Gas Networks Ireland

Strategic Gas Emergency Reserve – Marine Site Investigation (SI) Works

Natura Impact Statement (NIS)

RSK General Notes

Project No.: 81256

Title: Strategic Gas Emergency Reserve – Site Investigation (SI) Works: Assessment of Impacts on the Maritime Usage (AIMU) Report

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

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1 Introduction

1.1 Overview

Following a review carried out by the Department of the Environment, Climate and Communications (DECC) of the Security of Energy Supply of Ireland's Electricity and Gas Systems, there is need to improve the resilience of Ireland's natural gas supplies and infrastructure in the event of a disruption to the country's natural gas supplies for the short to medium term.

Energy Security in Ireland (ESI) to 2030 outlines a comprehensive strategy aimed at ensuring energy security throughout the current decade while facilitating a sustainable transition towards a carbon-neutral energy system by 2050.

Action 17 of ESI proposes the implementation of a "Strategic Gas Emergency Reserve to protect Ireland in the event of a gas supply disruption as Ireland makes a secure transition to a majority renewable energy".

In January 2025, the Government of Ireland issued the "Programme for Government 2025 – Securing Ireland's Future" which included the commitment that the government will "Take all necessary action to ensure and protect Ireland's energy security".

In March 2025, the Government of Ireland gave approval to proceed with the development of a State-led strategic gas emergency reserve. The delivery of a temporary gas reserve is deemed critical to Ireland's energy security as we continue to transition to indigenous, clean renewable energy.

Based on the above decision, Gas Networks Ireland (GNI) proposes to construct a receiving terminal and jetty to accommodate a Floating Storage and Regasification Unit (FSRU), which will allow for the importation of and storage of Liquified Natural Gas (LNG) within Ireland's jurisdictional waters. The FSRU will be connected to the national grid network for injection in case of a supply emergency. The project will involve the construction of a receiving terminal and jetty to accommodate the FSRU. Depending on the site chosen, there may be capital dredging required.

GNI intends to apply to the Maritime Area Regulatory Authority (MARA) for a Maritime Usage Licence (MUL) to conduct marine Site Investigations (SI) and environmental surveys within the Shannon Estuary adjacent to the townlands of Shannakea Beg, Cahiracon, Foynes Island, Leahys and Corgrig.

This report has been prepared as part of the MUL application process. The proposed works are designed to provide high quality baseline data that will contribute to site selection and any subsequent design, EIAR, and Appropriate Assessment, undertaken for the Strategic Gas Emergency Reserve (SGER) project; in the event that a site is taken forward to the planning/consenting stage.

1.2 Purpose of the report

This document has been prepared by RSK Environment Ltd. on behalf of GNI in support of the Maritime Usage Licence Application to the MARA. A Supporting Information for Screening for Appropriate Assessment (SISAA) report was prepared for the SI works and identified the presence of European sites within the potential Zone of Influence (ZoI) of the SI works. The SISAA concluded that the potential for

the SI works to cause Likely Significant Effects (LSEs) cannot be ruled out on two accounts. Specifically, it identified that the works have the potential to contribute to habitat loss, alteration, fragmentation in the Lower River Shannon Special Area of Conservation (SAC) (002165). The SISAA also concluded that the SI works will introduce subsea noise that has the potential to impact on bottlenose dolphin that are a QI species of the Lower River Shannon SAC (002165). Mitigation measures to avoid adverse impacts are therefore required. As such, the SISAA concludes that a Natura Impact Statement (NIS) be prepared to assist the Maritime Area Regulatory Authority (MARA), the competent authority, in conducting an Appropriate Assessment (AA) should they agree with the findings of the SISAA.

The purpose of this NIS is to provide MARA with information for the purposes of Article 6 of the Habitats Directive on the implications of the SI works, on its own or in combination with other plans or projects, for one or more than one European site, in view of the conservation objectives of the site or sites. This NIS will assist MARA in determining whether or not the SI works will adversely affect the integrity of the site(s) concerned. This NIS provides an overview of the marine SI works proposed to be undertaken in support of the Maritime Usage Licence Application to MARA. The Maritime Usage Licence Application is for site survey and investigation works to inform site selection and engineering design. The results of these surveys will also provide baseline data for any subsequent Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) should the development be taken forward to the planning/consenting stage.

This assessment has been carried out in accordance with the legal context as outlined in Section 1.4.

1.3 Statement of Authority

This report has been prepared by RSK on behalf of the GNI. The technical competence of the authors is outlined below:

[redacted] is Technical Director within the International Projects Group Marine Team in RSK. He has over 20 years of experience in marine environmental surveying and consulting. He holds an honours degree in Marine Biology and Oceanography and a Masters in Marine Resource Development and Protection. He has particular experience in marine ecology surveys, and the subsequent analysis and reporting of marine survey data for EIA projects, AA and Annex IV species reports.

[redacted] is a Senior Marine Consultant within the International Projects Group Marine Team in RSK. She has over 10 years of experience in the marine ecology field. She holds and honours degree in Marine Science and a Masters in Biology. She has contributed to numerous marine environmental projects including AA Screening, Natura Impact Statements and EIAR chapters.

This Supporting Information for Screening for Appropriate Assessment (SISAA) report has been prepared in compliance with the legislative and policy requirements described below.

1.4 Legislation

1.4.1 European Legislation

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) provides protection for habitats and species of European importance; Council Directive 79/409/EEC (the Birds Directive) aims to protect all 500 wild bird species naturally occurring in the European Union (EU). Areas designated for protection under the Habitats Directive are described as Special Areas of Conservation (SAC) and those designated under the Birds Directive, as Special Protection Areas (SPA) and the sites are known collectively as Natura 2000 sites (see Section 1.4.2.5). As each member of the EU is required to designate areas in their jurisdictions, the establishment of this network of Natura 2000 sites under Articles 3 to 9 of Directive 92/43EEC is the key measure to protect nature and biodiversity in the EU.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of Natura 2000 sites. Article 7 of the Habitats Directive extends the scope of its articles 6(3) and 6(4) to the Birds Directive.

Article 6(3) establishes the requirement for Appropriate Assessment (AA):

“Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site’s conservation objectives. Considering 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 public.”

Further detail on the stages of AA is provided in Section 3.2 of this report.

Each Natura 2000 site has assigned Conservation Objectives (COs) and a list of Qualifying Interests (QI). The CO concept appears in the eighth recital of Directive 92/43/EEC which reads: “whereas it is appropriate, in each area designated, to implement the necessary measures having regard to the conservation objectives pursued”. Article 1 then explains that “conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status”.

The National Parks and Wildlife Service (NPWS) has established COs for each Natura 2000 site in Ireland. These are published on their website. NPWS advise in the general introductory notes of their site-specific conservation objectives (SSCO) series publications, that an appropriate assessment based on their “published conservation objectives will remain valid even if the CO targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out”.

NPWS advise that to assist in that regard, it is essential that the date and version are included when objectives are cited.

1.4.2 National Legislation

1.4.2.1 Maritime Area Planning Act

The Maritime Area Planning Act, 2021 (as amended) established the Maritime Area Regulatory Authority (MARA). One of the functions of MARA is to consider licence applications and the granting of licences.

Schedule 7 of the Maritime Area Planning Act, 2021 (as amended) lists maritime usages which may be undertaken in the maritime area pursuant to licence. Of relevance to this site investigation project are the following items within Schedule 7:

3. Marine environmental surveys for the purposes of site investigation or in support of an application under Part XXI of the Act of 2000.

5. The installation of non-permanent platforms, pontoons, or slipways.

6. The deposit of any substance or object, either in the sea or on or under the seabed, from-

a) a vehicle, vessel (including a craft capable of travelling on, in or under water, whether or not self-propelled), boat, aircraft or marine structure (other than a pipeline).

7. The use of a vehicle, vessel (including a craft capable of travelling on, in or under water, whether or not self-propelled), boat, aircraft, marine structure (other than a pipeline) or floating container to remove any substance or object from the seabed.

11. The deposit, construction or removal of any mooring not requiring authorisation under any other enactment.

12.

a) The removal of beach material from, or the disturbance of beach material in, the maritime area otherwise than in the course of the ordinary or reasonable recreational enjoyment of the maritime area.

b) In this paragraph, "beach material" means sand, clay, gravel, shingle, stones, rocks, mineral substances, seashells, coral and maerl and any flora, in or on the surface of the seabed or suspended in the water of the maritime area, and includes outcrops of rock or any other mineral substance above the surface of the seabed.

GNI is applying to MARA for the grant of a licence for the above Schedule 7 usages, as more fully described in Section 2 of this report.

1.4.2.2 Requirements in Relation to Appropriate Assessment

The following definitions in relation to AA are included in Section 2(1) of the Maritime Area Planning Act, 2021 (as amended):

"screening for appropriate assessment" shall be construed in accordance with, as appropriate—

a) section 177U of the Act of 2000, or

b) (b) Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011)

"appropriate assessment" shall be construed in accordance with, as appropriate—

a) section 177V of the Act of 2000, or

b) Part 5 of the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011);

where the Act of 2000 refers to the Planning and Development Act 2000 (as amended).

The European Communities (Birds and Natural Habitats) Regulations 2011 have also been amended.

Under Section 112 of the Maritime Area Planning Act, 2021 (as amended), MARA has been designated as a competent authority for the purposes of Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011); and appropriate assessments to which that Part applies.

MARA is required to carry out a screening for AA in accordance with Section 117(4)(a) of the Act.

Where MARA determines that an AA is required it shall carry out the AA in accordance with Section 117(7)(a) of the Act.

1.4.2.3 Screening Out for AA

Under Section 177U (5) of the Planning and Development Act 2000 (as amended), the competent authority shall determine that an AA of a proposed development **is not required** if it can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

Under Regulation 42(7) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) the public authority shall determine that an AA of a project **is not required** where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening that the project, individually or in combination with other plans or projects, will have a significant effect on a European site.

1.4.2.4 Screening In for AA

Under Section 177U (4) of the Planning and Development Act 2000 (as amended), the competent authority shall determine that an AA of a proposed development **is required** if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

Under Regulation 42(6) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) the public authority shall determine that an AA of a plan or project **is required** where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site.

Where the competent authority determines that an AA is required, they shall make a determination under Article 6.3 of the Habitats Directive as to whether or not the proposed development would adversely affect the integrity of a European site and an appropriate assessment shall be carried out by the competent/ public authority before consent is given for the proposed development (see Section

177V(1) of the Planning and Development Act 2000 (as amended) and Regulation 42(11) European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

1.4.2.5 European Sites and Natura 2000 Sites

The term European site is defined in the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) as:

"European Site" means—

a) a candidate site of Community importance,

b) a site of Community importance,

c) a candidate special area of conservation,

d) a special area of conservation,

e) a candidate special protection area, or

f) a special protection area.

The term Natura 2000 site is defined in the same Regulations as:

"Natura 2000" means the European network of SACs under the Habitats Directive and SPAs under the Birds Directive, provided for by Article 3(1) of the Habitats Directive and, for the purposes of these Regulations, includes European Sites.

The two terms are often used interchangeably. For the purposes of this report, the term European site is used.

2 Project Description

2.1 Site Location

The proposed MUL Area covers an area of 11.19km^2 and extends from the townland of Shannakea Beg along the Clare coast to Cahiracon (Ed Killadysert), across the Shannon Estuary to Shannon Foynes Island and along the Limerick coast to the townland of Leahys and Corgrig (Figure 2.1). The works described in this application relates solely to the SI / sampling works within the proposed MUL Area (Figure 2.2 and Figure 2.3). Marine SI is required to inform preliminary design and facilitate environmental assessment in advance of Planning for the SGER project. Site investigations are to be completed over two phases, with Phase 1 being used to determining the optimum location of the SGER and Phase 2 being used at a later date to coordinate with the detailed design stage.

