
- guillemot (*Uria aalge*)
- razorbill (*Alca torda*)
- puffin (*Fratercula arctica*)
- chough (*Pyrrhocorax pyrrhocorax*).

The site holds the largest kittiwake and razorbill colonies in Ireland, and the second largest fulmar colony. The breeding colony of chough is also nationally important, while breeding peregrine also nest on the cliffs, both listed on Annex I of the EU Birds Directive.

4.3.2.21 Tory Island SPA

The Tory Island SPA comprises the remote rocky island of Tory and a marine area extending 500 m from the base of the cliffs that form the eastern and north-east side of the island. The site is partially designated a SPA because of the population of breeding corncrake. Furthermore, it is one of the few sites along the coast that is regularly utilised by nationally important numbers of the species. Corncrake is listed on the 2010 International Union for Conservation of Nature (IUCN) Red List of Threatened Species, as well as listed under Annex I of the EU Birds Directive.

The conservation objectives (NPWS, 2018 v) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- fulmar (*Fulmarus glacialis*)
- corncrake (*Rissa tridactyla*)
- razorbill (*Alca torda*)
- puffin (*Fratercula arctica*).

Nationally important breeding populations of the three seabirds the SPA is designated for also occur on the site. Other species include kittiwake, guillemot, black guillemot, shag, herring gull, great black-backed gull, black-headed gull and common gull.

4.3.2.22 Horn Head to Fanad Head SPA

The Horn Head to Fanad Head SPA comprises a number of separate sections of the north Co. Donegal coastline. The site includes high coast areas and sea cliffs, land adjacent to the cliff edge and the sand dunes and lake at Dunfanaghy/Rinclevan. At Horn Head the adjacent sea area out to 500 m is also included. The site hosts an internationally important population of breeding chough and a large peregrine population. It also supports nationally important

greenland white-fronted goose and barnacle goose populations.

The SPA is used by a wide variety of nesting seabirds. Along with the seabird species the SPA is designated for, which are nationally important population, the site is also of special conservation interest for holding an assemblage of over 20,000 breeding seabirds.

The conservation objectives (NPWS, 2018 w) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- fulmar (*Fulmarus glacialis*)
- cormorant (*Phalacrocorax carbo*)
- shag (*Phalacrocorax aristotelis*)
- barnacle goose (*Branta leucopsis*)
- peregrine (*Falco peregrinus*)
- kittiwake (*Rissa tridactyla*)
- guillemot (*Uria aalge*)
- razorbill (*Alca torda*)
- chough (*Pyrrhocorax pyrrhocorax*)
- greenland white-fronted goose (*Anser albifrons flavirostris*).

4.3.2.23 Mid-Clare Coast SPA

The Mid-Clare Coast SPA comprises the mainland shoreline, Mutton Island, Mattle Island, as series of rocky reefs, and the open marine water of Mal Bay between the islands and the mainland along the Co. Clare coast. As part of the site is wetlands, the SPA is partially designated under the EU Birds Directive for these and the associated waterbirds, some of which are listed on Annex I.

The conservation objectives (NPWS, 2014 f) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- cormorant (*Phalacrocorax carbo*)
- barnacle goose (*Branta leucopsis*)
- ringed plover (*Charadrius hiaticula*)
- sanderling (*Calidris alba*)
- purple sandpiper (*Calidris maritima*)
- dunlin (*Calidris aplina*)
- turnstone (*Arenaria interpres*).

A range of breeding seabirds use the site during summer, but the population of Cormorant is nationally important. The wintering population of purple sandpiper is internationally important, while the other four wintering waders and the barnacle goose are nationally important.

4.3.2.24 River Shannon and River Fergus Estuaries SPA

The River Shannon and River Fergus Estuaries SPA overlaps with the Lower River Shannon

SAC. The estuarine complex of the River Shannon and River Fergus is the largest in Ireland and the site comprises the entire estuarine habitat, including vast intertidal flats. The SPA is the most important coastal wetland site in the country and is partially designated under the EU Birds Directive due to this and the associated waterbirds, some of which are listed on Annex I of the EU Birds Directive. The site is of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds, and regularly supports in excess of 50,000 wintering waterfowl.

The conservation objectives (NPWS, 2012 f) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- Wintering populations of whooper swan (*Cygnus cygnus*), light-bellied brent goose (*Branta bernicla hrota*), shelduck (*Tadorna tadorna*), wigeon (*Anas penelope*), teal (*Anas crecca*), pintail (*Anas acuta*), shoveler (*Anas clypeata*), scaup (*Aythya marila*), 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*), greenshank (*Tringa nebularia*) and black-headed gull (*Chroicocephalus ridibundus*)
- Wintering and breeding populations of Cormorant (*Phalacrocorax carbo*).

The SPA is one of the most important sites for dunlin, lapwing and redshank, and the wintering populations of light-bellied brent goose, dunlin, black-tailed godwit and redshank are internationally important. Other regularly occurring species include mute swan, mallard, red-breasted merganser, great crested grebe, grey heron, oystercatcher, turnstone and common gull.

4.3.2.25 Loop Head SPA

The Loop Head SPA is the most westerly point of Co. Clare and the site comprises the cliffs, shoreline and adjacent marine water out to 500 m. The cliffs support large numbers of breeding seabirds, as well as small numbers of chough and peregrine, both of which are listed on the Annex I of EU Birds Directive.

The conservation objectives (NPWS, 2018 x) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- kittiwake (*Rissa tridactyla*)
- guillemot (*Uria aalge*).

The kittiwake and guillemot populations are of national importance. Other breeding seabird species include fulmar and razorbill.

4.3.2.26 Kerry Head SPA

The Kerry Head SPA is on the southern mouth of the River Shannon and encompasses the sea cliffs from just west of Ballyheigue, around the end of Kerry Head to the west and north-eastwards as far as Kilmore. The site hosts an internationally important population of breeding chough and is one of the most important sites in Ireland for this species. It also hosts a nationally important population of fulmar, as well as a small population of shags and is used by the peregrine.

The conservation objectives (NPWS, 2018 y) are to maintain or restore the favourable conditions

of the bird species listed as Special Conservation Interests for this SPA:

- **fulmar (*Fulmarus glacialis*)** (421 pairs)
- chough (*Pyrhocorax pyrrhocorax*).

4.3.2.27 Inishtrahull SPA

The Inishtrahull SPA comprises the whole island of Inishtrahull and the Tor Rock island group approximately 2 km north-north-west of Inishtahull, as well as the intervening sea. The site is approximately 12.5 km north-east of Malin Head, Co. Donegal. It is the most northerly seabird colony in Ireland and supports a good diversity of seabird species. It also supports other breeding birds including eider, chough, raven, lapwing, oystercatcher, turnstone and ringed plover. A wintering population of barnacle goose feed and roost on Inishtrahull, and peregrine and kestrel regularly hunt on the island.

In addition to the ornithological importance, grey seal, an Annex II species of the EU Habitats Directive, also hauls out on Inishtrahull, with up to 600 individuals reported in the area in the summer.

The conservation objectives (NPWS, 2018 z) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- shag (*Phalacrocorax aristotelis*)
- Barnacle goose (*Branta leucopsis*)
- common gull (*Larus canus*).

The shag and common gull populations are on national importance. Other breeding seabird species include fulmar, lesser black-backed gull, herring gull, kittiwake, black guillemot and storm petrel. The great black-backed gull is a resident species and the population is also of national importance.

4.3.2.28 Dingle Peninsula SPA

The Dingle Peninsula SPA is situated on the west coast of Co. Kerry. It is a large site, encompassing the high coast and sea cliff sections of the peninsula from just south of Brandon Point in the north, around to the end of the peninsula at Sleah Head, and as far east as Inch in the south. The site supports some of the highest densities of breeding Chough in Ireland.

The conservation objectives (NPWS, 2018 aa) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- **fulmar (*Fulmarus glacialis*)** (1,016 pairs)
- peregrine (*Falco peregrinus*)
- chough (*Pyrhocorax pyrrhocorax*).

The populations of fulmar and peregrine are of national importance. Other breeding species of the site include razorbill, herring gull, lesser black-backed gull, shag and great black-backed gull, as well as a population of black guillemot.

4.3.2.29 Blasket Islands SPA

The Blasket Islands SPA comprises the six main islands, plus some smaller islands, islets and

sea stacks, and also the seas which surround the islands to a distance of 500 m. These islands are situated at the end of the Dingle peninsula in Co. Kerry. The site is one of the most important seabird sites in the country, with at least 11 species of seabird breeding regularly. It also of special ornithological conservation interest for holding an assemblage of over 20,000 breeding seabirds.

The conservation objectives (NPWS, 2018 ab) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- **fulmar (*Fulmarus glacialis*)** (1,016 pairs)
- **Manx shearwater (*Puffinus puffinus*)** (23,500 pairs)
- **storm petrel (*Hydrobates pelagicus*)** (51,965 pairs)
- shag (*Phalacrocorax aristotelis*)
- lesser black-backed gull (*Larus fuscus*)
- herring gull (*Larus argentatus*)
- kittiwake (*Rissa tridactyla*)
- Arctic tern (*Sterna paradisaea*)
- razorbill (*Alca torda*)
- puffin (*Fratercula arctica*)
- chough (*Pyrrhocorax pyrrhocorax*).

The populations of **Manx shearwater** and **storm petrel** are of international importance, with the site one of the most important in Ireland for these species. The populations of **fulmar**, lesser black-backed gull, herring gull, kittiwake, puffin, shag, arctic tern and chough are also of national importance. The islands are also traditional sites for peregrine, as well as other breeding species typical of the western islands (oystercatcher, rock dove, wheatear, raven).

4.3.2.30 Iveragh Peninsula SPA

The Iveragh Peninsula SPA is a large site, encompassing the high coast and sea cliff sections of the peninsula from just west of Rossbehy in the north, around to the end of the peninsula at Valencia Island and Bolus Head, and as far east as Lamb's Head in the south. It also includes the land adjacent to the cliff edge and areas of sand dunes at Derrynane and Beginish. The high-water mark forms the seaward boundary except at Doulus Head/Killelan Mountain where the adjacent sea area to a distance of 500 m from the cliff base is included.

The conservation objectives (NPWS, 2018 ac) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- **fulmar (*Fulmarus glacialis*)** (766 pairs)
- peregrine (*Falco peregrinus*)
- kittiwake (*Rissa tridactyla*)
- guillemot (*Uria aalge*)
- chough (*Pyrrhocorax pyrrhocorax*).

The site is of ornithological importance as it supports an internationally important population of

chough, while the peregrine population and populations of the three species of breeding seabirds (**fulmar**, kittiwake and guillemot) are of national importance. Great black-backed gull and black guillemot are also recorded at the site, as well as smaller populations of other breeding seabirds: razorbill, herring gull, cormorant and shag.

4.3.2.31 Puffin Island SPA

The Puffin Island SPA lies approximately 0.5 km off the northern side of St Finan's bay in south-west Co. Kerry, and is a long, narrow island surrounded by mostly steep cliffs and slopes. It is one of the most important seabird sites in Ireland, due to its assemblage of breeding seabirds.

The conservation objectives (NPWS, 2018 ad) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- **fulmar (*Fulmarus glacialis*)** (447 pairs)
- **Manx shearwater (*Puffinus puffinus*)** (6,329 pairs)
- **storm petrel (*Hydrobates pelagicus*)** (5,177 pairs)
- lesser black-backed gull (*Larus fuscus*)
- razorbill (*Alca torda*)
- puffin (*Fratercula arctica*).

The populations of **storm petrel** and **Manx shearwater** are internationally important, while the populations of puffin, **fulmar**, razorbill and lesser black-backed gull are nationally important. Other seabirds recorded include shag, kittiwake, guillemot and great black-backed gull. Chough also breeds on Puffin Island.

4.3.2.32 Skelligs SPA

The Skelligs SPA comprises Great Skellig and Little Skellig islands, two highly exposed and isolated islands, separated by a distance of 3 km, approximately 14 km and 11 km (respectively) off the County Kerry mainland in the Atlantic. It is one of the most important seabird colonies in the country for populations and species diversity. Due to their importance for birds each island has been designated a Statutory Nature Reserve.

The conservation objectives (NPWS, 2018 ae) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- **fulmar (*Fulmarus glacialis*)** (806 pairs)
- **Manx shearwater (*Puffinus puffinus*)** (738 pairs)
- **storm petrel (*Hydrobates pelagicus*)** (9,994 pairs)
- **gannet (*Morus bassanus*)** (29,683 pairs)
- kittiwake (*Rissa tridactyla*)
- guillemot (*Uria aalge*)
- puffin (*Fratercula arctica*).

Great Skellig hosts an internationally important population of **storm petrel**, as well as one of the largest puffin colonies, while Little Skellig hosts a long established and internationally important colony of **gannets**. The populations of **fulmar**, **Manx shearwater**, kittiwake and guillemot are

nationally important, Razorbill also occurs on the site, as do chough and peregrine.

4.3.2.33 Deenish Island and Scariff Island SPA

The Deenish Island and Scariff Island SPA comprise the exposed small- to medium-sized islands situated between 5 and 7 km west of Lamb's Head off the Co. Kerry coast; Scariff is the larger of the two. The site is of high ornithological importance, with approximately 5% of the national total of Manx shearwaters breeding on the islands. Scariff Island is known as a storm petrel breeding site, while Deenish Island is a traditional nesting site for terns.

The conservation objectives (NPWS, 2018 af) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- **fulmar (*Fulmarus glacialis*)** (385 pairs)
- **Manx shearwater (*Puffinus puffinus*)** (23,11 pairs)
- **storm petrel (*Hydrobates pelagicus*)** (1,400 pairs)
- lesser black-backed gull (*Larus fuscus*)
- Arctic tern (*Sterna paradisaea*).

The **storm petrel** population is of international importance and the populations of **Manx shearwater**, **fulmar**, lesser black-backed gull and Arctic tern are nationally important. Other breeding seabird species include shag, herring gull, great black-backed gull and black guillemot.

4.3.2.34 Beara Peninsula SPA

The Beara Peninsula SPA is a coastal site situated on the west coast of Co. Cork, encompassing the high coast and sea cliff sections of the western end of the peninsula from Reenmore Point/Cod's Head in the north, around to the end of Dursey Island in the west, and as far east as Bear Island in the south. It is one of the most important sites in the country for chough, with a breeding population of international importance occurring. Peregrine are also present.

The conservation objectives (NPWS, 2018 ag) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- **fulmar (*Fulmarus glacialis*)** (575 pairs)
- chough (*Pyrrhocorax pyrrhocorax*).

The population of **fulmar** is nationally important, and populations of other breeding seabirds including shag, herring gull, lesser black-backed gull, razorbill and black guillemot are also present.

4.3.2.35 The Bull and The Cow Rocks SPA

The Bull and The Cow Rocks SPA comprises two very small rocky islands, the Cow and the Bull, situated 2.5 km and 4 km respectively from Dursey Head off the coast of Co. Cork. A few rocky islets occur off the main islands and the surrounding water, between and to a distance of 500 m around each island, is included within the site for the benefit of the breeding seabirds. The site is an important seabird colony, supporting a good diversity.

The conservation objectives (NPWS, 2018 ah) are to maintain or restore the favourable conditions of the bird species listed as Special Conservation Interests for this SPA:

- **storm petrel (*Hydrobates pelagicus*)** (3,500 pairs)
- **gannet (*Morus bassanus*)** (3,694 pairs)
- puffin (*Fratercula arctica*).

The populations of **storm petrel** and **gannet** of at least national importance, with storm petrels breeding on both Bull and Cow, while the **gannet** colony on Bull is long established and the second largest colony in Ireland. The populations of puffin and great black-backed gull may also be of national importance, with other breeding species including cormorant, kittiwake, guillemot, **fulmar**, herring gull and razorbill.

4.3.2.36 Irish Sea Front SPA

The Irish Sea Front SPA is located entirely in the offshore environment. The site lies about 35 km southwest of the Isle of Man and about 36 km northwest of Anglesey, very close to the Western Irish Sea Front. It was designated in 2017 for the Annex II species **Manx shearwater (*Puffinus puffinus*)** (12,039 individuals) (JNCC, 2017 a).

Its aim is to protect the foraging grounds of **Manx shearwater** as tracking studies indicate that individuals from at least three different colonies around the Irish sea utilise the area during breeding season.

4.3.2.37 Treshnish Isles SPA

Treshnish Isles SPA comprises a string of islands and skerries about 5 km off the west coast of the island of Mull in Argyll, south-west Scotland.

The conservation objectives (SNH, 2018) are 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 to ensure qualifying species are maintained in the long term. Qualifying species are:

- barnacle goose (*Branta leucopsis*)
- **storm petrel (*Hydrobates pelagicus*)** (5,040 pairs).

The islands are important for their breeding seabird colonies, with the most important seabird colonies for **storm petrel** on Lunga.

4.3.2.38 Rum SPA

Rum SPA includes the Inner Hebridean Island of Rum, which has a largely rocky coast with cliffs rising to 210 m, and adjacent coastal waters. It is located south-west of Skye in the Lochaber district of the Scottish Highlands.

The conservation objectives (JNCC, 2015 a; SNH, 2009) are 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 to ensure qualifying species are maintained in the long term. Qualifying species are:

- golden eagle (*Aquila chrysaetos*)
- **Manx shearwater (*Puffinus puffinus*)** (61,000 pairs)
- red-throated diver (*Gavia arctica*).

The population of **Manx shearwater** is of international importance. The site also regularly supports 130,000 seabirds including nationally (GB) important breeding populations of guillemot and kittiwake, as part of the internationally important seabird assemblage.

4.3.2.39 *Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA*

Glannau Aberdaron and Ynys Enlli / Aberdaron Coast and Bardsey Island SPA is located at the tip of the Llyn Peninsula in north-west Wales. The site consists of the island of Bardsey (Ynys Enlli) and part of the tip of the Llyn Peninsula, together with two smaller islands – the Gwylans.

It was originally designated for the breeding populations of the Annex II species chough (*Pyrrhocorax pyrrhocorax*) and **Manx shearwater (*Puffinus puffinus*)** (6,930 pairs) and was updated to include the over-wintering population of chough and an extended marine area for Manx shearwater (JNCC, 2015 b).

4.3.2.40 *Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA*

This SPA includes Skomer, Skokholm and Middleholm, three islands located off the south-west tip of Pembrokeshire, Wales. The site supports a nationally important resident population of chough. The islands also support a large number of breeding seabirds.

The site was designated for the following qualifying features:

- storm petrel (*Hydrobates pelagicus*)
- chough (*Pyrrhocorax pyrrhocorax*)
- short-eared owl (*Asio flammeus*)
- lesser black-backed gull (*Larus fuscus*)
- **Manx shearwater (*Puffinus puffinus*)** (150,968 pairs)
- puffin (*Fratercula arctica*).

The breeding populations of storm petrel, chough and short-eared owl are of national importance, while the breeding populations of lesser black-backed gull, **Manx shearwater** and puffin are of international importance. The site also regularly supports an internationally important seabird assemblage of at least 394,260 individual seabirds during the breeding season, including razorbill, guillemot and kittiwake (JNCC, 2017 b).

5 APPROPRIATE ASSESSMENT SCREENING

5.1 Introduction

This section provides the information necessary for the Competent Authority to screen for AA and determine whether the proposed inspection and maintenance surveys of the Corrib export pipeline and other subsea infrastructure, in view of best scientific knowledge, are likely to have a significant effect on nearby or relevant European (Natura 2000) sites. Specifically, it aims to:

- Provide information on, and assess the potential for the proposed survey operations to significantly impact European sites;
- Determine whether the proposed survey activities, alone or in combination with other projects, are likely to have significant effects on European sites in view of their qualifying features (conservation objectives).

5.2 Potential Impacts on European sites

The 32 coastal SACs and 34 coastal SPAs described in the previous section may have qualifying features that are screened into, or out of, the AA. The following sections discuss the aspects of the project that may impact the qualifying features of the European sites, namely:

- Physical presence of the survey vessels and equipment;
- Underwater noise from operation of geophysical survey equipment and survey vessels and any noise/disturbance from the operation of the pipeline mini-dredger;
- Localised disturbance to seabed sediments during operation of the pipeline mini-dredger
- Routine emissions and discharges during vessel operations;
- Accidental events.

Statements about which qualifying features of the relevant European sites are screened into the assessment are included in the sections below and the potential environmental impacts discussed further in Section 6.

5.2.1 Physical presence of survey vessels and equipment

The physical presence of the survey vessels and survey equipment results in the potential for interaction with marine mammals (disturbance / risk of collision) and seabirds (disturbance resulting in displacement from foraging areas).

With regard to the interaction with marine mammals in coastal SACs, activities will be temporary, with the duration at sea for survey vessels minimised, and confined to as small an area as possible. For any reduction in Annex IV species abundance from an area, rapid repopulation is likely, as response by marine mammals is likely to be behavioural and temporary in nature. No changes in overall species abundances are anticipated. It is recognised that the marine mammal species potentially in the vicinity of the proposed activities can have extensive foraging ranges. As such the potential zones of influence for these Annex IV species from direct and indirect impacts could potentially be extensive as animals may contribute to the designation of SACs / MPAs which are either close to the proposed survey

area or considerably further away. In addition, due to the foraging distances of these species, and the suitability of the coastal waters on the west coast of Ireland, there is likely extensive connectivity of habitat. This area supports both resident and semi-resident populations of both grey and harbour seals and a number of species of small cetacean. As such European sites that are within these extensive foraging ranges have been screened into the initial Appropriate Assessment screening. While this assessment document focusses on those species that are qualifying features of European designated sites in proximity to the proposed operations, the EIA screening and risk assessment for Annex IV species that also accompanies this application provides further characterisation of the baseline for Annex IV species of marine mammals and sea turtles in the area. The EIA screening and risk assessment report (RSK, 2020 a) should be read in conjunction with this report when considering the application.

The likelihood of survey vessel collision with animals is considered to be extremely low as vessels will operate in accordance with the relevant codes of conduct at all times, and at low speed. Also, despite the potential for animals from a wide area to be present in the vicinity at the time of the survey, the potential areas where impacts have the potential to occur are extremely localised in the immediate vicinity of the survey operations. The likelihood of interaction (such as entanglement) is low as acoustic survey equipment will be mounted directly to the survey vessel hulls, or to ROVs. The potential exception is the side-scan sonar towfish for the nearshore survey. In addition, the marine mammal species present are all highly mobile and are free to move in any direction within an open marine environment. Therefore, it is unlikely that the physical presence of the survey vessels or equipment will traumatise or interact with marine mammals.

Seabirds will be present in the Corrib Field and along the export pipeline survey route. Depending on the foraging range of the species involved, these birds could contribute to the designation of SPAs which are either within (e.g. Broadhaven Bay SPA) the proposed survey area, relatively close or much further away. Due to the foraging distances of certain seabird species, and the suitability of the coastal waters on the western coast of Ireland to support large seabird populations, there is likely extensive connectivity of habitat. Broadhaven Bay SPA has an important breeding colony of Sandwich terns, Inishkea Islands SPA supports Arctic terns, little terns and Shag, whilst other SPAs in the vicinity also support large breeding populations of auks, gannets and gulls. European sites within the typical foraging ranges for these species have been screened into the initial Appropriate Assessment., greater consideration has however been given to those sites in closest proximity to the proposed survey works (within 25 km), as it is considered that it is the birds more closely associated with these sites that have the greatest potential to be present in the area of the proposed survey.

These birds could potentially be present in the area of the proposed works at a similar time to when survey activities are taking place. In a worst-case scenario, the presence of the survey vessels and equipment could prevent or reduce access to foraging seabirds. However, activities will be temporary, with the duration of the survey minimised, and confined to as small an area as possible. Seabird counts from the ObSERVE aerial surveys (Rogan et al., 2018) suggest that there is sufficient alternative foraging habitat in the wider area to accommodate any temporarily displaced seabirds. This would be further aided by the habitats' connectivity together with the fact that seabird species are highly mobile, and free to move in any direction in an open marine environment. Therefore, it is unlikely that the physical presence of the survey vessels and equipment will displace seabirds permanently.

5.2.1.1 Screening Outcome

In view of the best scientific knowledge, and in view of the conservation objectives of the sites, the physical presence of the survey vessels and equipment, when taken either individually or in combination with other plans or projects are not likely to have a significant effect on any European site. Broadhaven Bay SAC, Glenamoy Bog Complex SAC and Blacksod Bay / Broadhaven Bay SPA are within the survey activity area and none of the qualifying species of these areas are likely to be affected by the physical presence of the survey vessels and equipment.

5.2.2 Underwater noise from operation of geophysical survey equipment and survey vessels

The potential effects of underwater noise on marine biota is a key environmental concern. The potential for disturbance and possible injury (shifts in hearing sensitivity) resulting from the acoustic surveys and associated general survey vessel activity (particularly within Broadhaven Bay) are considered the primary potential impacts as a result of the proposed activities.

In order to assess the potential impacts of acoustic surveys on the receptor species associated with European designated sites, the characteristics of the sound source, sound propagation and the auditory sensitivity of the biota all need to be considered.

An animal's ability to detect sound produced by anthropogenic activities depends on their auditory hearing range and on the levels of natural ambient or background sound. Wind, precipitation, vessel traffic, and biological sources all contribute to ambient sound.