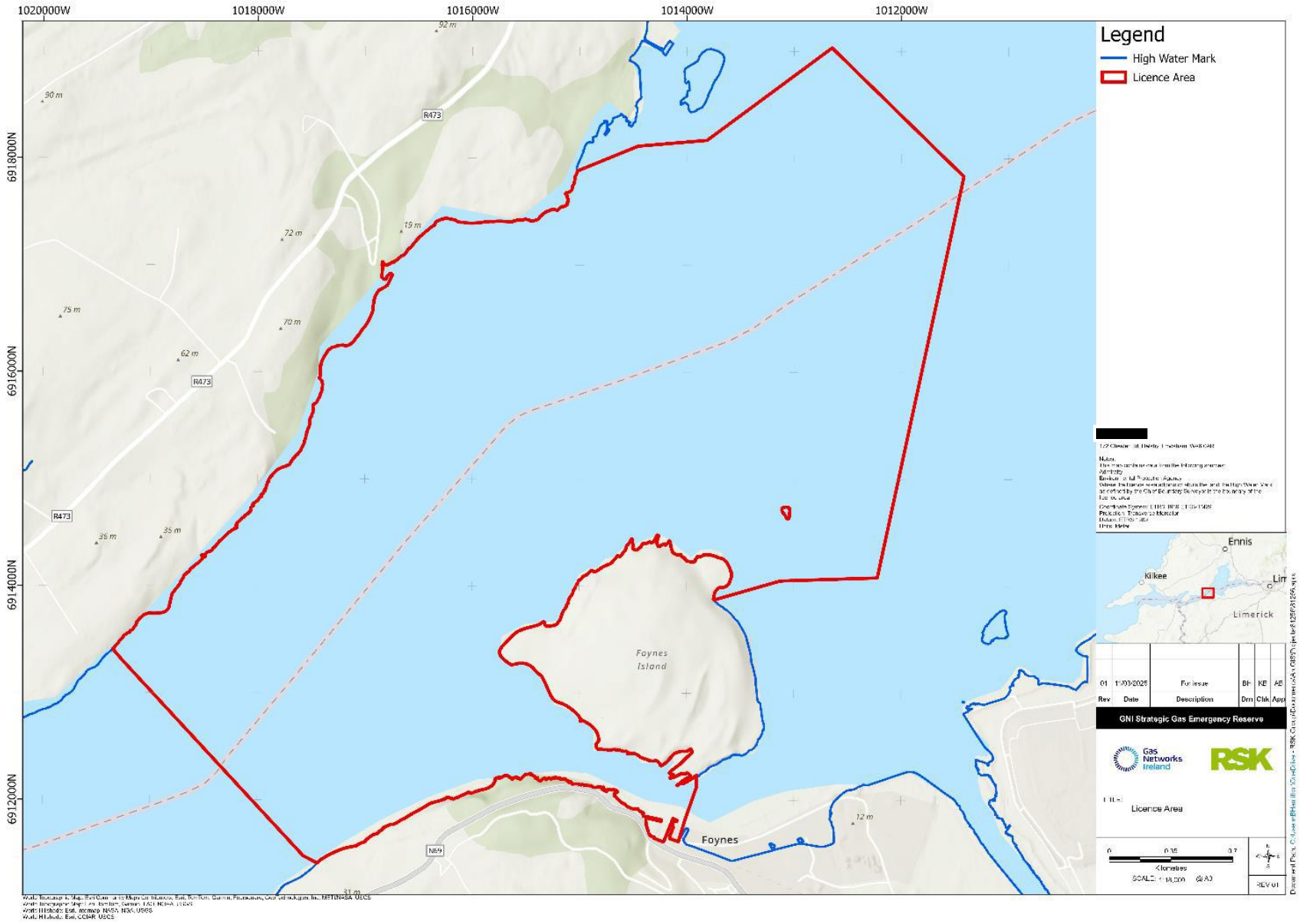

Figure 2.1
Proposed MUL Area

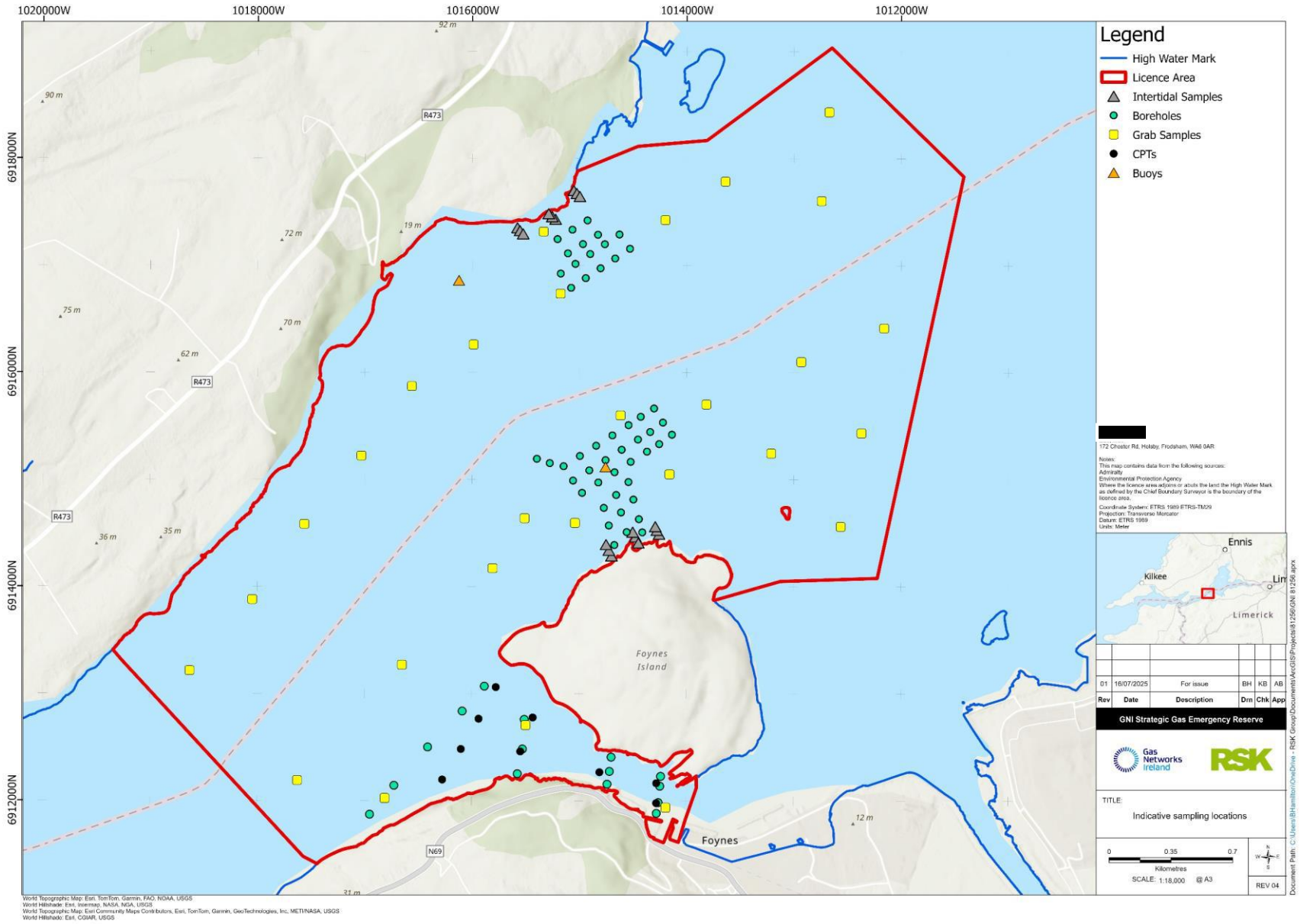

Figure 2.2
Indicative sampling locations

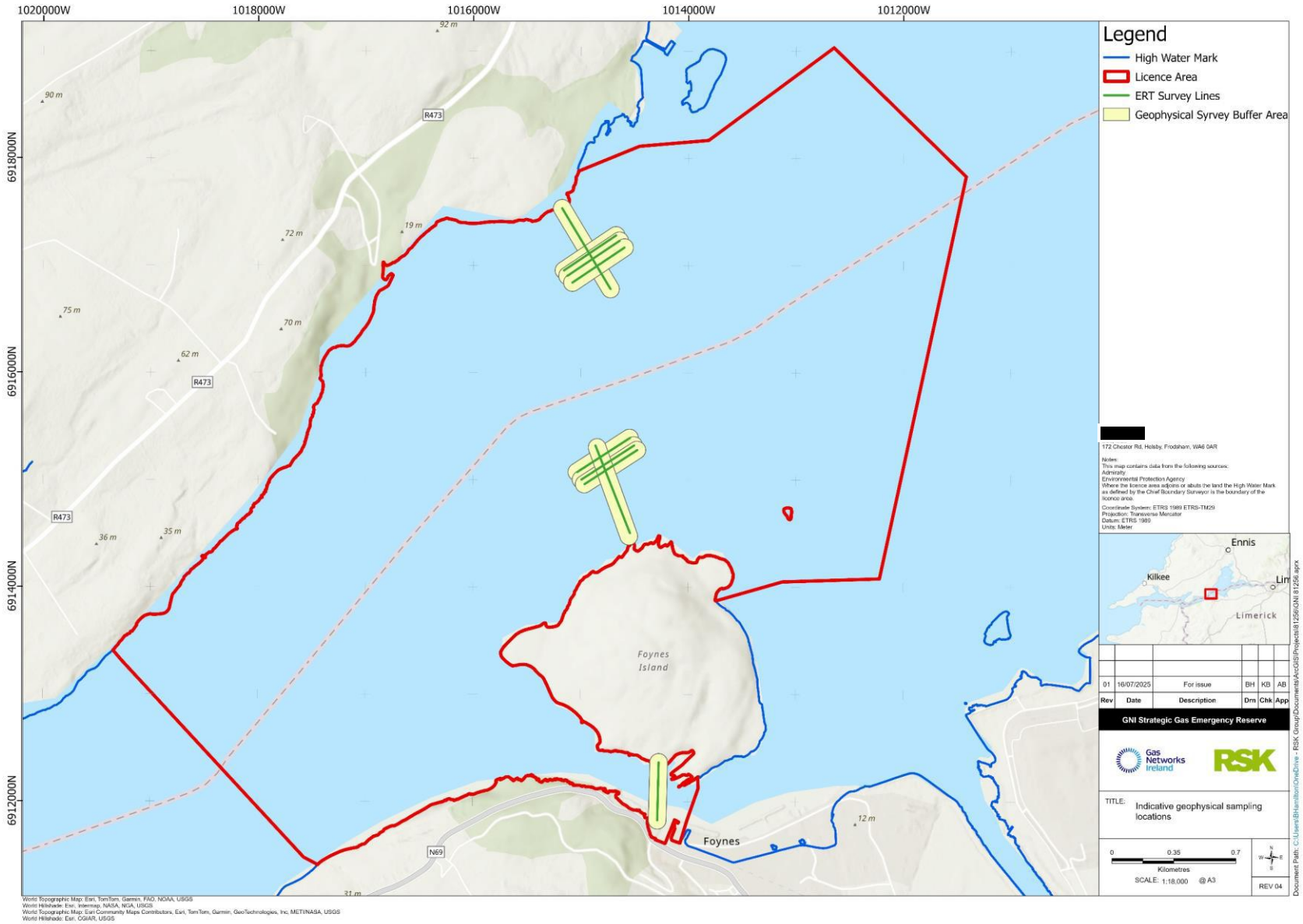

Figure 2.3

Indicative Geophysical Survey and Electrical Resistivity Tomography (ERT) electrode deployment locations

2.2 Description of the Works

2.2.1 Overview

The objective of the proposed surveys is to provide high-quality data that can contribute to a reliable baseline for site selection and subsequent project design and development as well as informing the EIA. As such, the following survey investigations are considered necessary and detailed further in **Table 2.1**:

- Drop-down camera survey
- Geophysical survey, including:
  - Magnetometer
  - Sub-bottom profiler (SBP)
  - Side-scan sonar (SSS)
  - Multibeam Echo Sounder (MBES)
  - Marine Refraction Seismic
  - Marine Electrical Resistivity Tomography (ERT)
- Boreholes
- Cone penetration tests (CPTs)
- Grab samples
- Surface water samples
- Intertidal walkover survey
- Intertidal core samples
- Archaeological surveys and other investigations (i.e. underwater inspections, walkovers, metal detectors, dive surveys).
- Deployment of metocean monitoring buoys to collect physical oceanographic data.