Table 5-1 presents hearing sensitivity information for marine mammal species known to be present in the vicinity of the proposed survey area. Table 5-2 shows various anthropogenic noise sources and received levels of sound in the marine environment.

Table 5-1: Hearing sensitivity information for species of qualifying interest known to be present in vicinity of survey area (marine mammal information extracted from Southall *et al.* 2019)

| Species | Marine mammal hearing group | Hearing sensitivity |
|--|------------------------------------|---|
| Marine mammals | | |
| Common bottlenose dolphin <i>Tursiops truncatus</i> | High frequency cetacean (HF) | BEH 0.4 – 146 kHz AEP <5 – 169 kHz Auditory modelling 0.15 – 163 kHz Frequency of best hearing for HF cetaceans 55 kHz |
| Harbour porpoise <i>Phocoena phocoena</i> | Very high frequency cetacean (VHF) | BEH 0.3 – 160 kHz AEP <10 – 160 kHz Frequency of best hearing for VHF cetaceans 105 kHz |
| Harbour seal <i>Phoca vitulina</i> | Phocid carnivore in water (PCW) | AEP <0.1 – 79 kHz Frequency of best hearing for PCW 8.6 kHz |
| Grey seal <i>Halichoerus grypus</i> | Phocid carnivore in water (PCW) | AEP <1.4 – 100 kHz Frequency of best hearing for PCW 8.6 kHz |

| Species | Marine mammal hearing group | Hearing sensitivity |
|--|-----------------------------|--|
| Fish | | |
| Salmon <i>Salmo salar</i> | - | 100 - 800 Hz (Simpson and Bruintjes, 2016) |
| Sea lamprey <i>Petromyzon marinus</i> | - | 50 – 300 Hz River lamprey considered similar (Mickle et al., 2018) |

BEH - behavioural studies

AEP – auditory evoked potential studies

Table 5-2: Anthropogenic sound sources and received levels of sound in the marine environment (adapted from: Evans & Nice, 1996; Richardson et al., 1995, in IOSEA2 (ERT/Aqua-Fact International Services, 2007))

| Activity | Frequency range (kHz) | Average source level (dB re 1µPa-m) | Estimated received level (dB) at different ranges by spherical spreading ^a | | | |
|--|---------------------------|-------------------------------------|---|------------------|------------------|------------------|
| | | | 0.1 km | 1 km | 10 km | 100 km |
| High resolution geophysical survey; pingers / profilers, side-scan, echo sounder | 10 to 200 | <230 | 190 | 169 | 144 | 69 |
| Low resolution geophysical seismic survey; seismic air gun | 0.008 to 0.2 ^b | 248 | 210 ^c | 144 ^c | 118 ^c | 102 ^d |
| | | | 208 | 187 | 162 | 87 |
| Production drilling | 0.25 | 163 | 123 | 102 | 77 | 2 |
| Jack-up drilling rig | 0.005 to 1.2 | 85 to 127 | 45 to 87 | 24 to 66 | <41 | 0 |
| Semi-submersible rig | 0.016 to 0.2 | 167 to 171 | 127 to 131 | 106 to 110 | 81 to 85 | 6 to 10 |
| Drill ship | 0.01 to 10 | 179 to 191 | 139 to 151 | 118 to 130 | 93 to 105 | 18 to 30 |
| Large merchant vessel | 0.005 to 0.9 | 160 to 190 | 120 to 150 | 99 to 129 | 74 to 104 | <29 |
| Military vessel | - | 190 to 203 | 150 to 163 | 129 to 142 | 104 to 117 | 29 to 42 |
| Super tanker | 0.02 to 0.1 | 187 to 232 | 147 to 192 | 126 to 171 | 101 to 146 | 26 to 71 |

^a Spherical spreading is calculated here using the formula presented in IOSEA2 (ERT/Aqua-Fact International Services, 2007).

^b Seismic surveys produce occasional sounds with frequencies of 1 to 22 kHz (Evans, 1998)

^c Actual measurements in St George's Channel, Irish Sea.

^d Extrapolated figure as presented by Evans & Nice, 1996.

5.2.2.1 Sound propagation

In general, sound sources that have high sound pressure levels and low frequency (i.e. large airgun array seismic sources) travel the greatest distance underwater. The spread of low

frequency sound in the sea is efficient, with little loss due to attenuation (i.e. due to absorption and scattering). Conversely, high frequency sources (such as those emitted from geophysical survey equipment, such as MBES and side scan sonar) tend to have greater attenuation over distance. The process is non-linear with the rate of absorption varying roughly as the square of the frequency. The overall degree of attenuation is also dependent on the water pressure, temperature and salinity.

Spherical spreading describes the decrease in level when a sound wave propagates away from a source uniformly in all directions. Overall, the intensity of sound waves decay exponentially and although low-level signals travel for long distances, higher amplitude waves lose much of their energy very close to the sound source (Gisiner, 1998).

5.2.2.2 *Characteristics of proposed sound sources*

During the deployment of the principal geophysical acoustic sources (MBES, sub-bottom profiler, and side-scan sonar) there exists the potential for disturbance of marine biota and possible injury (shifts in hearing sensitivity). In order to assess the potential impacts of the operation of this survey equipment on key receptor species, the characteristics of the sound sources are considered.

MBES

Use of a MBES is proposed along the entire length of the offshore export pipeline, BBGT surface water outfall pipe, infield flowlines and umbilicals. The MBES proposed for use in the nearshore survey on the *Leah-C* will operate at a relatively high frequency range (between 200 and 400 kHz, although typically operating between 350 and 400 kHz). The MBES system used for the offshore survey using the *Edda Sun* will be mounted on an ROV and will operate at a frequency of around 400 kHz.

The range of frequencies for this MBES equipment are considered to be outside the hearing range of the cetaceans and pinnipeds known to be present in the study area (see Table 5-1). The frequency range also lies outside the known auditory range of migratory fish species, such as salmon and river and sea lampreys (see Table 5-1). The migratory fish that are likely to be in the vicinity of the proposed survey activity do not have particularly sensitive hearing and are considered low frequency hearing generalists (Nedwell et al., 2003, 2006; Popper, 2005). The noise intensity will decrease as it propagates from the source due to spherical spreading, in addition attenuation of these high frequency sounds will be rapid due to scattering and absorption in the water column.

Based on the proposed models of MBES (see Table 3-1), the peak source level expected, or maximum amplitude, will be in the range of 225 dB re: 1µPa @1 m. The acoustic intensity will attenuate as it propagates throughout the water column rapidly through spreading loss alone. In addition to this, the high frequency acoustic energies typified by this equipment are more quickly absorbed through the water column than sounds with lower frequencies.

Sub-bottom profiler

A sub-bottom profiler system will be used as part of the nearshore survey to assess pipeline burial depth and integrity within Broadhaven Bay and will be deployed from the *Leah-C*. The system proposed will operate at a relatively low frequency range (3 – 8 kHz).

This frequency range overlaps with the lower end of the hearing range of common bottlenose dolphins and harbour porpoise and coincides with the best hearing range for the pinniped species present (see Table 5-1). The risk to cetaceans and pinnipeds from use of this lower frequency acoustic equipment is reduced by the orientation of the sound source (hull mounted in relatively shallow water on the *Leah-C*). The equipment and resulting sound waves are directed downwards to the seabed, reducing the area impacted by noise. In addition, the pulse duration of sub-bottom profilers is extremely short, in the order of tens to hundreds of milliseconds (Nedwell *et al.*, 2008). A sub-bottom profiler is not proposed for deployment from the ROV of the *Edda Sun* for the offshore component of the surveys.

This frequency range lies outside of the hearing range of some toothed whales (particularly beaked whales) and porpoise species, although overlaps with that of baleen whales and a range of toothed whale species and pinnipeds. This frequency range also lies outside the auditory range of migratory fish species, such as salmon and river and sea lampreys (Simpson and Brintjes, 2016; Mickle *et al.*, 2018) (see Table 5-1). Based on the specifications of equipment in Table 3-1, the peak source level is expected to be in the range of 214 dB re: 1µPa @1 m.

Side-scan sonar

The proposed side-scan sonar equipment can operate at a range of frequencies depending on water depth, ranging from between 300 and 900 kHz. The selection of frequency is dependent on water depth, with lower frequencies typically recommended for deeper water, and higher frequencies for shallower depths. It is important to note however that the side-scan sonar equipment will typically only be operating at relatively shallow depths in the nearshore survey from the *Leah-C*.

The range of frequencies for this side-scan sonar equipment are considered to be outside the hearing range of the cetaceans and pinnipeds known to be present in the study area (see Table 5-1). The frequency range also lies outside the known auditory range of migratory fish species, such as salmon and river and sea lampreys (see Table 5-1). The noise intensity will decrease as it propagates from the source due to spherical spreading, in addition attenuation of these high frequency sounds will be rapid due to scattering and adsorption in the water column.

Other acoustic survey equipment

The obstacle avoidance sonar, altimeter systems, sound velocity probe and doppler velocity log all operate at a relatively high frequency (see Table 3-1) that is outside the hearing range of the cetaceans and pinnipeds known to be present in the study area (see Table 5-1). The frequency range also lies outside the known auditory range of migratory fish species, such as salmon and river and sea lampreys (see Table 5-1).

The single beam echosounders on both the nearshore and offshore vessels, and the USBL, operate at a much lower frequency and are within the hearing range of the cetaceans and pinnipeds known to be present in the study area. However, these are also operating at a very low sound pressure intensity level, for example the USBL transponders are for communicating a position relative to the survey vessel, therefore, the acoustic pulses from these pieces of equipment are not considered likely to cause undue disturbance to these marine mammals.

The frequency range for this equipment lies outside the known auditory range of migratory fish

species, such as salmon and river and sea lampreys (see Table 5-1).

Pipeline mini dredger

The Piranha STS 8 inch mini-dredge tool will be used in areas where localised reprofiling of the seabed sediments is required in order to ensure that pipeline integrity on the seabed is maintained. The mini-dredge tool can operate in both hydraulic and electronic pump suction modes. The main processes that would contribute to noise associated with this type and scale of dredging of the seabed sediments are, pump noise, and any noise from the vessel itself. In general, dredging operations produce continuous, broadband sound concentrated at or below 1 kHz. Sound pressure levels can vary widely depending on the type of dredging and the environmental conditions. Noise levels also depend on the materials being extracted, with harder sediment extraction generating higher noise levels than loose or soft sediment extraction. Estimated source levels for dredging range between 168 and 186 underwater dB at 1 m. Such source levels for full-scale dredging works can be considered similar to those produced from drilling operations, however the levels likely to be produced from the proposed operations need to be considered in context. The mini dredge tool is a small piece of plant, using a small electric or hydraulic pump. Material does not need to be extracted back to the surface for complete removal, but will settle back to the seabed, as such the pumps are relatively low powered. Works will be localised to only those localised small sections of the pipeline route that have previously been identified as requiring dredging works. Typical dredging works are of a relatively low frequency source that would be audible to marine mammals and also possibly to fish. The exact frequency of noise from the proposed equipment is not known, although is likely to be of a higher frequency due to its much smaller size and speed of operation. The intensity of the noise will also be significantly lower than for full-scale dredging equipment. However, for the purposes this assessment a worst-case is considered. The lower frequency of the sound source associated with the mini dredge operations would not be expected to attenuate as rapidly in the water column though as the high frequency noise associated with shallow geophysical survey equipment, however the operation of the equipment will be for relatively short durations at a few localised places along the route of the offshore pipeline and will form a relatively small proportion of the overall work scope.

Survey vessels

Noise levels for merchant shipping compiled from a number of academic studies are published in Richardson et al., (1995). These estimate source levels of 160-190 dB re 1µPa-m for merchant vessels under transit.

The survey vessel itself will have an acoustic signature that is similar to that of a merchant vessel (Table 5-2). During the survey it will not be operating at transit speeds for much of the operations and as such the vessels engines will be operating at much lower revolutions and as a consequence a much lower level of source intensity comparatively as it progresses along the route of the offshore pipeline and umbilical.

In the event that the vessel uses dynamic positioning in order to maintain precise position on station then there will be occasional use of thrusters and main engines resulting in higher intensity underwater noise of short duration.

Vessel noise during dynamic positioning station keeping operations is of a similar low

frequency broadband level, with sound levels of between 180 to 197 dB re 1µPa-m during thruster usage (Talisman Energy, 2006; Wyatt, 2008; & Xodus, 2014). Noise levels during dynamic positioning station keeping will vary with climatic and tidal conditions, which affect a vessels ability to maintain position, since these factors change the amount of thrust required to keep the vessel in position. In lower or moderate wind, sea state and current; the noise levels can be expected to be lower than in more challenging conditions. The work scope has been proposed for the time of year when the likelihood of a suitable window of good weather conditions is maximized. Overall vessel noise is considered to be of a relatively low frequency that would not likely be audible to small cetaceans such as dolphins (qualifying features of the closest SAC) but would be within the hearing ranges of large cetaceans and pinnipeds. These relatively low levels of intensity will attenuate relatively rapidly in the relatively deep water at the Corrib Field and along much of the route of the offshore pipeline to around 100 dB at 1km distance (by spherical spreading alone). - These relatively low intensity levels of underwater noise and the predictable stationary nature of the operations will not result in a significant disturbance to marine mammals and seabirds.

The *Leah-C* will also have an underwater acoustic signature, the vessel having two marine diesel engines as the primary sources. The sound source from the *Leah-C* will be relatively small and of a higher frequency than that of a large commercial vessel such as the *Edda Sun*. The sound will not however be the higher frequency sound that would be expected from an outboard driven high speed vessel. Engine revolutions would be quite slow as the vessel would be moving at low speeds while conducting survey operations in Broadhaven Bay. She does not have dynamic positioning capabilities and as such would not impart the higher frequency bursts of sound from thrusters during station-keeping.

5.2.2.3 Screening Outcome

In view of the best scientific knowledge, and in view of the conservation objectives of the European sites, there is potential for underwater acoustic disturbance and possible injury (hearing shifts) to marine species from the acoustic survey and mini-dredging equipment and associated general vessel activity, when taken either individually or in combination with other plans or projects.

Marine mammals:

The foraging ranges for marine mammals can be significant and they are considered to be key receptor species when considering underwater noise. As such it is important to consider SACs within the foraging ranges for these species. For example, grey seals - Inishkea Islands SAC and Duvillaun Islands SAC; harbour seals - Killala Bay and Moy Estuary SAC, Clew Bay Complex SAC; and bottlenose dolphins - West Connacht Coast SAC and Lower River Shannon SAC (see Table 4-1). Although Annex IV species of marine mammals such as harbour porpoise and bottlenose dolphins and the pinnipeds grey seal and harbour seal are not qualifying species of the Broadhaven Bay SAC (with which the proposed survey operations overlap), the potential impacts of underwater noise also require further consideration due to the known presence of these species in the vicinity.

As it is not possible to rule out the potential for impacts on qualifying species of marine mammals as a consequence of underwater noise from the proposed operations, given the potential foraging ranges of these species, further discussion of the likelihood and magnitude of impacts to marine mammals is provided in Section 6, which also discusses the rates at

which the intensity of the acoustic sources rapidly propagate and attenuate throughout the water column.

Monitoring results during similar geophysical surveys over the past three years, when bottlenose dolphins, harbour porpoise, harbour seals and grey seals were recorded in the immediate area during the surveys (RSK, 2016; 2018; 2019), have shown little or no discernible effects on the animals present (including little or no discernible alterations in behaviour or activity whilst in close proximity to operations within Broadhaven Bay itself). As such it is considered unlikely that the proposed activities, which are similar in scope to previous operations, would result in any significant effect on them.

While it is recognised that there exists the potential for animals from a wide area to have the potential to occur in the vicinity of the operations, the likelihood of these occurrences is relatively low (based on previous monitoring results), with the potential for animals being exposed to source intensities from the acoustic survey equipment that would cause injury or distress of negligible likelihood. Due to the rapid attenuation of the high frequency sound underwater through natural spherical spreading and absorption during propagation, the impact ranges for marine mammals due to underwater noise are localised in extent.

Conservative impact ranges for underwater noise have been included in Section 6, which consider the attenuation of underwater noise from the proposed activities throughout the water column due to spherical spreading alone, based on the typical high frequency sound source used for the survey using calculations included in Gausland (1998). These ranges are then compared with the attenuation ranges for low frequency seismic survey of similar source level to show the differences between the attenuation of high and low frequency sounds in the water column. These ranges do not take into consideration absorption in the water column and also the fact that the sound source will be located in close proximity to the seabed and as such sound would be attenuated by the substrate. It is however recognised that animals may forage much further offshore to the more immediate vicinity of the proposed operations.

Fish:

As with marine mammals, the fish species under consideration are highly migratory and have large ranges. As such it is important to consider SACs within the ranges for these species. For example, salmon in Glenamoy Bog Complex SAC, Mweelrea / Sheeffry / Erriff Complex SAC, Owenduff / Nephin Complex SAC, Newport River SACs and River Moy SAC; sea lamprey in River Moy SAC and Killala Bay / Moy Estuary SAC. The closest European site with migratory fish as a qualifying interest is the Glenamoy Bog Complex SAC, which overlaps with the survey operations, whilst the Owenduff / Nephin Complex, River Moy, Killala Bay / Moy Estuary and Newport River SACs are all within 50 km of the operations.

It should be noted that salmonids (e.g. salmon and trout, including sea trout) and lamprey (both river and sea) are relatively insensitive to sound due to a lack of hearing specialist structures (Nedwell et al., 2003, 2006; Popper, 2005). Based on auditory evoked potential experiments, salmon detect sounds between 100 and 800 Hz, while sea lamprey and lamprey detect sounds between 50 and 300 Hz (Simpson and Brintjes, 2016; Mickle et al., 2018). These hearing ranges do not overlap with the frequencies of the proposed acoustic survey equipment. It is therefore unlikely this species would be significantly affected by underwater noise from survey activities. There may be some small-scale disturbance from the operation of survey vessels (anticipated frequency 5 Hz to 900 Hz, see Table 5-2), however, this is not

anticipated to be significant and highly mobile species such as salmon are easily able to undertake avoidance behaviour and return following cessation of the survey activities.

Seabirds:

Owing to the foraging ranges and behaviour of certain seabirds, it is not possible to say with certainty which species would be present at the time of survey. Sites within the typical foraging ranges of receptor species of seabirds that spend time underwater (diving birds), have been considered. It is known from the ObSERVE aerial surveys from 2015-2016 that certain species of seabirds are present throughout the year, however the areas of proposed survey activities, particularly offshore, are regarded to have lower densities of seabirds than areas to the north and south (Rogan et al. 2018). Therefore, it is considered unlikely that such activities would result in any significant effect on these species.

5.2.3 Routine emissions and discharges during vessel and mini-dredge tool operations

Atmospheric emissions (primarily exhaust gases) and routine marine discharges (macerated food, grey water, bilge water and ballast water) will be released by the survey vessels during normal survey operations.

The atmospheric emissions may result in localised decreases in air quality in the immediate vicinity of the survey vessels, but they will be temporary given the rapid dispersion of emissions in the exposed locations of the surveys. Furthermore, levels of carbon dioxide, methane and nitrous oxide emitted by the survey vessels during the proposed works will be negligible and will have minimal effects on climate change.

The routine marine discharges could result in localised decreases in water quality with the potential for impacts on marine fauna. However, the treatment systems in place on the vessels and relatively small quantities generated will be rapidly dispersed in the open exposed location of the proposed survey area.

The use of a mini-dredge tool will result in the suspension of seabed sediments into the water column in those areas where seabed reprofiling beneath the pipeline is required in order to correct areas of free span. While these areas of dredging works are limited in number and localised, resulting in the removal of relatively low quantities of seabed sediments. It is understood that seabed sediment will be displaced, rather than removed to the surface. The dredging operations will result in localised suspension and resettlement of suspended sediments, which will result in increased turbidity for a short period as well as both temporary and a degree of permanent smothering of benthos, as well as permanent alteration to the seabed. These changes will be limited in spatial extent to the immediate vicinity of the reprofiling works, while any increases in water column turbidity will be localised and of short duration.

5.2.3.1 Screening Outcome

In view of the best scientific knowledge, and in view of the conservation objectives of the sites, routine emissions and discharges during vessels operation and while undertaking infrastructure maintenance activities, when taken either individually or in combination with other plans or projects will not have a likely significant effect on any European site. None of

the qualifying features of the SACs and SPAs are likely to be impacted by routine emissions and discharges.

5.2.4 Accidental events

As with any marine-based operation, an accidental fuel oil spillage along the survey route, particularly from the larger *Edda Sun* offshore survey vessel, could potentially result in a spill that could impact the coastline. There is also the potential for a spill of hydraulic fluid from any on deck equipment or from the ROV. Such a spill could result in a reduction in water quality and degradation of habitats, resulting in impacts on qualifying habitats and species. Owing to the location of the survey activities (exposed nature of the location) it is considered likely that any spill would be rapidly dispersed. Additionally, such spillages occur rarely and the risk of such an event is further reduced by onboard preventative measures.

5.2.4.1 Screening Outcome

In view of the best scientific knowledge, and in view of the conservation objectives of the sites, as accidental fuel oil or hydraulic fluid spillage, when taken either individually or in combination with other plans or projects, could have a significant effect on a European site. However, all marine operations carry the risk of an accidental fuel oil spill. Preventative measures onboard the vessel and response plans in case of releases (Shipboard Oil Pollution Emergency Plans, etc) reduce the likelihood of the spillage and the resulting extent of impact. Potential for impact on European sites and their qualifying interests is therefore considered to be low.

5.2.4.2 Potential for Cumulative Impacts

Given that the proposed activities will involve acoustic survey techniques and the presence of survey vessels, there is potential for cumulative impacts with other proposed projects in the area.

Other known projects that will occur within a similar timescale to the proposed Corrib inspection and maintenance survey works are as follows:

- Corrib Field P6 Flexible Flowline Installation 2021 (Vermilion) – this work will take place between the P6 wellhead and the Corrib central manifold within the offshore Corrib field. It will involve one vessel and will utilise the following acoustic equipment: MBES, sound velocity probe, navigation / positioning sensors including a subsea USBL, obstacle avoidance sonar, an altimeter, and doppler velocity log. The work will take place for a period of approximately 6 days between May and October 2021 (depending on regulatory approval and contractor availability).
- Corrib Field central manifold / P1 wellsite Channel B EDU and electrical jumper repair programme. This will take place over a period of approximately 5 days between April and September 2021. These works are proposed to take place immediately prior to this proposed pipeline inspection and maintenance survey programme and will use the same support vessel (*Edda Sun*). The Channel B work programme will be carried out using ROVs and any surveys required will be by underwater video. No acoustic survey sensors are proposed.
- Geotechnical Investigation, Irish Atlantic Margin 2021 (Woodside Energy Ireland) – this work will involve geotechnical survey work (22 shallow boreholes) along the Irish

Shelf and Porcupine Bank. The closest sample site is approximately 30 km north of the export pipeline survey area. It will involve one vessel and will utilise USBL acoustic equipment to assist with positioning of boreholes and identification of hazards. The work will take approximately 40 days (including operational time, transit time and allowances for weather downtime) and will take place between June and early August 2021 (depending on regulatory approval and contractor availability). An Appropriate Assessment has been undertaken for this project, and the latest period of public consultation closed on 2nd May 2020.

Impacts resulting from the physical presence of the survey vessels will be limited in duration and localised in spatial extent in terms of the context of the foraging ranges of key receptor species of, marine mammals, fish and seabirds, as discussed in Section 5.2.1 above. The impacts resulting from underwater noise from the vessel operations and the surveys have the potential to result in impacts that could have a wider spatial extent due to the ways in which these sources of underwater noise propagate. However, given the high frequencies and low source levels at which the survey equipment operates and the fact that the surveys will be conducted by ROV close to the seabed to limit the degree of propagation, the overall spatial extent of potential impacts will be minimised.

The spatial extent that has been determined for other projects to be screened into the assessment is based on the likely impact ranges that have been discussed in the sections above and summarised here. It is appreciated that while likely impacts are relatively localised, the actual foraging and migratory ranges of receptor species and the designated sites that such species are potentially a feature of, are more extensive. Therefore, the spatial extent for potential cumulative impacts includes projects within the likely ranges for these species. As such a similar range for marine mammals, seabirds and migratory fish has been assumed based on foraging ranges for these receptors of approximately 200 km in order to capture any relevant offshore projects which may have timescales that coincide with the proposed survey operations.

At the Corrib Field specifically, there are additional work programmes scheduled for 2021. As the work scopes are to be completed by the same operator, efforts would be made to ensure that they did not occur concurrently. It is already understood that the Channel B work scope at the Corrib Field would precede this proposed survey of the offshore pipeline. However, as the activities are proposed for a similar timeframe as this proposed survey scope of works and also the flexible flowline replacement works, cumulative impacts are considered.

A review of projects planned by other contractors in the area over a similar timeframe has been undertaken, with the study area for this review covering a large enough area to include foraging and migratory ranges of sensitive species (as discussed above). The information is publicly available from the Department of the Environment, Climate and Communications¹¹ and the Department of Housing, Planning and Local Government.