These works are collectively referred to as the Site Investigation (SI) works throughout this report.

Indicative sampling locations within the proposed MUL Area are designed to inform a potential jetty and vessel, with the addition of potential pipeline route options from the southwest side of Foynes Island to the mainland. It should be noted that all locations shown for sampling within the proposed MUL Area are indicative and may be subject to a degree of change on-site.

The following drawings have been prepared in support of the Maritime Usage Licence application to the MARA:

- Proposed Licence Area Map
- Proposed Grab Sample Locations Map
- Proposed Borehole Locations Map
- SI Indicative Table of Coordinates

The exact technical specification of the equipment to be used will not be known until the survey contract has been awarded. However, descriptions of typical equipment and survey parameters has been used within this report.

Predicted time and footprint for the activities are presented in Table 2.2. It is noted that the requirement for additional and more refined works may arise as the SI works progress and are analysed. This may include areas of particular interest using more targeted techniques and/or refined borehole locations

and quantities.

There will be no permanent structures and all site investigation works will be temporary in nature. The moving marine plant will remain on site for the duration of the works.

2.2.2 SI Schedule

The intention is to begin SI activities as soon as feasible following MUL award. Timing of the SI activities is dependent on many factors including weather, tidal flows, availability of vessels and the grant of the MUL. The granting of the MUL will have a direct effect on the timing of SI activities. The duration of the phase 1 SI works is approximately 16 weeks and are currently scheduled for Q3 2025. Phase 2 SI works (if required) will be carried out at a later date to coordinate with the detailed design stage which is dependent on consenting for the main project. The proposed licence duration is for 5 years to account for potential delays in the consenting process.

Table 2.1
Description of proposed works

Survey	Method	Method detail	Sampling Effort
Geophysical	Side Scan Sonar (SSS)	SSS surveys are used to determine sediment characteristics and seabed features. The EdgeTech 4205 may be taken as an indicative example of an SSS device and for these surveys will have a potential operating frequency range of approximately 300/600kHz in the offshore area and 600/900kHz in the shallower nearshore area with sound pressure levels of 220-230dB re1µPa @1m. The SSS will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SSS may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Magnetometer	A magnetometer is used to identify magnetic anomalies and hazard mapping for metal obstructions, shipwrecks and unexploded ordnance on the surface and in the shallow sub-surface. The Geometrics G-882 can be taken as an indicative equipment example. It is a passive device (i.e. it does not emit any sound waves into the marine environment) the sensor responds to local variability in magnetic field. The magnetometer will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	Magnetometer survey may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) – Parametric Sub Bottom Profiler	SBP is used to develop an image of the subsurface, identifying different strata encountered in the shallow sediments. The Innomar "standard" Sub-Bottom Profiler is an indicative example of a parametric system with a primary and secondary frequency range of 85-115kHz and 2-22kHz, respectively, and sound pressure levels of up to 232 dB (typically operated at <200dB) re1µPa @ 1m, which would be used in both nearshore and offshore areas. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Parametric Sub Bottom Profiler may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) - Boomer	The Applied Acoustics AA301 is an indicative example of a boomer, the instrument consists of a piezo electric plate transducer mounted on a surface tow catamaran frame. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m). The Boomer SBP operates in a frequency range of 0.5 kHz to 5 kHz, with sound pressure levels in the range of 205-211dB re1µPa @ 1m which would be used in the nearshore shallower area. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Boomer may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) -	The applied Acoustics Dual 400 Tip is an indicative example of a sparker system used in sub-bottom profiling. Reflected sound signals are	SBP Sparker may be undertaken across the proposed MUL Area to

Survey	Method	Method detail	Sampling Effort
	Sparker	recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m) or a multi-channel hydrophone such as the Geometrics GeoEel LH-16™ Digital Streamer. The sparker source has a frequency range of between 0.4-5kHz and a recorded sound pressure of 203dB re1µPa @1m. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Multibeam Echo Sounder (MBES)	A bathymetric survey will be conducted using multibeam echo sounders. These systems may be mounted on a dedicated survey vessel or towed behind a smaller vessel, depending on site conditions and water depths. Multibeam systems emit wide acoustic signals to generate high-resolution images, creating three-dimensional maps of the seabed. Line spacing will be between 5 and 20m, depending on depth. The operating frequencies emitted from MBES will be 300-700 kHz, with a peak operating frequency of approximately 400kHz. Exposure time is approx. 0.05 ms per 1 ms for multibeam operating with 200-400 kHz, or 0.05 per 0.3 ms for higher frequencies (>400 kHz). Sound pressure levels will be approximately 215-220dB re 1µPa @ 1m.	MBES may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Marine Refraction Seismic	Marine refraction surveys use controlled seismic sources, such as air guns or weight drops, to generate seismic waves that travel through sediment and rock layers. Arrays of hydrophones or geophones deployed on the seabed record the refracted seismic waves as they bend and travel along subsurface interfaces. By analysing the travel times and velocities of these refracted waves, detailed models of sediment thickness, bedrock depth, and structural features can be developed. Airgun impulse energy is mostly concentrated within low frequencies, with peak frequencies between 5 and 90kHz. Source levels are predicted to be within the range of 186-220dB re 1µPa @1m.	Marine Refraction Seismic may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
	Marine Electrical Resistivity Tomography (ERT)	ERT surveys are conducted to investigate the electrical properties of subsurface sediments and rocks. The technique involves deploying a series of electrodes along the seabed, either towed or fixed. As a non-invasive, non-seismic geophysical method, marine ERT produces no significant underwater noise and has minimal environmental impact.	Maximum **20 ERT lines** of 315m length line with diameter of 20mm. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
Marine Environmental / Ecological	Benthic ecology samples (including subtidal and intertidal	Identify benthic communities and habitats at the site. Subtidal sample locations may be subject to drop down video in advance of sampling, intertidal sample locations may be subject to walkover/drone survey in advance of sampling.	There will be up to **30 no.** dedicated subtidal benthic ecology grab sampling locations within the proposed MUL Area and multiple samples (max 4) may be taken at each location.

Survey	Method	Method detail	Sampling Effort
	habitats surveys)		Samples would be of volume 0.1 m^2. There will be up to **30 no**. dedicated intertidal coring /grab locations if shoreline conditions allow for sediment sampling.
Archaeological	Walkover	Intertidal walkover to be undertaken at low tide to assess for the presence of sensitive archaeological features. Survey methodology may also involve the use of a metal detector along the foreshore. Pending the results of geophysical surveys there may be a requirement for further archaeological surveys (i.e. underwater video, dive surveys, etc.)	To be confirmed pending the results of the geophysical surveys.
Geotechnical	Drop-down video	Drop-down video survey to inspect the seabed and identify any reef structures in the vicinity without disturbance to the seabed.	There will be up to **30 transects** of up to 30 m each using a drop down camera and video surveillance.
	Boreholes	Boreholes may be up to 50 m below bed level but some may be terminated if sufficient bedrock is encountered. The boreholes will be carried out using sonic methods through the seabed sediment, with rotary coring used to advance through the bedrock. The typical frequencies emitted from rotary drilling are between 0.001-0.120kHz and a recorded sound pressure of approximately 145dB re1µPa @1m. Marine rotary drilling involves rotating a drill bit attached to a drill string and applying downward pressure to cut through the rock formations. Geotechnical sampling tools, including push and piston samples, can then be deployed into the ground to recover intact material. All drilling equipment used will follow the ISO and API technical specifications for drilling equipment. All boreholes will be drilled from a jack-up barge to maintain stability when drilling. Each location would require the 4 legs to penetrate the seabed and cause a temporary disturbance on each occasion. Each leg is typically less than 1m^2 in footprint.	A maximum of **80 no**. boreholes of a diameter of 300 mm will be required within the proposed MUL Area.
	Cone penetration tests (CPTs)	CPTs are to progress to a maximum depth of 20m but will be terminated when bedrock is encountered. In the CPT, an instrumented electronic probe (cone penetrometer) is situated at the front end of a string of steel rods that are hydraulically pushed into the ground at a constant rate of 20mm/s to measure soil response, geo-stratigraphy, and engineering parameters. A CPT vehicle or hydraulic ram set are often used to provide	**80 no. CPTs** will be conducted of a diameter of 44mm. 60 of the CPTs will be at borehole locations to clear for unexploded ordnance (UXOs) and 20 as standalone investigation sites.

Survey	Method	Method detail	Sampling Effort
		the reaction and pushing force. The equipment used will conform to relevant international standards, such as ISO, ensuring consistent and reliable geotechnical data.	
	Grab samples	Grab samples using 0.1 m^2 grabs will be collected for grading, loss on ignition and assessment of benthic community.	A maximum of **50 no**. grab samples of volume 0.1 m^2 will be collected within the proposed MUL Area.
	Metocean monitoring buoys	Metocean monitoring buoys are floating sensors with an anchorage system secured on the seabed. The buoys record various metocean conditions through the following monitoring equipment: • Conductivity, Temperature, Depth Sensors • Optical Salinity Sensor • Acoustic Doppler Current Profiler (ADCPs operating in the range of 600 Khz or 1 Mhz will be used. The instrument emits low amplitude "pings" of sound at a sampling rate of 1-minute average every 10 minutes. These pings will be emitted in a narrow sound beam (typically a few degrees in width) with a typical echo intensity profile of 80 dB (+/- 1.5 dB)) • Optical or Electrochemical Dissolved Oxygen Sensor • pH Sensor/Probe • Turbidity sensor • Turbidity meter/sediment trap. Metocean monitoring buoys will be anchored with two anchors per buoy. Anchors will have a maximum footprint of 4m^2 each.	**2 buoys** will be placed within the study area initially, with the possibility for **up to a further 4**.

Table 2.2
Predicted time and footprint of each survey activity

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
Geophysical survey	Up to 4 months	SSS, Magnetometer, SBP 20 m spacing of main lines and 100 m spacing of cross lines with 25% overlap onto neighbouring lines MBES: 5 -20 m line spacing	-	Area up to 2.155
Marine refraction seismic	Up to 4 months	20 m line spacing	-	Area up to 2.155
ERT	Up to 4 months	20 maximum ERT lines	6.3	0.0000063
Marine Environmental / Ecological	Up to 4 months	120 subtidal (30 no. grab locations with max 4 samples taken at each location) 120 intertidal (30 no. grab locations with max 4 samples taken at each location)	0.1	0.000024
Geotechnical: Drop down video	Up to 4 months	30 transects	30	0.0009
Geotechnical: Boreholes	Up to 4 months	80	0.071	0.00000568
CPTs	Up to 4 months	80	0.00152	0.0000001216

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
Jack-up barge leg	Up to 4 months	640*	1	0.00064
Geotechnical: Grab samples	Up to 4 months	50	0.1	0.000005
Metocean monitoring buoy anchors	Maximum of 24 months (2 years)	12 anchors	4	0.000048

** 80 Borehole locations and 80 CPT locations x 4 legs*

2.3 General Survey Requirements

All appointed survey contractors shall obtain and comply with all necessary marine operational permits including routine and customary vessel/crew/equipment clearances from Customs Agencies, Port Authorities, Marine Survey Office, etc. This will include adherence to all major international shipping conventions adopted by the International Maritime Organization (and the International Labour Organization) concerning maritime safety and pollution prevention.