As there is potential for additional projects to take place within the defined offshore study area off the west coast of Ireland within a similar timeframe to the survey activities in 2021, the potential impacts of all projects need to be considered in combination. All projects will have

¹¹ From September 2020 the Department of Communications, Climate Action and the Environment (DCCAE) is known as the Department of the Environment, Climate and Communications

an underwater noise impact through the use of equipment for geophysical and visual surveys and positioning, in addition to that from vessels. In addition, there will be a disturbance impact from the physical presence of vessels and associated equipment being present in the study area.

Due to the location of these projects, marine mammals as qualifying features, particularly the bottlenose dolphins designated in the West Connacht SAC are likely to represent the worst case in terms of receptors to the potential cumulative impacts. The potential cumulative impacts from underwater noise on marine mammals, including bottlenose dolphins and grey and harbour seals, would be as described in Section 5.2.2. However, these species are mobile, with the ability to move in any direction and over long distances in an open marine environment, while the frequencies of the survey equipment are outside their peak hearing thresholds. Therefore, it is unlikely there will be an impact on the qualifying species of the West Connacht Coast SAC and other coastal sites that have pinnipeds as qualifying species.

5.2.4.3 *Screening Outcome*

In view of the best scientific knowledge and conservation objectives of the sites, cumulative impacts with other plans or projects close to the Corrib Field may have a significant effect on a European site. However, the likelihood of such an eventuality occurring however is considered to be very low in terms of the potential for impact on or affecting the integrity of any European sites and their qualifying interests.

5.3 **AA Screening Conclusions**

No habitats are likely to be significantly affected by the potential impacts assessed here and so in view of the best scientific knowledge and in view of the conservation objectives of the sites, the proposed activities when taken either individually or in combination with other plans or projects are unlikely to have a significant effect on any European site, where habitats are the main qualifying features.

Based on the duration and nature of proposed survey activities and the zone of potential impact, the main potential impact on any European site is the effects of underwater noise generated from the acoustic surveys and associated vessel activity on key receptor species (qualifying features). It has been concluded, on the basis of objective information (survey activities carried out since 2010, with monitoring showing no impacts), that significant effects on the conservation objectives of the SACs and or OSPAR MPAs, as well as the coastal SPAs in the vicinity of the proposed survey activities listed in Table 4-1, are highly unlikely based on the nature of the activities, their anticipated duration and the localised extent of likely impacts. Despite this the potential for impacts on qualifying features of marine mammals, migratory fish and seabirds cannot be ruled out.

In respect to a fuel oil or hydraulic fluid spillage, this would be accidental and therefore an unpredictable event, the likelihood of such a spillage occurring is therefore considered to be very low and hence considered unlikely in terms of the potential for impact on European sites and their qualifying interests.

As a result of the above assessment, which takes account of the best scientific knowledge – including in the light of monitoring these activities over a period of years - and the conservation objectives of each European site, it is considered that the proposed survey operations either individually or when taken in combination with other plans or projects, are not likely to have a

significant effect on any European site. However, the potential for impacts on qualifying features as a result of underwater noise cannot be ruled out in spite of the unlikelihood of such an occurrence. As such the information to undertake a Stage 2 Appropriate Assessment has been included as Section 6 in this report.

6 IMPACT ASSESSMENT IN SUPPORT OF STAGE 2: APPROPRIATE ASSESSMENT

6.1 Introduction

This section of the NIS has been prepared to inform and assist the competent authority, should it decide to proceed to an appropriate assessment to determine whether or not the proposed survey activities will adversely affect the integrity of European sites.

This section presents, in light of best scientific knowledge, the assessment of underwater noise impacts generated by the acoustic surveys and associated general vessel activity, on European sites' qualifying interest species, and whether these impacts affect the conservation objectives of any European sites and thus adversely affect the integrity of these sites.

Consideration is also given to routine emissions and discharges during vessel operations and accidental fuel oil spillages, as although significant impacts on the conservation objectives of European sites are unlikely, best practice includes protocols and procedures that are required for statutory compliance. In the context of the judgment in CJEU Case C-323/17 (People over Wind) it is not clear whether such statutory requirements are considered as to be mitigation or standard best marine practice.

6.2 Potential impacts on European sites

This section considers the potential impacts arising from the proposed surveys, as discussed above, and further considers whether any such impact has the capacity to adversely affect the integrity of any European site.

6.2.1 Impacts of noise on key receptor species

As discussed above in Section 5, there are various potential effects of exposure to sound from anthropogenic activities that can be characterised as pathological, physiological or behavioural. Criteria can be established for zones of influence based on ambient sound levels, absolute hearing thresholds of the species of interest, slight changes in behaviour of the species of interest (including habituation), stronger disturbance effects (e.g. avoidance), temporary hearing impairment (TTS) and permanent hearing impairment (PTS), or other physical damage.

Southall et al. (2019) updated the 2007 study which carried out an extensive review of the available literature and formulated scientific recommendations for marine mammal exposure criteria, based on the peak pressure known or assumed to elicit the onset of TTS and PTS.

For high frequency hearing cetaceans, which includes bottlenose dolphins (auditory sensitivity range estimated at 150 Hz to 160 kHz), the sound pressure level (SPL) for TTS was set at 224 dB re 1 μ Pa (peak) and 230 dB re 1 μ Pa (peak) for PTS. The sound exposure level (SEL) for TTS onset is 170 dB re 1 μ P²-s and 185 dB re 1 μ Pa for the onset of PTS.

For very high frequency cetaceans, which includes the harbour porpoise, Southall et al. (2019) set the sound pressure level (SPL) for TTS onset at 196 dB re 1 μ Pa (peak) and 202 dB re 1 μ Pa (peak) for onset of PTS. The SEL for TTS onset is 140 dB re 1 μ P²-s and 155 dB re 1 μ Pa

for the onset of PTS.

For the phocid carnivores in water (PCW) (grey and harbour seals) Southall et al. (2019) sets the SPL TTS onset at 212 dB re: 1 μ Pa (peak) and 218 dB re: 1 μ Pa (peak) for PTS onset. The SEL for TTS onset is 170 dB re 1 μ P²-s and 185 dB re 1 μ P²-s.

The fundamental difference between these two parameters is that SPL can be an instantaneous value and SEL is the total noise energy to which the mammal is exposed during a given duration: 1 second in this case. It should be stressed that no marine mammal mortality or damage to tissue has been documented for exposure to geophysical acoustic surveys, and that the exposure level for injury is a theoretical value extrapolated from experimental data. Also, it is recognised that many variables affect the nature and extent of responses to a particular stimulus. Such variables may include the recent experience of marine mammals with the sound stimulus, and their current activity (e.g. feeding vs. migrating).

6.2.1.1 Bottlenose dolphins in West Connacht SAC

One way of estimating the level of effect on marine mammals is to consider species specific hearing audiograms, and to identify areas where the anthropogenic sound source level frequencies overlap with them. A calculated audiogram for the bottlenose dolphin and harbour porpoise is presented in Figure 6-1.

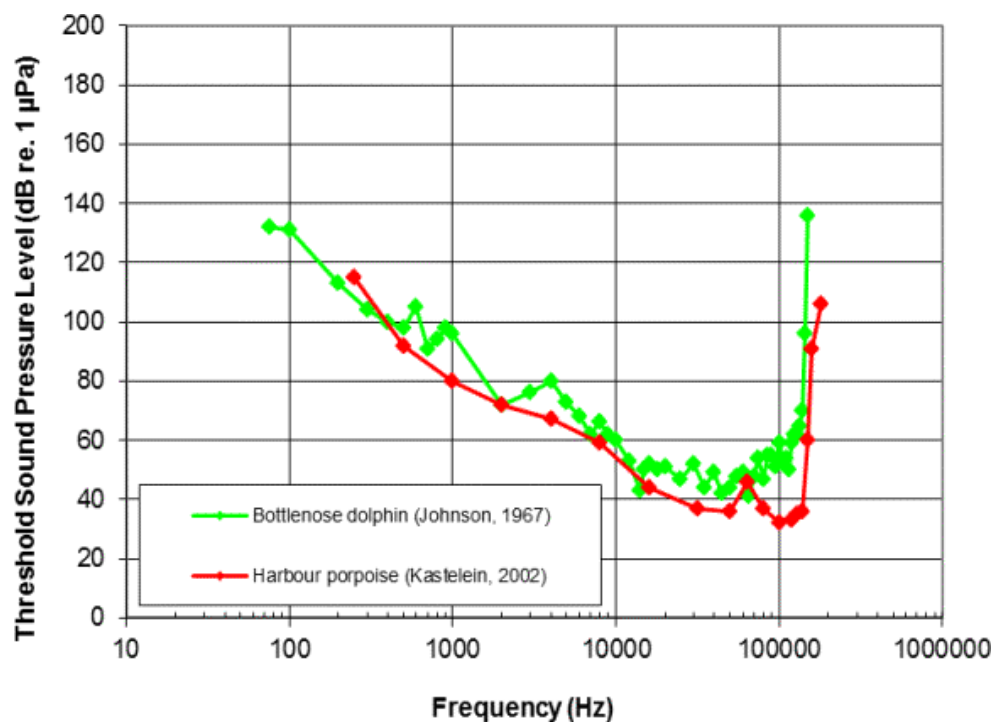


Figure 6-1: Bottlenose dolphin and harbour porpoise hearing threshold audiogram

The acoustic energy proposed for MBES (200 or 400 kHz on the *Leah-C* (typically operating around 350-400 kHz) and 400 kHz for ROV deployed MBES system on the *Edda Sun*), ROV positioning equipment (500 to 1200 kHz) in offshore areas, and side-scan sonar in inshore areas (likely to be in the range 300 to 900 kHz), are emitted at frequencies that are largely outside the range of hearing for bottlenose dolphins (Figure 6-1) and are therefore unlikely to have a significant effect on the species. The mini USBL transponder may be audible to bottlenose dolphins, however due to the very low intensity at which this equipment operates,

impacts are considered negligible.

The acoustic signature of the mini dredging tool will be audible to many of the receptors of marine mammals and fish. Frequency is expected to be much lower than for the acoustic survey sensors proposed for use, and predicted amplitude (source level of intensity) is also expected to be low. The equipment is proposed to be used at only a few discrete locations along the route of the offshore pipeline and umbilical. Its usage will be of short duration and will the vessels MMO will oversee its operation by monitoring the appropriate mitigation zone prior to the dredging works commencing and also monitoring the zone during the operation.

The audiogram in Figure 6-1 shows that the sound pressure level (SPL) required to be perceived to the dolphin at 100 kHz is around 50 dB re 1Pa. The maximum SPL at 1m distance for the side scan sonar proposed for the survey is estimated to be approximately 225 dB re 1μPa.

At ~ 225 dB re: 1μPa @1 m the maximum amplitude would be expected to drop exponentially due to spherical spreading and attenuation (as shown in Figure 6-1).

A further extrapolation of the values from Table 5-1 for the maximum source levels for the MBES would result in dB levels of around 180 dB at 0.1 km, 110 dB at 1 km, and undetectable within 5km. These reductions in amplitude would be the result of spherical spreading alone.

A comparison can be made with the attenuation from the MBES source levels above with those for typical exploration seismic survey, which operates at much lower frequencies. This highlights the rapid attenuation of high versus low frequency sound of similar source intensity in the water column. By extrapolating the values in Table 5-1 again using the calculations of Gausland (1998) it would be expected that lower frequency exploration seismic sources would be around 184 dB at 0.1 km, 162 dB at 1 km, 115 dB at 10 km, and 45 dB at 30 km. These reductions in amplitude would also be the result of attenuation in the water column through spherical spreading alone.

These losses would likely be increased due to the fact that the maximum amplitude of 225 dB re: 1μPa @1 m is expected at frequencies of around 400 kHz and the above ranges do not take into consideration losses through absorption which are anticipated to be greater.

The sound energy generated by the use of the MBES will be directed downwards to the seabed from the transducers mounted on the ROV.

Due to the high frequencies at which the MBES will be operated, it is possible that the proposed survey activities would be audible to bottlenose dolphins in the West Connacht Coast SAC (within 4 km of the operations as the vessel worked along the nearshore sections of the route), however at a relatively low level of intensity.

The acoustic energy from the sub bottom profiler used on the inshore survey has a frequency range of 3 – 8 kHz (Table 3-1). This is within the hearing range of the bottlenose dolphin close to the peak sensitivity for this species (~15-20 kHz). The audiogram in Figure 6-1 shows that the sound pressure level (SPL) required to be perceived to the dolphin at 10 kHz is about 60 dB re 1Pa. The maximum SPL at 1m distance for the sub bottom profiler proposed for the survey is estimated to be approximately 214 dB re 1μPa.

The sound energy generated by the use of the sub-bottom profiler will be directed downwards to the seabed (hull mounted on the *Leah-C*), and the pulse duration of sub- bottom profilers

is extremely short, in the order of tens to hundreds of milliseconds (Nedwell et al, 2008). Despite the energy dropping off rapidly from the source, the noise is likely to be perceived by dolphins outside of the immediate vicinity of the survey.

The maximum amplitude (based on the model of sub bottom profiler) which may arise from these activities of ~214 dB re: 1µPa @1m will drop exponentially due to spherical spreading and attenuation. Extrapolating values from Table 5-1, it is expected that dB levels will have dropped to approximately 174 by 0.1 km, 153 at 1 km (closest point of the West Connacht Coast SAC to the survey route), and undetectable within 5 km through spherical spreading alone.

The calculated source level value of 153 dB re: 1µPa @1m (at 1 km from the sound source) is well below both the SEL and SPL for injury to mid frequency hearing cetaceans. Considering this, and the natural avoidance behaviour of the species, injury / distress is unlikely, as an animal would need to be located in the very small zone of ensonification above the SEL, close to the sound source, and stay in that zone for a period of time.

The maximum amplitude of the side-scan sonar equipment proposed for deployment from the *Leah-C* is expected to be approximately 225 dB re: 1µPa @1 m. These source levels are slightly higher than that for the assessed sub bottom profiler. It is expected that these amplitudes would only be achieved at the equipment's higher operating frequencies (outside the limits of hearing of bottlenose dolphins). At ~ 225 dB re: 1µPa @1 m the maximum amplitude would be expected to drop exponentially due to spherical spreading and attenuation (as shown in Figure 6-1). A further extrapolation of the values from Table 5-1 for the maximum source levels for the side-scan sonar would result in dB levels of around 178 dB at 0.1 km, 96 dB at 1 km (closest point of the West Connacht Coast SAC to the survey route), and undetectable within 5 km. These reductions in amplitude would be the result of spherical spreading alone.

These losses could potentially be increased due to the fact that the maximum amplitude of 225 dB re: 1µPa @1 m is expected at frequencies at the higher operational ranges of the equipment typically used for the purposes of the survey (around 300 to 600 kHz, but up to 1200 kHz). At these frequencies the losses through absorption and attenuation are anticipated to be greater.

Where the various survey equipment is operated at lower frequencies, the survey may be audible to bottlenose dolphins in the West Connacht Coast SAC, and therefore may cause localised short-term impacts on behaviour, possibly resulting in avoidance at close proximities. Nonetheless the employment of industry standard best environmental practice protocols at all times, including soft starts, the use of Marine Mammal Observers (MMO's), and the following of the guidance in the Vessel Operators Code-of-Conduct (Document No. COR-14-SH-0227, 2018) - as required by the statutory agencies will further reduce the likelihood of potential impacts.

Exposure to any such impacts will be of short duration, with the overall programme surveys expected to take c.20 days. Survey effort will move along the route in a linear fashion, substantially reducing the duration of potential exposure at any given location.

Noise from vessels is also likely to be of low amplitude and frequency (Table 5-1) and unlikely to reach the SEL for Bottlenose dolphins even at very close proximity.

It is recognised that this part of the assessment focusses on the West Connacht Coast SAC due to its qualifying sensitive receptor species as well as its proximity to the proposed survey

operations. West Connacht Coast SAC is the closest European protected site with marine mammals as qualifying species to the Corrib Field, and is approximately 1 km from the proposed survey route. A number of other sites have been considered during the screening phase (Stage 1 of the Appropriate Assessment process (as described in the AA process in Section 2.2)) due to the foraging ranges of the species that are their qualifying species. Extrapolating the source level values by range, as has been carried out in this section serves to highlight the way in which the source level rapidly attenuates with increased distance. As such the West Connacht Coast SAC and its relevant qualifying feature (bottlenose dolphin) is considered as a worst-case scenario in terms of the direct impacts as a result of its proximity.

As concluded in Section 5 above, the potential impacts described above are not considered to have any likely significant effect on the conservation objectives for this species for the European site in question (West Connacht Coast SAC) when the described statutory-required protocols for the protection of these species are applied. It is considered therefore, that the potential impacts of underwater noise on bottlenose dolphins will not adversely affect the integrity of the West Connacht Coast SAC.

6.2.1.2 Annex IV species in Broadhaven Bay SAC

Very high frequency cetaceans such as harbour porpoise may be sensitive to some of the lower frequencies of the survey equipment used. There is potential for auditory overlap with the frequency of 400kHz proposed for the MBES. Estimates provided by Nedwell et al., (2008) using comparable MBES specifications (maximum source level of 220 dB re: 1µPa @1 m and an operating frequency of 200kHz) and using harbour porpoise as being the worst case scenario and a 90 dBht ((dB values above hearing threshold) strong avoidance impact criterion (Nedwell et al., 2008)), it was estimated a strong avoidance reaction might occur at around 30 m from the sound source.

Again, considering the natural avoidance behaviour, the peak source level of the sound source and the SPL and SEL for injury (202 dB re 1µPa (peak) and 155 dB re 1µPa respectively) it is unlikely that injury would occur. Due to spherical spreading alone, the SPL threshold for injury would be constrained to within 15 m of the sound source and the SEL threshold for injury would be within 500m of the sound source. It should be noted that the proposed peak source level of 225 dB re: 1µPa @1 m is a maximum and will also drop exponentially due to spherical spreading and greater attenuation of high frequencies.

Exposure to any impacts will be of short duration, as the survey will take place during a relatively short window.

Smaller personnel transfer and guard vessels may also operate in addition to the primary survey vessels (previously considered). Smaller vessels such as an outboard motor driven Rigid Inflatable Boat (RIB) have been estimated to produce a source level of around 150 dB re 1 µPa-m) @ 1m at a frequency in the range 400 – 800 Hz (Richardson et al., 1995 cited in Nedwell et al., 2008). The inshore survey vessel *Leah-C*, is an inboard-engine vessel, and its engines will impart underwater noise at a lower frequency to that of an outboard driven RIB, while the engines and plant noise from the *Edda Sun* will produce underwater noise at a considerably lower frequency.

These sound source levels are likely to result in sound levels that would potentially be perceived by any Annex IV species of cetacean that happened to be within Broadhaven Bay SAC and could result in avoidance behaviour if in very close proximity. Impacts are considered to constitute a minor impact. All vessels operating within Broadhaven Bay will follow the

Vessel Operators Code of Conduct (Document No. COR-14-SH-0227, 2018) for vessels to minimise interactions with marine mammals. The inshore survey vessel (*Leah-C*), will where possible, survey from inshore (close to the landfall) to offshore so as to avoid a scenario where animals actively avoiding the sound source are not inadvertently fleeing into constrained waters. In addition to this the equipment to be used will be operated at higher frequencies than those studies referenced above and would be less likely to overlap with the typical peak range of these species.

It is recognised that this part of the assessment focusses on the presence of receptor species within the Broadhaven Bay SAC. Sites at greater distances from the proposed operations have been considered during the screening phase (Stage 1 of the Appropriate Assessment process (as described in the AA process in Section 2.2)) due to the foraging ranges of the species that are their qualifying species and the overall connectivity of the habitat. Extrapolating the source level values by range due to attenuation and loss through spherical spreading, as has been carried out in this section serves to highlight the way in which the source level rapidly attenuates with increased distance. As such Broadhaven Bay SAC and its relevant qualifying features are considered as a worst-case scenario in terms of these direct impacts, and as such has been included here as the example due to its proximity. It is appreciated that harbour porpoise and other Annex IV species of marine mammals are not qualifying species of interest for Broadhaven Bay SAC, but their presence here has been recorded and as such this site has been considered as a worst case scenario in terms of these direct impacts.

When the required protocols described here are applied, the potential impacts of underwater noise are not considered to have any likely significant effect on the conservation objectives of the European site in question (Broadhaven Bay SAC) and will therefore not adversely affect the integrity of Broadhaven Bay SAC.

6.2.1.3 Grey seals in Inishkea Islands and Duvillaun Islands SACs

Figure 6-2 presents an audiogram for pinnipeds.

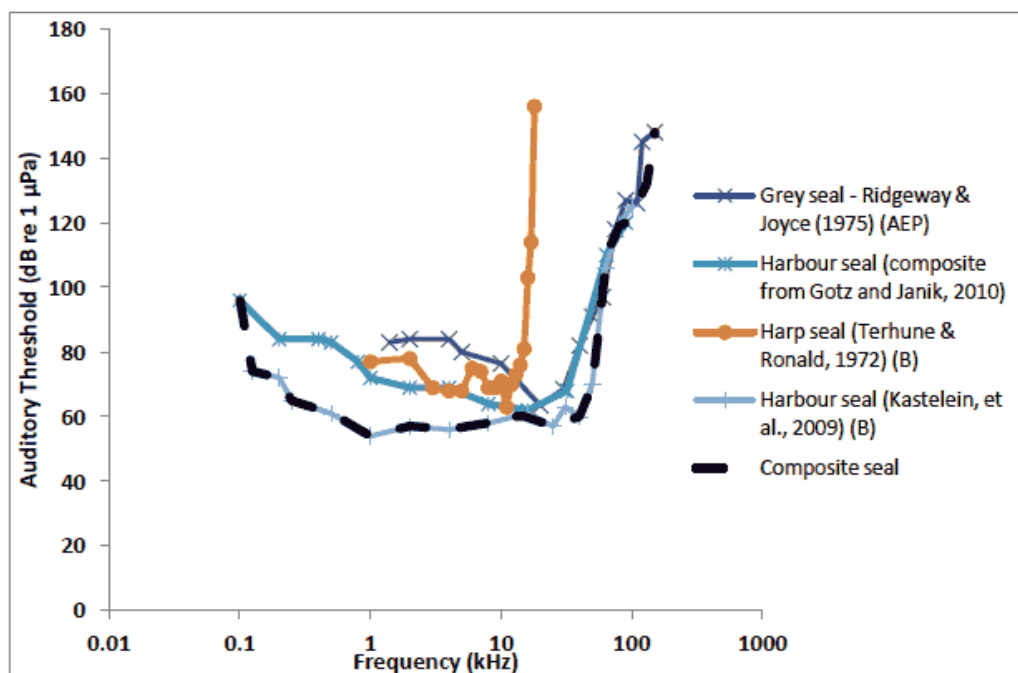


Figure 6-2: Audiogram for pinnipeds (Marmo *et al.*, 2013)

Pinnipeds have a hearing range typically between 75 Hz and 75 kHz, with peak sensitivity within that range between 20-30 kHz above a threshold level of approximately 60 dB re 1 μ Pa. The audiogram shows that the upper limits of frequency that could be detected by grey seals is close to 100 kHz. This would therefore mean that the acoustic energy for the MBES, and the side-scan sonar, and much of the ROV navigational and communication equipment (Table 3-1) is outside the upper frequency range of grey seal hearing.

The frequency range proposed for the sub bottom profiler proposed for the inshore survey will, however, coincide with the hearing range of grey seals. The USBL transponders and vessels single-beam depth sounders on the offshore survey may also be audible to seals, however due to the very low intensity at which this equipment operates, impacts are considered negligible.

Even though energy levels drop off rapidly from the source, the noise from the sub- bottom profiler could be detected by seals tens of kilometres distant from the survey, and closer to the source it is likely that responses in the form of avoidance would be exhibited (Thompson, 1998).

Studies dedicated to the effect of noise from acoustic survey on seals are limited, despite seals being recognised as having good underwater hearing. Of the few dedicated studies undertaken, Thompson (1998) provides an assessment of the physiological responses of grey and harbour seals to airguns. The study showed that harbour seals exhibited fright responses when a sound source (source levels of 215 to 224 dB) was switched on, followed by strong avoidance behaviour. The seals also stopped feeding during this time. The behaviour of the harbour seals soon returned to normal after the sound source was switched off. Similar avoidance responses were recorded in grey seals at similar exposure levels, with seals changing from foraging behaviour to transiting away from the sound source. The grey seals were recorded as returning to normal behaviour within two hours of the sound source ceasing.

The maximum amplitude of the sub bottom profiler proposed for deployment on the *Leah-C* is 214 dB re: 1 μ Pa @1 m and the amplitude will drop off rapidly from the source. Using the extrapolated values from Table 5-1, it is expected that dB levels will have dropped to approximately 117 dB at 19 km (distance from the Inishkea Islands SAC to the survey route at its closest point) through spherical spreading alone. This value is well below both the SPL and SEL for injury provided by Southall et al. (2007), and therefore the potential for injury to seals from the acoustic sound sources proposed for this survey is extremely low.