2.3.1 Quality Assurance

Each of the appointed survey contractors shall comply with the following as a minimum:

- Quality and Environmental Management Systems based on ISO9001:2015 and ISO14001
- Provision of site and activity specific Method Statements for all the marine operations within their scope
- Provision of Quality Management Plans for all the marine operations.

2.3.2 Health & Safety

Health, safety, environment, and welfare considerations will be a priority in the evaluation of possible contractors for the various survey scopes and will be actively managed during the survey work.

Appointed contractors will be required to comply with all legislation relevant to the activities within their scope of work, such as the Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005) and Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007), as amended.

Project / survey specific Health, Safety and Environment (HSE) plans will be put in place which will form part of the project / survey execution plans.

2.3.3 Working Hours

The working hours for the SI works are proposed to be up to 24 hours per day, seven days a week. It is anticipated that the main SI works will be carried out over a period of approximately four months including mobilisation and demobilisation. While metocean monitoring buoy deployment will be for period of up to two years, the devices will be autonomous apart from maintenance visits every two to four months. Such maintenance visits will occur during daylight hours only.

Weather conditions and/or sea-state will impact on the working hours, and it may be necessary to temporarily suspend operations when adverse weather conditions and/or sea-state are encountered or forecast. As such, survey plans will remain flexible to take advantage of optimal weather windows. Similarly, equipment or vessel maintenance and repair may impact on the SI works resulting in changes to the survey schedule.

2.3.4 Environmental Procedures

Environmental procedures to be followed by the appointed survey contractors are detailed within Section 6.

2.3.5 Vessels

All vessels will be fit for purpose, certified and capable of safely undertaking all required survey work. Marine vessels will be governed by the provisions of the Sea Pollution Act 1991, as amended. In addition, all vessels will adhere to published guidelines and best working practices such as: the National Maritime Oil/HNS Spill Contingency Plan (NMOSCP), Marine Pollution Contingency Plan (MPCP), Chemicals Act 2008 (No. 13 of 2008), Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated regulations.

Vessels shall have a Health, Safety and Environmental Managements system which should conform to the requirements of the latest International Maritime Organisation (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or continental / EEZ waters to be operated in.

The SI works will be undertaken from vessels in accordance with the relevant guidelines[1] required to manage the risk to marine mammals from man-made sound sources in Irish waters (DAHG, 2014).

[1] Relevant guidance may include the incorporation of the methods outlined in the following text, additional activity-specific mitigation is outlined in Section 6 and within the guidance document (DAHG, 2014). A3: Avoid critical habitats for marine mammals, A4: Avoid operations during key periods of species life cycles, A5: Avoid time periods when effective impact mitigation is not possible, A6: Risk minimisation measures, including minimisation of duration over which sound producing activity takes place, and minimise sound pressure and exposure levels delivered into the environment (i.e., lower impact methods), clear ramp-up procedure, bubble curtain implementation (where relevant), use of dedicated Marine Mammal Observer (MMO) (where relevant).

3 Methodology

3.1 Appropriate Assessment Guidance

This report has been completed in consideration of the EU and national guidance documents that pertain in relation to Member States' fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in relation to this report has had regard to the following guidance:

- EC (2000). Communication from the Commission on the Precautionary Principle. Office for Official Publications of the European Communities, Luxembourg
- EC (2002). 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, Office for Official Publications of the European Communities, Luxembourg. European Commission
- EC, (2007). Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC. European Commission
- DoEHLG (2009, rev. 2010). Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government;
- EC (2013). Interpretation Manual of European Union Habitats. Version EUR 28. European Commission, Luxembourg
- EC (2018). European Commission Notice C (2018) 7621 'Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC', Office for Official Publications of the European Communities, Luxembourg
- OPR (2021). Practice Note PN01: Appropriate Assessment Screening for Development Management. Office of the Planning Regulator, Dublin Ireland
- EC (2021). European Commission Notice C (2021) 6913 'Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC', Office for Official Publications of the European Communities, Luxembourg.

3.2 Stages of Appropriate Assessment

The AA is a four-stage process with tests at each stage. The four stages are shown in Figure 3.1 below. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

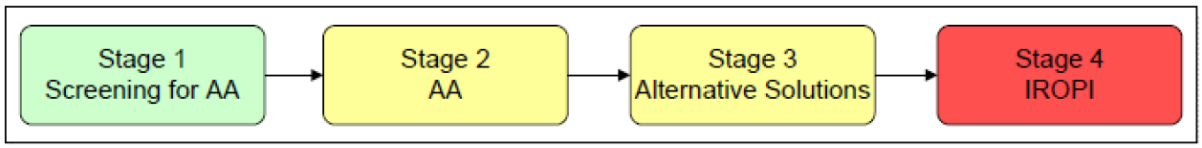

Figure 3.1
Four Stages of Appropriate Assessment

Stages 1-2 deal with the main requirements for assessment under Article 6(3) of the Habitats Directive. Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

The screening for AA carried out by the public authority/ competent authority (Stage 1), will determine whether an AA (Stage 2) of the proposed project is required. Stage 2 is required if it cannot be excluded, on the basis of the objective information provided at Stage 1, that the proposed project, individually or in combination with other projects or plans, will have a significant effect on a European site, in view of the site's conservation objectives. In this case, a Natura Impact Statement (NIS) must be prepared to assist the public authority/competent authority to conduct the Stage 2 AA. If it is not possible during Stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, Stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. If alternative solutions exist that do not have negative impacts on European sites; they should be adopted regardless of economic considerations. The process must then return to Stage 2, as any alternative proposal must be subject to a Stage 2 AA before it can be subject to the Article 6(4) test. If it can be demonstrated that all reasonable alternatives have been considered and assessed, the AA progresses to Stage 4. This final stage is undertaken when it has been determined that negative impacts on the integrity of a European site will result from a plan or project and there are no alternative solutions. At Stage 4 of the AA process, it is the characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of Imperative Reasons for Overriding Public Interest (IROPI).

While there is no prescribed form or content for reporting (DoEHLG, 2009) the methodology and format adopted in this report has been in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2021) and the European Commission Guidance 'Managing Natura 2000 sites' (EC, 2018), guidance prepared by the NPWS (DoEHLG, 2009) and by the Office of the Planning Regulator (OPR, 2021).

As per DoEHLG (2009):

"The first test is to establish whether, in relation to a particular plan or project, appropriate assessment is required."

In summary, the test for the screening for AA is to assess, in view of objective scientific information, if the proposed development, individually or in combination with other plans/projects is likely to have a significant effect on a European site. The precautionary-principle approach is required, meaning decisions must avoid deterioration and disturbances that could significantly impact the site's integrity, even where there is uncertainty regarding a likely effect. Under the Habitats Directive, a plan or project cannot be authorised if there remains reasonable scientific doubt that it will adversely affect the integrity of a European site. If there are any significant, potentially significant, or uncertain effects, it will be necessary to proceed to AA and submit an NIS.

3.3 Stage 1 Screening / Test of Significance

This process identifies whether the proposed development is directly connected to or necessary for the management of a European site(s) and identifies whether the development is likely to have significant impacts upon a European site(s) either alone or in combination with other projects or plans.

The screening for AA will incorporate the following steps:

1. determining whether a project or plan is directly connected with or necessary to the conservation management of any European sites
2. describing the project or plan
3. identifying the European sites potentially affected by the project or plan
4. identifying and describing any potential effects of the project or plan on European sites, alone, in combination and cumulatively with other plans/projects
5. determining the likelihood of significant effects on European sites.

The output from this stage is a determination for each European site(s) of the likelihood of not significant, significant, potentially significant, or uncertain effects. The latter three determinations will cause that site to be brought forward to Stage 2.

3.4 Desk Study

Information on the receiving environment was analysed to determine the potential for significant effects to qualifying interests (QI) of the European sites with established connectivity to the work. The following publications and data sources were reviewed:

- Environmental Protection Agency (EPA) online interactive mapping tools (https://gis.epa.ie/EPAMaps) and (https://www.catchments.ie/maps/) for water quality data including surface and ground water quality status, and river catchment boundaries
- Information on ranges of mobile QI populations in Volume 1 of NPWS' Status of EU Protected Habitats and Species in Ireland (NPWS, 2019), and associated digital shapefiles obtained from the NPWS Research Branch
- Inland Fisheries Ireland mapping (http://wfdfish.ie/)
- BirdWatch Ireland (https://birdwatchireland.ie/)
- Mapping of European site boundaries and Conservation Objectives for relevant sites, available online from the NPWS included site synopsis, Natura 2000 Data form and Conservation Objective Supporting Documents where available (https://www.npws.ie/protected-sites)
- Distribution records for QI of European sites held online by the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie)
- Geohive online Environmental Sensitivity Mapping tool (https://airomaps.geohive.ie/ESM/)
- Geological Survey Ireland (GSI) (https://www.gsi.ie/en-ie/Pages/default.aspx)
- Local surveys of flora, fauna, and habitat available using the Heritage Councils mapping website (https://heritagemaps.ie/WebApps/HeritageMaps/index.html)
- Ordnance Survey of Ireland maps and aerial photography (https://osi.ie).

The identification of relevant European sites to be included in this report was based on the criteria provided in OPR (2021), namely:

- any European site within or immediately adjacent to the project area
- identification of European sites where a Source-Pathway-Receptor (S-P-R) link exists, explained in Section 3.5.

3.5 Identification of Relevant European Sites

3.5.1 Source-Pathway-Receptor Model

The identification of relevant European sites to be included in this report was based on the identification of the 'zone of influence' of the proposed SI works using a Source-Pathway-Receptor (S-P-R) model where:

- a 'source' is defined as the individual element of the proposed works that has the potential to impact on a European site, its qualifying features, and its COs
- a 'pathway' is defined as the means or route by which a source can affect the ecological receptor
- a 'receptor' is defined as QI of SACs or SPAs for which COs have been set for the European site(s) being assessed.

An S-P-R model is a standard tool used in environmental assessment. For an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur. The S-P-R model was used to identify a list of European sites, and their QIs, to which the proposed works are potentially linked. These are termed as 'relevant' sites/QIs throughout this report.

3.5.2 Zone of Influence

Determination of the project's zone of influence was achieved by assessing the project's requirements and deliverables against the ecological receptors within the project footprint, in addition to the ecological receptors that could be connected to and subsequently impacted by the project through abiotic and biotic vectors.

The proximity of the works to European sites, and more importantly, QIs of the European sites, is of importance when identifying potentially likely significant effects. In accordance with the OPR AA Screening Guidelines (2021), the S-P-R model has been used to identify the zone of influence to ensure that relevant European sites are identified. The S-P-R model minimises the risk of overlooking distant or obscure effect pathways, while also avoiding an over reliance on buffer zones (e.g., 15 km), within which all European sites should be considered. This approach follows the DoEHLG 2009 guidance on AA which states that:

"For projects, the distance could be much less than 15 km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects" (DoEHLG, 2009; p.32, para 1).

The zone of influence of the works on mobile species (e.g., birds, mammals, and fish), and static species and habitats (e.g., saltmarshes, woodlands, and flora) is considered differently. Mobile species have 'range' outside of the European sites in which they are QI. The range of mobile QI species varies considerably, from several metres (e.g., in the case of whorl snails Vertigo spp.), to hundreds of kilometres (in the case of migratory wetland birds). A project's zone of influence may extend well beyond the project boundary and can impact or have an effect on static species and habitats remote from the proposed works; for example, where an aquatic QI habitat or plant is located many kilometres downstream from a pollution source. In particular, hydrological linkages between the proposed works and European sites (and their QIs) can occur over significant distances; however, any effect will be site-specific depending on the receiving water environment and nature of the potential impact.

To this end, the zone of influence for this project extends outside of the immediate proposed MUL Area to include ecological receptors connected to the SI works through proximity and connectivity through features such as watercourses and waterbodies in addition to potential connectivity through land and air. See Section 4.4 for the identification of relevant European sites.