The maximum amplitude of the proposed side-scan sonar equipment is 225 dB re: 1 μ Pa @1 m (when operating at around 500 to 600 kHz). The maximum amplitude of the proposed MBES equipment is 225 dB re: 1 μ Pa @1 m (when operating at around 350 to 400 kHz as proposed for the survey activities). The typical operating frequencies of 300 to 900 kHz for the inshore survey are well outside the audible range for grey seals. Using the extrapolated values in Table 5-1, the source levels would be expected to drop to approximately 128 dB at 19 km (distance from the Inishkea Islands SAC boundary to the survey route at its closest point) through spherical spreading alone. This value is well below both the SPL and SEL for injury provided by Southall *et al.* (2019). As the Duvillaun Islands SAC boundary is even further away from the survey route (22 km at its closest point), impacts would be further negated. These values are likely to be further reduced through increased absorption and attenuation associated with source levels at higher frequencies, (the ranges quoted to do not consider absorption, but attenuation through spherical spreading only), and therefore the potential for injury to seals from the acoustic sound sources proposed for this survey is

considered to be extremely low, as is the potential for behavioural impacts. It should further be noted that since both the sub-bottom profiler and side-scan sonar are both proposed for use only on the inshore components of the survey (deployed from the *Leah-C*), all survey effort will be within Broadhaven Bay, and as such will further reduce the potential for propagation of underwater noise from these activities to disturb receptor species of seals within the Inishkea Islands or Duvillaun Islands SACs.

Exposure to any impacts will be of short duration. The survey works are expected to take only around 20 days in duration, with the survey effort constantly moving along the pipeline route in a linear fashion so that exposure at any given location is minimal. All vessels operating within Broadhaven Bay will follow the Vessel Operators Code of Conduct (Document No. COR-14-SH-0227, 2018) to minimise interactions with marine mammals. The inshore survey will, where possible, survey from inshore (close to the landfall) to offshore so as to avoid a scenario where animals actively avoiding the sound source are not inadvertently fleeing into constrained waters.

The offshore sections of the surveys (in particular at the Corrib Field) will largely occur at considerable distances offshore and will only be using high frequency MBES equipment and other very high frequency low-intensity sensors. As a result, the likelihood for injury or disturbance to seals is reduced, as the frequency of occurrence of seals decreases with increasing distances from areas of known coastal sensitivity.

It is recognised that this part of the assessment focusses on the receptor species of seals within the Inishkea Islands or Duvillaun Islands SACs due to their proximity to the proposed survey operations (19 and 22 km respectively). Sites at greater distances, with both grey and harbour seals as qualifying features, from proposed operations have been considered during the screening phase (Stage 1 of the Appropriate Assessment process) due to the foraging ranges of these species. Extrapolating the source level values by range, as has been carried out in this section serves to highlight the way in which the source level rapidly attenuates with increased distance. As such the Inishkea Islands and Duvillaun Islands SACs are considered as a worst-case scenario in terms of the direct impacts and as such have been included here as examples due to their proximity.

As stated above in Section 5, in view of the conservation objectives for this species, the predicted impacts described above are not likely to have a significant effect on the qualifying interests of the European sites in question (Inishkea Islands and Duvillaun Islands SACs). It is considered therefore that the potential impacts of underwater noise on grey seals would not adversely affect the integrity of these or any other European site.

6.2.1.4 *Indirect impacts on prey species for cetaceans and pinnipeds*

Indirect impacts on the prey species of fish behaviour and availability for all species of Annex II marine mammal under consideration is also considered. Impacts on fish species are discussed in more detail in Section 6.2.1.6 below. This assessment focusses on the impacts on migratory species of fish listed under Annex II of the Habitats Directive, however does also consider other species of fish that will include likely prey species for cetaceans and seals in the vicinity of the proposed activities for which European sites have been designated.

All fish have ears to detect sound through their otolithic organs, which respond to particle motion of the surrounding fluid. Many fish are also able to detect sound pressure with a swim bladder which re-radiates the sound energy as particle motion to the otolithic organs (herring). These fish generally have lower sound pressure thresholds and wider frequency ranges of hearing that

those that rely on particle motion detection by the otolithic organs alone (Popper *et al.*, 2014). Whereas other fish have a swim bladder, but it is not used in hearing (Atlantic Salmon) making them less sensitive to sound. Figure 6-3 presents behavioural audiograms for four fish species. The particle acceleration level is well below a frequency of 1 kHz and as such the frequency of the MBES and other equipment proposed for use in the surveys.

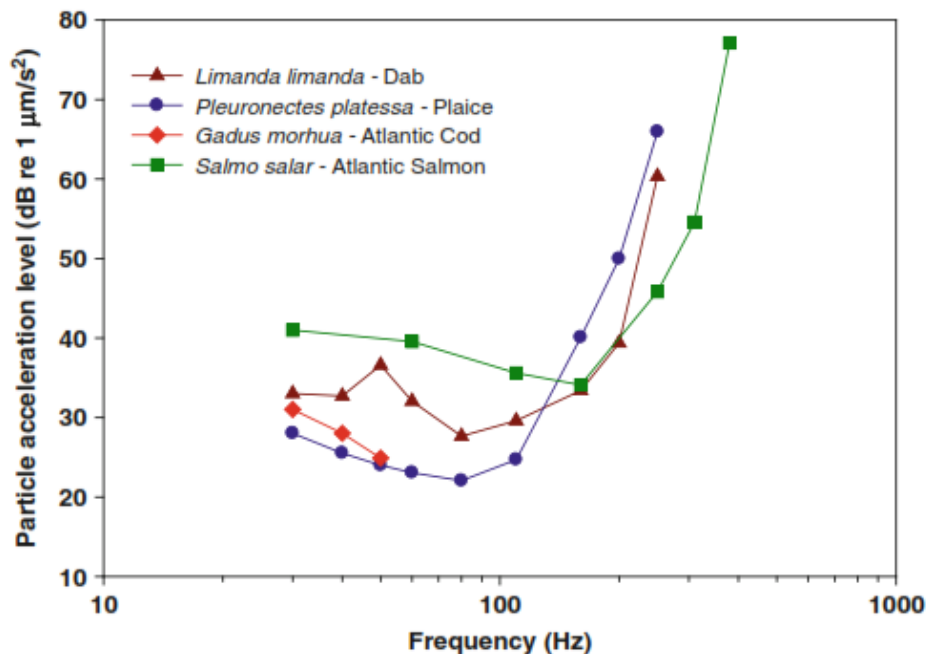


Figure 6-3: Particle motion behavioural audio grams for Atlantic salmon (*Salmo salar*, Hawkins & Johnstone 1978); plaice (*Pleuronectes platessa*, Chapman & Sand 1974); dab (*Limanda limanda*, Chapman & Sand 1974); Atlantic cod (*Gadus morhua*, Chapman & Hawkins 1973)

Hearing range and sensitivity ranges widely among species. Herring are considered to be of higher sensitivity compared with others as their hearing thresholds extends to higher frequencies up to several kHz (Nedwell *et al.*, 2004). Studies on smaller species of fish that would be expected to make up the prey species for marine mammals are more limited but would tend to suggest that impacts are extremely localised to the immediate vicinity of the underwater noise source along the survey route and that furthermore impacts are of very short duration, and fish quickly resume normal behaviour once the sound source has passed by / ceased. Impacts on larger species such as salmonids, which would also be important prey would suggest that they are less sensitive to underwater noise (Nedwell *et al.*, 2003, 2006; Popper, 2005). Salmonids are also highly mobile and relatively large, and therefore easily able to undertake avoidance behaviour and return following cessation of the survey operations.

Due to the localised extent of the impact, the overall proportion of the prey species population that is affected is likely to be minimal. Designated species of marine mammals in the vicinity of the proposed activities have access to a large area for foraging and are highly mobile (as are their prey species), and consequently they have wide potential prey availability. Therefore, the localised and short duration impacts on prey species will not have a significant indirect impact on the marine mammal populations in the vicinity. The use of Soft-Start procedures will mitigate the impacts on prey species of fish by gradually increasing the intensity of the equipment over time allowing time for these species to take avoiding action.

6.2.1.5 Seabirds in the coastal SPAs

Although impacts to birds (and the SPAs to which they may contribute) from the proposed works are considered highly unlikely, they are briefly considered here.

Seabirds will occur at the Corrib Field and along the survey route, and it is probable that some of these individual birds are those that collectively contribute to the designation of an SPA. Depending on the foraging range of the species involved, these birds could contribute to the designation of SPAs which are either close to the proposed survey area (and shown in Figure 4-1, e.g. Inishglora and Inishkeeragh) or much further away. For example, gannets are reported as having a maximum foraging range of 640 km, which could therefore encompass individuals from SPAs in Scotland. Broadhaven Bay has an important breeding colony of Sandwich terns (*Sterna sandvicensis*) and these birds could be present in the area of the proposed works at a similar time to when works are taking place. Terns are surface feeding and very shallow diving and the impacts of acoustic surveys would not be expected to cause injury, however the disturbance either directly or indirectly to prey species of fish could potentially result in minor, non-significant impacts as described in the following section.

However, the potential exposure of birds to underwater noise varies greatly with their feeding ecology. Some species may be at higher risk to noise sources either because a) they enter the water by plunge diving directly from the air (e.g. gannets) and therefore may not be able to detect noise prior to exposure; and b) they spend a relatively long time underwater and/or dive to a deep depth (e.g. auks, scoter). Other species of seabird (such as terns, gulls and shearwaters) only have very shallow diving depths and/or spend a short time underwater, thereby inherently minimising any exposure. Many species of wader and wildfowl that contribute to SPAs are unlikely to be affected, as they do not fully immerse their bodies in water when they are feeding (e.g. by wading or dabbling; examples contributing to the Inishkea Islands SPA designation (19 km from closest point on survey route) include ringed plover, sanderling, purple sandpiper, turnstone, barnacle goose and dunlin). A number of European sites have been considered for birds where there exists the potential for direct or indirect impacts as a result of the proposed operations.

Even for those species that are potentially at higher risk to noise exposure (e.g. auks), such exposure will be inherently minimised by the nature of the survey and the locations in which it is taking place. Factors inherently reducing risk (several of which are also applicable to marine mammals and fish) are summarised below:

- Natural flight response: most surface-diving diving birds (such as auks and scoter) will, in response to moving vessels, fly out of the way, due to natural evasion behaviour. This will therefore increase the distance between them and the highest sound levels;
- Exposure to sound: as noted, the sound pressure levels from the survey's acoustic sources are expected to attenuate rapidly in water. Furthermore, transducer-based acoustic sources will target sound directly downwards to the seabed from a close distance (the ROV will be operating close to the seabed) and in a narrow band or cone. To be subjected to maximum noise levels, birds would therefore have to be very close to the sound source. In practice this would require them to be either near the ROV (close to the seabed and therefore highly unlikely or not possible; see

below), or almost directly under the hull of the moving vessel or towfish in the case of the inshore survey. Both of these scenarios are considered unlikely. The soft start procedure will allow animals to move away from the area, or curtail a deep dive, in response to gradually increasing sound levels.

- Water depths for much of the survey offshore (outside Broadhaven Bay): the peak source noise levels from the ROV will be largely restricted to near the seabed in deep water (>150 m). This depth is far beyond the maximum diving depths of the majority of the seabirds that might occur in the region (e.g. gannets and eider duck 40 m; black guillemots 50 m; puffins 70 m; BirdLife International, 2014). Two species (the guillemot and the razorbill have greater maximum diving depths (of 180 m and 140 m respectively, with maximum recorded dive times of over 3.5 minutes for guillemot), although the mean depths for these species are significantly shallower (90 m and 40 m respectively) (BirdLife International, 2014). It would therefore be highly unlikely that any bird would be in close proximity to the noise source in deeper water (especially given soft-start procedure noted above); even if this was to occur, no injury would be expected to occur given that no fatalities of diving seabirds were recorded as a result of seismic surveys using much greater sound levels from the equipment (see below).

In addition to the above factors, it is considered highly improbable that seabirds will be impacted by the proposed work programme (using standard and widely-used survey equipment) given that there is some evidence that diving seabirds are not especially vulnerable to the much greater sound levels experienced as a result of airguns firing during seismic surveys. In a risk assessment for seismic surveys offshore from Ireland, Turnpenny and Nedwell (1994) cited research (Stemp, 1985) that considered the effects of seismic surveys on three seabird species; this concluded that no fatalities resulted, and any variations in abundance were within natural variation. A further study found no effect of seismic activity on movements and diving of long-tailed ducks in the North Pacific (*Clangula hyemalis*) (Lacroix et al. 2003).