4 Stage Two Appraisal to Inform an Appropriate Assessment of Implications on European Sites

4.1 Conclusions of the SISAA Report

The Supporting Information for Screening for Appropriate Assessment (SISAA report) was completed in compliance with EU and Irish law and the relevant European Commission and national guidelines to determine whether or not Likely Significant Effects on any European site could be excluded as a result of the proposed SI works.

The proposed SI works, as stated in the SISAA, are not directly connected with or necessary to the management of any European site.

The possibility of significant effects was considered using a source-pathway-receptor model, where 'Source' was defined as the individual elements of the proposed works that have the potential to affect the identified ecological receptors both within the European site and outside of it based on site connectivity. 'Pathway' was defined as the means or route by which a source can affect the ecological receptor. 'Ecological receptor' was defined as the Special Conservation Interests (for SPAs) or Qualifying Interests for which conservation objectives have been set for the European sites under consideration. Each element can exist independently however an effect is created when there is a linkage between the source, pathway and receptor

The SISAA report concluded that it could not be ruled out that the proposed SI works had the potential to give rise to likely significant effects on conservation objectives of European sites. These sites and receptors are being carried forward to Stage 2 assessment. Possible direct and indirect effects resulting from the proposed SI works, either alone or in combination with other projects, were identified as:

- Habitat loss, alteration, and disturbance of Annex I habitats of the Lower River Shannon SAC
- Underwater noise on Annex II QI species of the Lower River Shannon SAC, Slyne Head Peninsula SAC, West Connacht Coast SAC and Slyne Head Islands SAC.

The location of the relevant European sites in relation to the SI works proposed MUL Area is shown in Figure 4.1. Table 4.1 identifies the SI works associated with each impact, and the receptors with the potential to be affected. The conservation objective of the Lower River Shannon SAC is to maintain the favourable conservation condition of the 14 no. Annex I habitat types in the SAC, as defined by a range of attributes and targets; and of 7 no. Annex II species in the SAC, as defined by a range of attributes and targets. The conservation objective of the Slyne Head Peninsula SAC, West Connacht Coast SAC and Slyne Head Islands SAC relevant to these works are to maintain the favourable conservation condition of the bottlenose dolphin for which the sites are designated. Table 4.2 lists the relevant sites' qualifying interests and their attributes and targets.

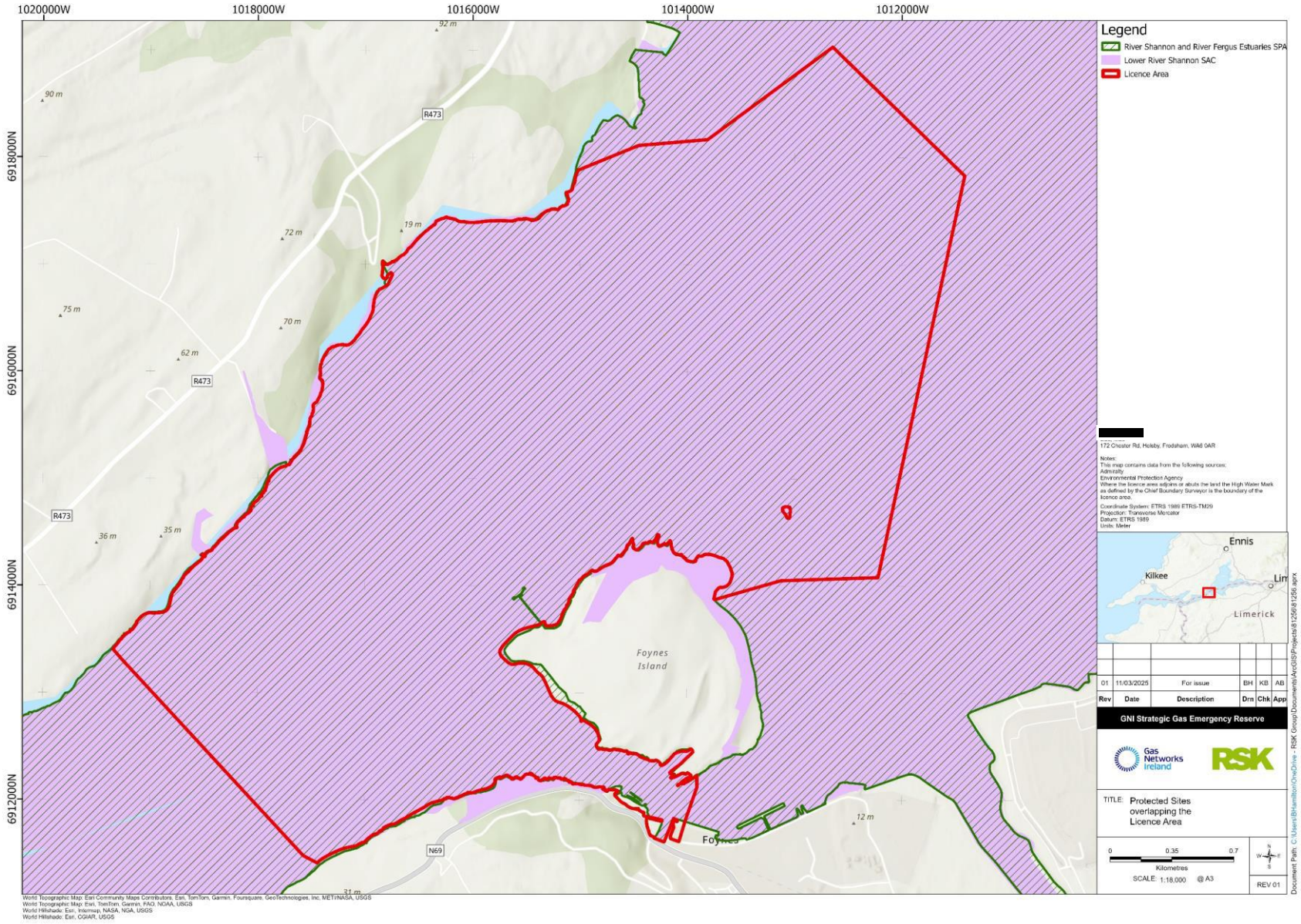

Figure 4.1

Protected areas in proximity to the Licence Area

Table 4.1
Source-Pathway-Receptor assessment for the works

Impact	Potential source of Impact	Description of Effect Pathway	Relevant Receptors
Noise, vibration, lighting, and human presence-related species disturbance	Jack-up barge and vessel activity associated with the SI works.	Potential for direct impacts by disturbing species, leading to displacement from the area.	Otter, marine mammals, birds
Habitat loss, alteration, and fragmentation.	Interactions with the seabed resulting from geotechnical surveys, deployment of seabed equipment, and marine environmental sediment sampling	Potential for direct effects on sensitive habitats and indirect effects to species which rely on those habitats for feeding and/or breeding.	Marine habitats, marine mammals, otter, fish, birds
Increased Suspended Sediment Concentrations (SSC).	Interactions with the seabed resulting from geotechnical surveys, deployment of seabed equipment, and marine environmental sediment sampling	Potential for direct effects on sensitive habitats and indirect effects to species which rely on those habitats for feeding and/or breeding.	Marine habitats, marine mammals, otter, fish, birds
Underwater noise, including injury and or displacement of Annex II marine mammals, otter, and fish from underwater noise and/or the presence of increased marine traffic (visual).	Noise emissions and increased marine traffic from survey equipment and vessels associated with the SI works. May cause injury and/or displacement of Annex II marine mammals, otter, and fish.	Potential for direct effects on species in the marine environment including injury, disturbance and/or displacement.	Marine mammals, otter, fish, birds
Entanglement, including injury and/or disturbance of Annex II marine mammals, otter, and fish from the presence of towed gear and seabed gear.	Risk of entanglement from the towed and seabed equipment associated with the geophysical and geotechnical survey works. May cause injury and/or displacement of Annex II marine mammals, otter, and	Potential for direct effects on species in the marine environment including injury, disturbance and/or displacement.	Marine mammals, otter, fish birds

Impact	Potential source of Impact	Description of Effect Pathway	Relevant Receptors
	fish.		
Accidental pollution event.	Jack-up barge and vessel activity associated with the SI works.	Potential for direct effects on marine habitats and species, and indirect effects through contamination of supporting habitats.	Marine habitats, marine mammals, otter, fish, birds
Collision with survey vessels	Vessel activity associated with the SI works.	Potential for direct effects to large species in the marine environment.	Marine mammals, otter

Table 4.2
Qualifying Interests and Conservation Objectives of the European Sites considered

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
Lower River Shannon SAC		
Sandbanks which are slightly covered by sea water all the time [1110]	Habitat distribution	The distribution of sandbanks is stable, subject to natural processes
	Habitat area	The permanent habitat area is stable or increasing, subject to natural processes
	Community distribution	Conserve the following community type in a natural condition: Subtidal sand to mixed sediment with *Nephtys spp*. community complex
Estuaries [1130]	Habitat area	The permanent habitat area is stable or increasing, subject to natural processes
	Community Distribution	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys spp*. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community
Mudflats and sandflats not covered by seawater at low tide [1140]	Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes
	Community Distribution	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates spp*. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex
Coastal lagoons* [1150]	Habitat Area	Area stable or increasing, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha
	Habitat Distribution	No decline, subject to natural processes

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Salinity Regime	Median annual salinity and temporal variation within natural ranges
	Hydrological regime	Annual water level fluctuations and minima within natural ranges
	Barrier: connectivity between lagoon and sea	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management
	Water quality: chlorophyll a	Annual median chlorophyll a within natural ranges and less than 5µg/L
	Water quality: Molybdate Reactive Phosphorus (MRP)	Annual median MRP within natural ranges and less than 0.1mg/L
	Water quality: Dissolved Inorganic Nitrogen (DIN)	Annual median DIN within natural ranges and less than 0.15mg/L
	Depth of macrophyte colonisation	Macrophyte colonisation to maximum depth of lagoons
	Typical plant species	Maintain number and extent of listed lagoonal specialists, subject to natural variation
	Typical animal species	Maintain listed lagoon specialists, subject to natural variation
	Negative indicator species	Negative indicator species absent or under control
Large shallow inlets and bays [1160]	Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes
	Community Distribution	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates spp*. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys spp*. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and Laminaria-dominated community complex
Reefs [1170]	Habitat Distribution	The distribution of Reefs is stable, subject to natural processes

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Habitat Area	The permanent habitat area is stable, subject to natural processes.
	Community Distribution	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and Laminaria- dominated community complex.
Perennial vegetation of stony banks [1220]	Habitat Area	Area stable or increasing, subject to natural processes, including erosion and succession
	Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes
	Physical structure: functionality and sediment supply	Maintain the natural circulation of sediment and organic matter, without any physical obstructions
	Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
	Vegetation composition: typical species and sub-communities	Maintain the typical vegetated shingle flora including the range of sub-communities within the different zones
	Vegetation composition: negative indicator species	Negative indicator species (including non-natives) to represent less than 5% cover
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Habitat length	Area stable or increasing, subject to natural processes, including erosion. For sub- sites mapped: Kilbaha- 4.1km; Ladder Rock- 1.0km; Moyarta- 0.9km; Lisheencrony- 1.1km; Burrane- 0.2km; Kerry Head- 33.4km; Ballybunion- 15.6km; Kilclogher- 4.9km; Loop Head- 6.1km
	Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes
	Physical structure: functionality and hydrological regime	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures
	Vegetation structure: zonation	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Maintain structural variation within sward
	Vegetation composition: typical species and sub-communities	Maintain range of sub- communities with typical species listed in the Irish Sea cliff survey (Barron et al., 2011)

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Vegetation composition: negative indicator species	Negative indicator species (including non-natives) to represent less than 5% cover
	Vegetation composition: bracken and woody species	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath to be less than 10%. Cover of woody species on grassland and/or heath to be less than 20%
Salicornia and other annuals colonizing mud and sand [1310]	Habitat Area	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 0.005ha; Inishdea, Owenshere - 0.003ha; Knock - 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha
	Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes
	Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions
	Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
	Physical structure: flooding regime	Maintain natural tidal regime
	Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Maintain structural variation within sward
	Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated
	Vegetation composition: typical species and sub-communities	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)
	Vegetation structure: negative indicator species- *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	Habitat Area	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 6.774ha; Barrigone, Aughinish- 10.288ha; Beagh- 0.517ha; Bunratty- 26.939ha; Shepperton, Fergus Estuary- 37.925ha; Inishdea, Owenshere- 18.127ha; Killadysert,

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
		Inishcorker- 2.604ha; Knock- 0.576ha; Querin- 3.726ha; Rinevilla Bay- 11.883ha
	Habitat Distribution	No decline or change in habitat distribution, subject to natural processes.
	Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions
	Physical structure: creeks and pans	Maintain creek and pan structure, subject to natural processes, including erosion and succession
	Physical structure: flooding regime	Maintain natural tidal regime
	Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Maintain structural variation within sward
	Vegetation structure: vegetation cover	Maintain more than 90% of the saltmarsh area vegetated
	Vegetation composition: typical species and sub-communities	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)
	Vegetation structure: negative indicator species- *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Habitat Area	Area increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 4.193ha; Barrigone, Aughinish- 2.407ha; Bunratty- 0.865ha; Inishdea, Owenshere- 11.609ha; Killadysert, Inishcorker- 0.705ha; Knock- 0.143ha, Querin- 0.008ha; Rinevilla Bay- 2.449ha
	Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes
	Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions
	Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Physical structure: flooding regime	Maintain natural tidal regime
	Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Maintain structural variation within sward
	Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated
	Vegetation composition: typical species	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)
	Vegetation structure: negative indicator species - *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Habitat Area	Area stable or increasing, subject to natural processes
	Habitat Distribution	No decline, subject to natural processes
	Hydrological regime: river flow	Maintain appropriate hydrological regimes
	Hydrological regime: tidal influence	Maintain natural tidal regime
	Hydrological regime: freshwater seepages	Maintain appropriate freshwater seepage regimes
	Substratum composition: particle size range	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)
	Water quality: nutrients	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition
	Vegetation composition: typical species	Typical species of the relevant habitat sub-type should be present and in good condition
	Floodplain connectivity	The area of active floodplain at and upstream of the habitat should be maintained
	Riparian habitat	The area of riparian woodland at and upstream of the bryophyte-rich sub-

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
		type should be maintained
Molinia meadows on calcareous, peaty, or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	Habitat Area	Area stable or increasing, subject to natural processes
	Habitat Distribution	No decline, subject to natural processes
	Vegetation structure: broadleaf herb: grass ratio	Broadleaf herb component of vegetation between 40 and 90%
	Vegetation structure: sward height	30-70% of sward between 10 and 80cm high
	Vegetation composition: typical species	At least 7 positive indicator species present, including 1 "high quality" species
	Vegetation composition: notable species	No decline, subject to natural processes
	Vegetation composition: negative indicator species	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%. Non-native invasive species, absent or under control
	Vegetation composition: negative indicator moss species	Bog mosses (*Sphagnum spp*.) not more than 10% cover; hair mosses (*Polytrichum spp*.) not more than 25% cover
	Vegetation structure: woody species and bracken (*Pteridium aquilinum*)	Cover of woody species and bracken not more than 5% cover
	Physical structure: bare ground	Not more than 10% bare ground
*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	Habitat Area	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed
	Habitat Distribution	No decline
	Woodland size	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size
	Woodland structure: cover and height	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi- mature trees and shrubs; and well-developed herb layer
	Woodland structure:	Maintain diversity and extent of community types

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	community diversity and extent	
	Woodland structure: natural regeneration	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy
	Hydrological regime: flooding depth/height of water table	Appropriate hydrological regime necessary for maintenance of alluvial vegetation
	Woodland structure: dead wood	At least 30m³/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)
	Woodland structure: veteran trees	No decline
	Woodland structure: indicators of local distinctiveness	No decline
	Vegetation composition: native tree cover	No decline. Native tree cover not less than 95%
	Vegetation composition: typical species	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix spp*) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)
	Vegetation composition: negative indicator species	Negative indicator species, particularly non-native invasive species, absent or under control
Freshwater pearl mussel (*Margaritifera margaritifera)* [1029]	Distribution	Maintain at 7km.
	Population size	Restore to 10,000 adult mussels
	Population structure: recruitment	Restore to least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length
	Population structure: adult mortality	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution
	Habitat extent	Restore suitable habitat in more than 3.3km (see map 15) and any additional stretches necessary for salmonid spawning
	Water quality: macroinvertebrate and	Restore water quality- macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	phytobenthos (diatoms)	
	Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Restore substratum quality- filamentous algae: absent or trace (<5%)
	Substratum quality: sediment	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment
	Substratum quality: oxygen availability	Restore to no more than 20% decline from water column to 5cm depth in substrate
	Hydrological regime: flow variability	Restore appropriate hydrological regimes
	Host fish	Maintain sufficient juvenile salmonids to host glochidial larvae
Sea lamprey (*Petromyzon marinus*) [1095]	Distribution: extent of anadromy	Greater than 75% of main stem length of rivers accessible from estuary
	Population structure of juveniles	At least three age/size groups present
	Juvenile density in fine sediment	Juvenile density at least 1/m²
	Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	More than 50% of sample sites positive
Brook lamprey (*Lampetra planeri)* [1096]	Distribution	Access to all water courses down to first order streams
	Population structure of juveniles	At least three age/size groups of brook/river lamprey present
	Juvenile density in fine sediment	Mean catchment juvenile density of brook/river lamprey at least 2/m²
	Extent and distribution of spawning habitat	No decline in extent and distribution of spawning bed
	Availability of juvenile habitat	More than 50% of sample sites positive

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
River lamprey (*Lampetra fluviatilis)* [1099]	Distribution	Access to all water courses down to first order streams
	Population structure of juveniles	At least three age/size groups of river/brook lamprey present
	Juvenile density in fine sediment	Mean catchment juvenile density of river/brook lamprey at least 2/m^2
	Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	More than 50% of sample sites positive
Atlantic salmon (*Salmo salar*) [1106]	Distribution: extent of anadromy	100% of river channels down to second order accessible from estuary
	Adult spawning fish	Conservation Limit (CL) for each system consistently exceeded
	Salmon fry abundance	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling
	Out-migrating smolt abundance	No significant decline
	Number and distribution of redds	No decline in number and distribution of spawning redds due to anthropogenic causes
	Water quality	At least Q4 at all sites sampled by EPA
Common bottlenose dolphin (*Tursiops truncatus*) [1349]	Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use
	Habitat use: critical areas	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition.
	Disturbance	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site
Otter [1355]	Distribution	No significant decline
	Extent of terrestrial habitat	No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds
	Extent of marine habitat	No significant decline. Area mapped and calculated as 4,461.6ha

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Extent of freshwater (river) habitat	No significant decline. Length mapped and calculated as 500.1km
	Extent of freshwater (lake/lagoon) habitat	No significant decline. Area mapped and calculated as 125.6ha
	Couching sites and holts	No significant decline
	Fish biomass available	No significant decline
	Barriers to connectivity	No significant decline
Slyne Head Peninsula SAC		
Common bottlenose dolphin	Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use.
	Disturbance	Human activities should occur at levels that do not adversely affect the Bottlenose Dolphin population at the site.
West Connacht Coast SAC		
Common bottlenose dolphin	Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use.
	Disturbance	Human activities should occur at levels that do not adversely affect the Bottlenose Dolphin population at the site.
Slyne Head Islands SAC		
Common bottlenose dolphin	Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use.
	Disturbance	Human activities should occur at levels that do not adversely affect the Bottlenose Dolphin population at the site.

[2] Asterisk indicates a priority habitat under the Habitats Directive.

5 Likely Significant Effects Identified in Screening for Appropriate Assessment

Of the potential impact sources and pathways as identified in Table 4.1, the SISAA concluded that the potential for impact on European sites from the following could not be ruled out and required further assessment:

- Habitat loss or disturbance
- Underwater noise
- In-combination effects.

5.1 Habitat Loss or Disturbance

In the vicinity of the proposed MUL Area, the Lower River Shannon SAC boundary extends from the high water mark out into the marine area away from the land. Of the 14 Annex I habitat types selected for protection as part of the Lower River Shannon SAC (see Table 4.2), eleven are categorised as being 'Coastal and Halophytic' in their distributions, while the remaining three habitats are categorised as freshwater, grasslands, and forests. The distribution of all annexed habitats within the SAC are presented in the conservation objectives document (NPWS, 2012a). The marine based geotechnical works may impact on annexed habitats within the SAC. The distribution of the following habitats may occur within the area where the marine elements of the SI works will occur:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Reefs [1170].

As identified in Table 4.1, there is the potential for loss and/or disturbance to these marine habitats as a result of geotechnical sampling. In addition to direct habitat loss when taking samples, there will also be temporary habitat loss due to the four feet of the jack-up barge used to conduct sampling, the anchoring of the metocean monitoring buoys and placement of seabed equipment during some geophysical surveys.

The substrate in the proposed MUL Area is dominated by fine sandy habitat with water depths up to 50 m below chart datum. The Lower River Shannon SAC has Annex I Marine Habitats as qualifying interests that overlap the proposed MUL Area. These protected habitats include reefs, estuaries, and mudflats and sandflats not covered by seawater at low tide (Table 4.2).

The vast majority of the sampling will occur in area consisting of mud and mixed sediment. Very few samples may occur within Annex I Mudflats and sandflats not covered by seawater at low tide habitat. Sampling will avoid the known subtidal reef in the deepest waters in the centre of the estuary as well as intertidal reef to either side of the Cahiracon point and along the west side of Foynes Island. It is noted that the entire proposed MUL Area is mapped as being Annex I Estuaries habitat, therefore all sampling will occur within this habitat.

The feet of the jack-up rig from which the works will take place will cover an area of 1 m^2 each (for a combined total of 4 m^2), while the boreholes themselves will be drilled within a steel casing 300 mm in diameter. Table 5.1 shows the estimated maximum number of boreholes within each Annex I habitat based on NPWS habitat mapping of the SAC (Figure 5.1, NPWS, 2012b). It is noted that since the entire proposed MUL Area is mapped as Annex I estuaries habitat, there is a redundant count of the five samples that may occur within mudflats and sandflats, meaning that the total area affected for each habitat type can be considered an absolute maximum based on final siting of the sampling locations.