Indirect impacts on the prey species behaviour and availability for seabirds is also considered. Impacts on fish species are discussed in Section 6.2.1.6 below. This assessment focusses on the impacts on migratory species of fish listed under Annex II of the Habitats Directive, however does also consider other species of fish that will include likely prey species for Annex II designated seabirds. A number of species of fish have known sensitivity to underwater noise, in particular those whose auditory apparatus are closely linked with a swimbladder, such as herring are considered to be of higher sensitivity compared with others (Nedwell et al., 2004). Studies on smaller species of fish that would be expected to make up the prey species of seabirds are more limited but would tend to suggest that impacts are extremely localised to the immediate vicinity of the underwater noise source and that furthermore impacts are of very short duration, and fish quickly resume normal behaviour once the sound source has passed by / ceased. In addition, due to the localised extent of the impact the overall proportion of the prey species population that is affected is likely to be minimal. Given that Annex II designated species of seabirds in the vicinity of the proposed activities have access to a large area for foraging and are highly mobile (as are their prey species), and consequently they have wide potential prey availability. Therefore, the localised and short duration impacts on prey species will not have a significant indirect impact on the seabird populations in the vicinity. The use of Soft-Start procedures will mitigate the impacts on prey species of fish by gradually increasing the intensity of the equipment over time.

The predicted impacts described above are considered unlikely to have a significant effect on the conservation objectives for diving seabird species for the European sites in question. Therefore, the potential impacts associated with underwater noise on seabirds are not considered to adversely affect the integrity of any of the coastal / offshore SPAs in the vicinity of the Corrib development.

6.2.1.6 *Fish species in Glenamoy Bog Complex, Mweelrea / Sheeffry / Erriff Complex, Owenduff / Nephin Complex, Newport River, River Moy and Killala Bay / Moy Estuary SACs*

As for seabirds described in the previous section above, although significant impacts to certain fish species (and consequently the integrity of the SACs for which they may contribute) from the proposed survey are considered highly unlikely, they are briefly considered here.

Of the Annex II fish species that occur in Ireland and have marine life history stages (i.e. river lamprey, sea lamprey, twaite shad, allis shad, salmon), the salmon, river and sea lamprey contribute to the designation of SACs within Co. Mayo and near the proposed survey area (i.e. the Glenamoy Bog Complex, Mweelrea / Sheeffry / Erriff Complex, Owenduff / Nephin Complex, Newport River, River Moy and Killala Bay / Moy Estuary). It is possible that these migratory species of fish may occur in inshore areas during the time of the proposed survey, and within relatively close proximity to acoustic survey sound sources.

However, significant impacts to migratory fish such as salmon and lamprey are considered highly unlikely, given knowledge on the known sensitivity of various fish species to underwater noise. Although some fish species (whose auditory apparatus are closely linked with the swimbladder, such as herring) are considered to be of high sensitivity (Nedwell *et al.*, 2004), salmonids (e.g. salmon and trout, including sea trout) and lamprey are thought to be relatively insensitive to sound (Nedwell *et al.*, 2003, 2006; Popper, 2005). Salmon are also highly mobile and relatively large, and therefore easily able to undertake avoidance behaviour and return following cessation of the underwater noise generating activities. Figure 6-3 presents behavioural audiograms for four fish species.

Lamprey are less mobile, but are less sensitive to higher frequency sounds, with sea lamprey showing behavioural changes, such as increased activity in response to low frequency sounds in the range of 50-200 Hz (Mickle *et al.*, 2018). The use of Soft-Start procedures will provide ample time for migratory fish to avoid the sound source prior to the equipment reaching full intensity.

The potential impacts described above are considered unlikely to have any significant effect on the conservation objectives for these species for the European sites in question (Glenamoy Bog Complex, Mweelrea / Sheeffry / Erriff Complex, Owenduff / Nephin Complex, Newport River, River Moy and Killala Bay / Moy Estuary SACs) particularly given the frequency levels and intensity of the equipment to be used and that Soft-Start procedures will be applied. Therefore, the potential impacts of underwater noise on migratory fish are not considered to have the potential to adversely affect the integrity of Glenamoy Bog Complex, Mweelrea / Sheeffry / Erriff Complex, Owenduff / Nephin Complex, Newport River, River Moy or Killala Bay / Moy Estuary SACs.

6.2.1.7 *Conclusion*

In view of the best scientific knowledge and in view of the conservation objectives of the designated sites, these proposed survey operations when taken either individually or in

combination with other plans or projects, will not have a likely significant effect on any European site as a consequence of underwater noise or disturbance resulting from the works.

Impacts to the European sites in closest proximity to the proposed activities that have the potential to be impacted have been predicted as not significant. Given the nature of the impact sources, it is not expected that any residual impacts would result in significant impacts to designated features of other European sites in the wider locality or on their conservation objectives.

Therefore, as there are no residual impacts of underwater noise on the conservation objectives of any of the European sites in the vicinity of the Corrib development, the integrity of these sites is not expected to be adversely affected.

6.2.2 Other potential impacts

Impacts from the survey vessels in terms of standard emissions and discharges during operation will be minimised where possible. Emissions will be minimised through regular maintenance of all engines onboard, in line with Maritime Registry of Shipping (MRS), MARPOL 73/78 Annex VI (as appropriate) and other similar requirements. Vessel discharges will also be managed in accordance with the requirements of MARPOL 73/78 as appropriate.

As previously mentioned, fuel oil spillage and a minor spill/ leak of hydraulic fluids from the ROV or any deck equipment along the survey route, particularly from the larger *Edda Sun* offshore survey vessel, could potentially result in a spill. The likelihood of such an event occurring is considered to be very low. All vessels will have appropriate spill contingency plans in place to deal with such events with the aim of reducing environmental damage as far as possible. In addition, no fuelling of vessels will be undertaken within the boundaries of any European sites, or where there is the potential for fuel oil spilled during refuelling to enter any European sites. Vessel fuelling will take place in a designated port, will have strict safety, navigation, operations and communications plans in place to minimise collision risk and will have maintenance, audit and inspection plans in place to identify fuel spillage risks as soon as possible. Furthermore, during works the fuel valves will be kept closed and only marine grade oil will be used (less of an environmental hazard than heavy fuel oil). All deck machinery will only be refuelled within a bunded area. Hydraulic fluids used by the ROV and ROV handling equipment have been selected partly based on their environmental credentials, being inherently rapidly biodegradable and having passed stringent LC 50 and EC 50 tests to determine their toxicity to aquatic life.

While it is accepted that a deposit of fuel oil within the European sites, or in areas where qualifying features could be impacted, could have a significant effect on the designated sites, including their qualifying interests for which the sites were selected, the protocols and procedures in place to prevent this occurrence and the low probability of such a deposit occurring mean that the overall significance of this impact is determined as very unlikely (minor).

6.2.2.1 Conclusion

In view of the best scientific knowledge and in view of the conservation objectives of the site, these activities when taken either individually or in combination with other plans or projects will not have a likely significant effect on any European site.

Impacts from other impact sources to the European sites in closest proximity to the proposed

activities have been predicted as not significant. Given the nature of the impact sources, it is not expected that any residual impacts would result in significant effects on designated features of other European sites in the wider locality or on their conservation objectives.

Therefore, as there are no residual impacts of the proposed survey activities on the conservation objectives of any of the European sites in the vicinity of the Corrib development, the integrity of these sites will not be adversely affected.

6.2.3 Cumulative impacts

A review has been undertaken of applications for offshore works that are currently at consultation stage, and which have the potential to result in impacts within the project study area. The study area for project and cumulative impacts is broad enough to encompass typical foraging and migratory ranges for the qualifying species of the European designated sites.

This information is publicly available from the Department of the Environment, Climate and Communications and the Department of Housing, Planning and Local Government. The review identified one project in addition to those being carried out as part of the Corrib project by the project operator, that has the potential to take place during a similar timeframe as the proposed survey operations. The projects that have been identified are listed in Section 5.2.4.2. and include the geotechnical investigation being undertaken by Woodside Energy (Ireland) Pty Ltd, who currently hold the Petroleum Prospecting Licence PPL 1/20. They propose to collect cores from shallow boreholes at depths from 50 to 2,600 metres, throughout the Irish Atlantic Margin. The investigation is expected to take place over 40 days (including operational and transit time, and allowing for weather downtime), starting between June and early August 2021.

The following projects were identified: The other scopes of work being undertaken for the Corrib project that are scheduled to take place in 2021 (The P6 flexible flowline replacement works and the Channel B EDU and electrical jumper replacement at the Corrib central manifold cannot take place concurrently with these proposed survey activities due to the same vessel operator and primary survey vessel being used for all activities.

Potential impact sources from the Woodside survey combined with the proposed survey activities could result in cumulative impacts in the form of underwater noise from the vessel operations and the operation of geophysical survey and positioning equipment. In addition, there will be a disturbance impact from the physical presence of vessels and associated equipment being present in the study area.

Due to the location of these projects, marine mammals as qualifying features, particularly the bottlenose dolphins designated in the West Connacht SAC and the harbour seals in the Clew Bay Complex SAC are likely to represent the worst case in terms of receptors to the potential cumulative impacts.

It is recognised that the scheduling of the inshore and offshore infrastructure, inspection and maintenance surveys may result in a degree of unavoidable overlap between the two programmes. However, this overlap will be of as short duration as possible and will also mean that the overall duration of disturbance from the combined programme is shortened. It is also anticipated that the two surveys (inshore and offshore) will not be in close proximity for a long period when operating survey equipment.

Due to the location of these various projects and the fact that there will not be a temporal

overlap in scheduling, it is not anticipated that underwater noise generated by these projects will have an additive effect. Despite this it is considered that marine mammals as qualifying features, particularly the bottlenose dolphins and the harbour seals are likely to represent the worst case in terms of receptors to the potential cumulative impacts. However, these species are mobile, with the ability to move in any direction and over long distances in an open marine environment, while the frequencies of the survey equipment are outside their peak hearing thresholds. Therefore, it is unlikely there will be an impact on the qualifying species of the West Connacht Coast SAC, the Duvillaun Islands SAC, the Inishkea Islands SAC, and Clew Bay Complex SAC.

Communication between the operators will also ensure that operations are coordinated to limit noise exposure, and the stringent application of the described statutory-required marine mammal mitigation protocols by operators for the protection of these species will result in no significant cumulative impacts. Furthermore, regarding all works undertaken as part of the Corrib offshore gas development, efforts will be made to schedule the works over different periods.

The impact of disturbance from additional vessels and equipment in the area will be minimised by the short duration of the project activities and the limited area of each project.

Overall, it can be determined that the additional proposed projects in or close to the Corrib survey route will not result in any significant effects on any European protected sites or key designated species in the vicinity of the Corrib survey route, nor will they adversely affect the integrity of any such site.

7 CONCLUSION

As a result of the assessment undertaken in support of Stage 2 of the AA process, which takes account of the best scientific knowledge and the conservation objectives of each European site, it can be determined that the proposed survey operations either individually or when taken in combination with other plans or projects, are not likely to have a significant effect on a European site.

If it is decided that it is necessary to carry out an appropriate assessment under Article 6.3 of the EU Habitats Directive, it is the view of the authors of this NIS that based on the scientific evidence presented (including the monitoring undertaken since annual geophysical inspection and maintenance surveys of the Corrib development subsea infrastructure began following installation in 2009 (RSK, (2016, 2018, 2019), Anderwald *et al.*, (2011 and 2012), Haberland *et al.*, (2013), and Culloch *et al.*, (2014)), that the proposed survey operations will not adversely affect the integrity of the European sites in the vicinity and in the wider location or on any other designated site, when taken individually or when taken in combination with the other plans or projects and there is no reasonable scientific doubt in this regard.

The conservation objectives for the Special Areas of Conservation (i.e. the habitats and species for which they have been selected) will not be compromised by the proposed survey operations, and there will be no likely significant effect on the European sites in the Natura 2000 network either when taken individually or when taken in combination with the other plans or projects.

However, if it is decided that, it is necessary to carry out an appropriate assessment under Article 6(3) of the EU Habitats Directive, this NIS provides the requisite information to ground such an assessment. In the context of such an assessment it is the considered view of the authors of this NIS that the proposed survey operations will not adversely affect the integrity of any European sites or on any other designated site and there is no reasonable scientific doubt in this regard.

The conservation objectives for the Special Protection Areas (i.e. the species for which they have been selected) will not be compromised by the proposed survey operations, and there will be no likely significant effect on the European sites in the Natura 2000 network either when taken individually or when taken in combination with the other plans or projects.

However, if it is decided that, it is necessary to carry out an appropriate assessment, this NIS provides the requisite information to ground such an assessment. In the context of such an assessment it is the considered view of the authors of this NIS that the proposed survey operations will not adversely affect the integrity of any European sites or on any other designated site and there is no reasonable scientific doubt in this regard.

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