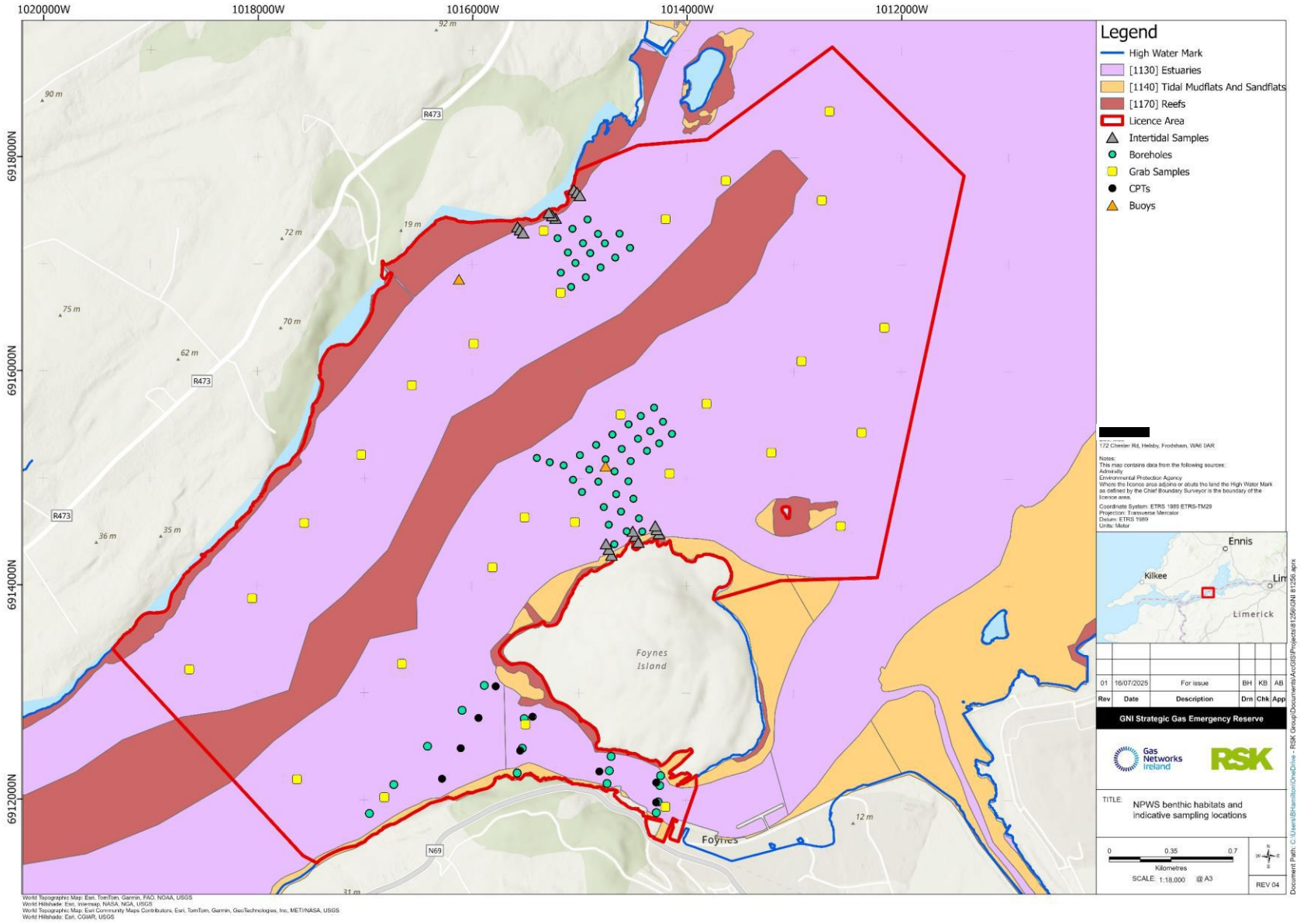

Figure 5.1
Benthic habitats of relevance to the SI works (NPWS, 2021b)

Table 5.1
Predicted areas of Annex I habitats within the Lower River Shannon

Annex I habitat	Maximum No boreholes proposed	Total area of proposed boreholes (m^2)	Total cumulative area of jack-up barge feet (m^2)	Total area affected (m^2)	Total Annex I Habitat within SAC (ha)	Percentage of total area affected (%) [Boreholes only]
Estuaries [1130]	75	5.35	640	645.35	24,273	0.0000027 [0.00000002]
Mudflats and sandflats [1140]	5	0.35	20	20.35	8,808	0.00000023 [0.000000004]
Reefs [1170]	0	0	0	0	21,421	0

As shown in Table 5.1, the total impact area of the boreholes will be extremely small and represent an extremely small proportion of the total area of the relevant Annex I habitats within the SAC. In addition, no permanent losses of relevant Annex I habitats are expected to arise as a result of the SI works. The vast majority of the area affected will be from the jack-up barge feet with a significantly smaller area being impacted by the 300 mm diameter boreholes.

The impacts associated with the jack-up barge feet will be temporary in nature and will not create any long term impact on the seabed beyond the period of deployment. These potential impacts are anticipated to be similar to those of a boat anchor within the relevant habitats and will not cause any non-temporary or large scale alterations to the habitat. As such, it is considered that the proposed use of the jack-up barge and associated feet will not give rise to any significant loss of habitat within the Lower River Shannon SAC.

Each borehole sample will involve the disturbance of seabed 300 mm in diameter. Direct disturbance will be temporary in nature as is it anticipated that the removed habitat will be quickly and naturally filled by surrounding sediment following completion of sampling. For all habitat types affected by borehole sampling, the area over which effects will occur are extremely small in the context of the areas of relevant Annex I habitat supported by the SAC, being an extremely small percentage (<0.0001%), as listed inTable 5.1.

The proposed use of anchors for the metocean monitoring buoys will be of a footprint area up to 4 m^2 per anchor, for a total of two anchors per buoy, equating to a total maximum footprint of 48 m^2. These anchors will be exclusively within Annex I estuaries habitat [1130]. This gives a total percentage area affected of 0.0000002% of estuary habitat within the SAC. Similarly to the jack-up barge feet, associated impacts will be temporary in nature and will not create any long term impact on the seabed beyond the period of deployment. These potential impacts are anticipated to be similar to those of a boat anchor within the relevant habitats and will not cause any non-temporary or large scale alterations to the

habitat. As such, it is considered that the proposed use of the anchors will not give rise to any significant loss of habitat within the Lower River Shannon SAC.

The placement of temporary survey equipment on the seabed during some geophysical surveys is likewise expected to be localised and temporary in nature, disturbing a very small proportion of the seabed surface.

Such small-scale and temporary effects are not considered representative of an adverse impact upon the integrity of the qualifying features of the European site. It is not predicted that such effects could give rise to any wider impacts to the favourable structure and functioning of the wider area of Annex I or wetlands qualifying habitats.

As such, it is considered that the temporary impacts associated with borehole creation, metocean monitoring buoy anchoring and deployment of seabed equipment associated with geophysical surveys within areas of Annex I habitat within the Lower River Shannon SAC would not give rise to a significant habitat loss effect upon the European site.

Proposed grab and intertidal core sampling will involve the removal of a maximum of 0.1 m^2 surface area of material from each sample location. It is considered that such small-scale sampling area will have no potential to give rise to significant effects upon any Annex I habitat within the SAC. Likewise, the cone penetration tests will be of a diameter of 44 mm, meaning that these samples will also be of such small scale to have no potential significant effects on any Annex I habitat within the SAC.

On the basis of the assessment presented here, it is considered that the SI works will not have potential to give rise to any adverse impacts upon the integrity of European sites through habitat loss. This conclusion is made without the consideration of applying any mitigation measures.

5.2 Underwater Noise

As listed in Table 4.1, noise-generation resulting from the SI works has the potential to affect some marine species that are QI species of a European site. The SISAA concluded that it could not be ruled out that there may be significant effects from the noise generated by the geophysical surveys on the common bottlenose dolphin as a QI of the following sites:

- Lower River Shannon SAC
- Slyne Head Peninsula SAC
- West Connacht Coast SAC
- Slyne Head Islands SAC.

Very few sightings of harbour porpoise (*Phocoena phocoena*) have been recorded within the Shannon Estuary (IWDG, 2025). There was one sighting adjacent to Moneypoint in 2018 (IWDG), and strandings have been recorded as far up the estuary as Foynes (O'Callaghan et al., 2021). Violent interactions have been recorded between bottlenose dolphins and harbour porpoise (Ross and Wilson., 1996; Gross et al., 2020) and suggested reasons for this aggression include interspecies territoriality, defence of group members, food competition, feeding interference and object-orientated play (Gross et al., 2020). Two sightings of harbour porpoise occurred within the past 12 months, located at the entrance of the Shannon Estuary off Aill Na Brun (IWDG, 2025) . From the lack of recorded sightings of harbour porpoise

within the Shannon Estuary, it is likely that they largely avoid the area. As a result, spatial overlap with harbour porpoise individuals from other SACs within foraging range is considered highly unlikely, and SACs with harbour porpoise as a QI are not considered relevant for ex situ effects within the Shannon.

Underwater noise is a temporary effect, with noise levels dropping near-instantly to pre-existing levels upon the cessation of noise sources. The natural soundscape of the Shannon Estuary is considered to be noisy – a mix of biological sound such as fish and marine mammals , current flow and turbulence, rain and wind/storm noise, and noise from human activities such as shipping and leisure activities.

When assessing the potential impact of underwater noise sources on the marine environment a range of variables such as source level, frequency, duration, and directivity influence received sound levels. Increasing the distance from the sound source usually results in attenuation with distance. The factors that affect the way noise propagates underwater include; water column depth, pressure, temperature gradients, salinity, as well as water surface and seabed type and thickness. When sound encounters the seabed the amount of noise/sound reflected back depends on the composition of the seabed, i.e., mud or other soft sediment will reflect less than rock. The water depth within the proposed MUL Area ranges up to 50 m below chart datum with a mixed substrate type, of muds, sands, coarse gravels, and exposed bedrock. All factors listed above reduce the propagation of the sound, decreasing the zone of influence of the geophysical survey.

Auditory injury in cetaceans can be defined as a permanent threshold shift (PTS) leading to non-reversible auditory injury, or as a temporary threshold shift (TTS) in hearing sensitivity, which can have negative effects on the ability to use natural sounds (e.g., to communicate, navigate, locate prey) for a period of minutes, hours, or days. With increasing distance from the sound source, where it is audible to the animal, the effect is expected to diminish through identifiable stages (i.e., PTS or TTS in hearing, avoidance, masking, reduced vocalisation) to a point where no significant response occurs. Factors such as local propagation and individual hearing ability can influence the actual effect (Department of Arts, Heritage and the Gaeltacht (DAHG), 2014). The underwater noise threshold levels for marine mammals as given in international guidance is shown in Table 5.2Table 5.2. The expected sound properties of the relevant survey activities are presented in Table 5.3.

Table 5.2
TTS- and PTS-onset thresholds for marine mammals exposed to non-impulsive noise

Marine mammal hearing group	TTS onset: SEL (weighted) dB re 1 µPa2s	PTS onset: SEL (weighted) dB re 1 µPa2s
Low frequency cetaceans (baleen whales)	179	199
High frequency cetaceans (most dolphin species)	178	198
Very high frequency cetaceans (harbour porpoise)	153	173
Phocid carnivores (seal species)	181	201
Other Carnivores (otters)	199	219

Table 5.3
Expected noise parameters for survey activities

Survey activity	Frequency range (kHz)	Peak frequency (kHz)	Source level (dB re 1 µPa)
ADCP	600 - 1000	Variable	80 (+/- 1.5)
Rotary drilling	0.001- 0.120	0.045	145
SSS	300/600kHz (offshore area) 600/900kHz (shallower nearshore area)	Variable	220-230
SBP	85-115 (primary) 2-22 (secondary)	Variable	232
MBES	300 - 700	400	215-220
Marine refraction seismic	0 - 10	0.005 and 0. 113	182-220

The ADCP devices on the metocean monitoring buoys do produce some lower frequency sounds that are within the hearing range of high-frequency marine mammal species, such as harbour porpoise. The

proposed ADCP device installation will be temporary in nature and will emit a narrow sound beam (typically a few degrees in width) with a typical echo intensity profile of 80 dB (+/- 1.5 dB). This falls below the TTS and PTS threshold for all species. Therefore, the potential impact on protected species is considered to be negligible. Therefore, the potential impact on protected species is considered to be very low. As such, the possibility for impacts on protected species from underwater noise associated with ADCPs can be excluded from further consideration.

The type of coring and/or drilling proposed as well as the size of the boreholes mean that sound levels from the activity is unlikely to exceed previously recorded level of similar setups with source levels of 130-147dB SPL1 (re 1 µPa) (Erbe & McPherson, 2017; MR, M, M, & I, 2010). Recent measurements of geotechnical drilling in shallow waters (Huang Long-Fei et al. 2023) recorded an SPL of 155.9 dB re 1µPa rms @ 1 m at a peak frequency of 45 Hz. These levels are below the source levels of even quiet vessels and at modest ranges of c. 100 m, below the commonly used 160dB SPL2 limit for behavioural effect for marine mammals. Considering that the weighted source level of the drilling/boring (147dB SPL) is below the TTS or PTS onset levels for all marine mammal species as listed in Table 5.2., it is extremely unlikely that the drilling/boring could cause hearing impact on marine mammals.

The geophysical survey will utilise active acoustic instruments. Active acoustic instruments, such as those proposed on this survey, operate by emitting extremely short pulses and are mostly directional or omni-directional (e.g., sparker) (Ruppell et al, 2022). The range of the geophysical equipment will have a range limited principally by water depth and attenuation particularly of high frequency sources. Coupled with the narrow beam angle and short duty cycles (‘on’ for microseconds or milliseconds per second) means that surveying sonars have relatively low acoustic range.

The SSS and MBES are higher frequency acoustic survey methods, with acoustic ranges above the hearing sensitive range for marine mammals, therefore not considered a risk for disturbance.

The SBP and marine refraction seismic survey methods fall within the sensitive hearing range of marine mammals and exceed the onset levels for TTS and PTS for marine mammals. Since the noise levels from these sources exceed TTS and PTS thresholds, there is the potential for underwater noise generated during the SBP and marine refraction seismic surveys to result in injury and/or disturbance to bottlenose dolphin in the vicinity of the SI works. The estimated zone of audibility for all species is largest for these low-frequency sources, which propagate over longer distances relative to the rapidly attenuating high frequencies. Thus marine mammals, if very close to the survey vessel during site investigations may lead to disturbance and, at worse, auditory injury. As such, impacts from this source are considered to have potential to give rise to auditory injury to common bottlenose dolphin.

Adverse effects upon QI common bottlenose dolphin associated with the Lower River Shannon SAC, Slyne head Peninsula SAC, West Connacht Coast SAC and Slyne Head Islands SAC as a result of underwater noise and vibrational effects cannot be excluded in the absence of mitigation measures in respect of the proposed SBP and marine refraction seismic surveys only.

5.3 In-combination Effects

As part any AA process, other relevant projects and plans in the region must also be considered for the

possibility of the proposed project having significant effects on European sites when combined with existing, ongoing, or foreseeable future plans or projects, even in the case that the SI works have no anticipated significant effects when assessed in isolation. The in-combination assessment is scoped regarding the site-specific pressures and threats identified for the protected sites identified in Table 4.2.

5.3.1 Plans

The plans that are considered in-combination with the SI works proposed within the Shannon Estuary include:

- Clare County Development Plan (2023-2029)
- Kerry County Development Plan (2022-2028)
- Limerick County Development Plan (2022-2028)
- National Biodiversity Action Plan (2023-2030).

There are no anticipated in-combination effects from plans and therefore in-combination effects are not considered for further assessment.

5.3.2 Projects

Other marine projects, when considered in-combination with the proposed survey activities, could potentially give rise to either direct or indirect impacts. A search of planning authority applications and foreshore/MUL applications which could interact with the proposed surveys (within 10 km) was conducted using the planning authority websites (i.e., My Plan.ie, EIA planning portal which include applications from Clare Co. Co. planning website, Kerry Co. Co. planning website, An Bord Pleanála (ABP) website, Department of Housing and Local Government and Heritage (DHPLG) website and the MARA website). Several projects were identified as having the potential for overlap with the proposed works (Table 5.4).

Table 5.4
Applications with potential to interact with the proposed MUL Area, their current application status, and the assessed potential for cumulative effects

Application	Project	Status	Potential for Cumulative Effects
LIC230008	EBS Moneypoint surveys	Determined	This proposal has been supported by documents relevant to appropriate assessment which identified that the proposed SI works would not have potential to give rise to likely significant effects upon the Lower River Shannon SAC, or any other relevant European sites. On this basis it is considered that the proposed SI works would have no potential to act in-combination with this project.
LIC230014	Shannon Foynes Port Company	Determined	This application was subject to appropriate assessment as part of the submission. This assessment concluded that subject to the implementation of mitigation measures at construction stage, principally to avoid the potential for pollution and associated water

Application	Project	Status	Potential for Cumulative Effects
			quality and habitat deterioration effects, there would be no adverse impacts upon any European sites as a result of the development. However, if the works were to happen concurrently with the proposed SI works, there is the possibility of cumulative visual disturbance, underwater noise, suspended sediment concentration, and water quality impacts. The SI activities associated with LIC230014 are expected to be completed prior to the proposed SI activities.
LIC230004	Aughinish Alumina Ltd	Determined	This application was subject to appropriate assessment as part of the submission. This assessment concluded that subject to the implementation of mitigation measures, there would be no adverse impacts upon any European sites as a result of the SI works. On this bases it is considered that the proposed SI works would have no potential to act in combination with this project.
MAC20230032	Net Zero Energy Project 4 Limited	Applied	The proposed project is set to deploy up to 300MW of floating solar photovoltaic (PV) units and ancillary infrastructure including mooring systems, inter-array cabling and export cables off the coast of Killadysert and nearby islands. At the time of this application, no project description details or impact assessments are available to determine the possibility of cumulative impact potential.
MUL240034	Gas Networks Ireland, Shannon Estuary	Applied	This proposal has been supported by documents relevant to appropriate assessment which identified that the proposed survey activity would not have potential to give rise to likely significant effects upon the Lower River Shannon SAC, or any other relevant European sites. On this basis it is considered that the proposed SI works would have no potential to act in-combination with this project.

Considering the level of activity in the vicinity along with the limited and temporary nature of the SI works, with no permanent or continuous impacts, it is considered that the SI works will not have any cumulative impacts with other plans or projects in the area with the exception of the case of possible overlap with the Shannon Foynes Port Company works (LIC230014). Appropriate Assessment informed by an NIS concluded that this development would not adversely affect any European site following the implementation of mitigation measures. Given that there are no anticipated LSEs from these proposed SI works also, it can be concluded that if the projects happened concurrently, the significance of potential effects would still not be considered to be high enough to potentially impact conservation

objectives of the relevant designated sites and receptors.

As such, it is considered that the proposed SI works would have no potential to give rise to any in-combination effects alongside the proposed Shannon Foynes Port Company works.

6 Mitigation Measures

The proposed SI works will incorporate a range of measures to safeguard the environment within the Lower River Shannon SAC and to address the following identified potential effects upon the integrity of the following European sites:

- Adverse water quality and habitat deterioration and oiling effects arising through pollution events upon the following European Sites:
    - Lower River Shannon SAC.
- Adverse underwater noise and vibration effects upon marine mammals, including common bottlenose dolphin upon the following European Sites:
    - Lower River Shannon SAC
    - Slyne Head Islands SAC
    - West Connacht Coast SAC
    - Slyne Head Peninsula SAC.

The proposed factored in measures and mitigation measures are set out in Table 6.1.

Table 6.1
Embedded measures and mitigation measures reducing potential impacts

Receptor	Potential Impact	Summary of Proposed Mitigation
Water	Impact on water quality Introduction of INNS	• All equipment shall be cleaned and checked before use on site. • Refuelling will occur offsite where possible. • Any oil/fuel stored on site will be kept in adequate storage for containment of any potential spills or leaks. • A spill response kit will be available onsite and accessible for control of pollution incidents. • Spill response kit will be regularly inspected and replaced immediately if used. • Toolbox talks prior to work commencing will communicate to staff and contractors regarding refuelling procedures and procedures in the event of a spill.
Underwater Noise and Vibration	Impact on marine mammals Impact on fish	The proposed SI works will incorporate a range of measures to safeguard the environment and potential impacts to marine mammals and fish. The impact of greatest concern to these receptors is underwater noise and vibration from the noise-generating survey activities with the potential to harm or disturb (SBP and marine refraction seismic survey); this will be mitigated as follows: • Survey Marine Mammal Mitigation Plan: The following mitigation measures will be employed. These mitigation measures are in line with best practice guidance (NPWS, 2014): • A qualified Marine Mammal Observer (MMO) will be on board the survey vessel to monitor marine mammal activity and log all events;

Receptor	Potential Impact	Summary of Proposed Mitigation
		• Pre-start monitoring: relevant operations shall not commence if marine mammals are detected within a 500 m radial distance of the vessel (a conservative range which accounts for the maximum likely zone of influence for potential injury from geophysical surveys (SBP) of 130 m); • Survey operations shall only commence in daylight hours where effective visual monitoring by the MMOs has been achieved. Where effective visual monitoring is not possible, the sound-producing activities shall be postponed until effective visual monitoring has been completed; • Ramp Up: Following the pre-start monitoring, a ramp-up procedure will take place or a period of 20 minutes for all relevant survey equipment; • Where the duration of a survey line or station change will be greater than 40 minutes, the activity shall, on completion of the line/station being surveyed, either shut down and undertake a full pre-start monitoring and ramp-up procedure or reduce the sound energy output to a lower state with an output peak SPL of 165-170 dB re 1µPa @1m, and then undertake the full ramp up procedure; • If there is a break in sound output for a period of 5 – 10 minutes the MMO will be required to check that no marine mammals are observed within the monitored zone prior to recommencement of the sound sources at full power. Where a marine mammal is observed within the 500 m monitored zone during such a break, then all pre-start monitoring and a subsequent ramp-up

Receptor	Potential Impact	Summary of Proposed Mitigation
		procedure shall recommence as in a normal start-up operation; and • If there is a break in sound output for a period greater than 10 minutes, then all pre-start monitoring and a subsequent ramp-up procedure will be undertaken.

7 Summary and Conclusions

7.1 Screening for Appropriate Assessment

Having regard to the relevant legislation and the methodology followed, supporting information for Screening for Appropriate Assessment (the SISAA report) was presented to evaluate whether or not the Proposed Project is likely to have an adverse effect on the integrity of any European sites.

LSEs could not be excluded at stage 1 screening for one European site, without further analysis or the application of measures intended to avoid or reduce the harmful effects of the proposed site survey activities on the sites concerned. The potential effects that could not be excluded were:

- the possibility of loss or disturbance of Annex I habitats of the Lower River Shannon SAC
- the possibility of injury or disturbance to marine mammal qualifying interests of the Lower River Shannon SAC
- the possibility for in-combination effects on qualifying interests of the Lower River Shannon SAC.

The screening within this NIS identified and screened in a further range of SACs with cetacean species as qualifying interests within 200 km of the proposed MUL Area. These sites being:

- Slyne Head Peninsula SAC
- West Connacht Coast SAC
- Slyne Head Islands SAC.

The potential impacts and Europeans sites listed above where therefore considered within the stage two appraisal within this NIS.

7.2 Natura Impact Statement

Further assessment, as presented in Section 5.1 provided certainty beyond reasonable scientific doubt that the proposed SI works would not give rise to adverse effects upon the integrity of the relevant European sites via loss of disturbance of Annex I habitats of the Lower River Shannon SAC.

The assessment within this NIS determined that the proposed SI works could have potential for adverse impacts upon the integrity of the following European sites due to underwater noise and vibration impacts upon common bottlenose dolphin in the absence of mitigation measures:

- Lower River Shannon SAC
- Slyne head Peninsula SAC
- West Connacht Coast SAC
- Slyne Head Islands SAC.

The mitigation measures that will be put in place, as outlined in Section 6, will effectively mitigate potential adverse impacts from underwater noise and vibration and ensure no adverse effect on the integrity of any European site.

Accordingly, for the reasons set out in detail, in the light of the best scientific knowledge in the field, all aspects of the proposed SI works which, by themselves, or in combination with other plans or projects,

may affect the relevant European Sites have been considered. The SISAA report and this NIS contain information which the MARA may consider in making their own complete, precise and definitive findings and conclusions and upon which the public authority is capable of determining that all reasonable scientific doubt has been removed as to the effects of the proposed development on the integrity of the relevant European sites.

In the light of the conclusions of the assessment which it shall conduct on the implications for the European sites concerned, the relevant public authority is enabled to ascertain that the proposed site survey activities will not adversely affect the integrity of any European site.

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