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APPROPRIATE ASSESSMENT REPORT

FS007358 Statkraft North Irish Sea Array (NISA) Site Investigations for Export Cable Route

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Contents

1 INTRODUCTION 1
1.1 Project Overview 1
1.2 Purpose of the Appropriate Assessment Report 1
1.3 Foreshore Licence Application Update 2
1.4 Structure of the Appropriate Assessment Report 2

2 PROJECT DESCRIPTION 3

3 SUMMARY OF STAGE 1 SCREENING FOR APPROPRIATE ASSESSMENT 7

4 STAGE 2 APPROPRIATE ASSESSMENT 8
4.1 European Site Descriptions 8
4.1.1 Rockabill SPA 8
4.1.2 Skerries Islands SPA 10
4.1.3 Rockabill to Dalkey Island SAC 10
4.1.4 Lambay Island SAC 11
4.1.5 River Boyne and River Blackwater SAC 12
4.1.6 North Anglesey Marine / Môn Forol SAC 14
4.1.7 Murlough SAC 15
4.1.8 North Channel SAC 16
4.1.9 Strangford Lough SAC 17
4.2 Assessment of Impacts 18
4.2.1 Changes to reef habitat 19
4.2.2 Changes to Special Protection Areas and bird conservation interests 19
4.2.3 Changes to SAC designated for marine mammal species 21
4.2.4 Changes to SAC designated for otter 27
4.2.5 Changes to SAC designated for migratory fish species 28
4.3 Assessment of In-Combination Effects 31
4.3.1 Reef habitat at Rockabill to Dalkey Island SAC 36
4.3.2 Special Protection Areas 36
4.3.3 Marine Mammal SACs 37
4.3.4 SACs designated for otter 38
4.3.5 SACs designated for migratory fish 38
4.4 Assessment of Impacts on the Integrity of European Sites 38
4.5 Observations and Submissions 46
4.5.1 Inland Fisheries Ireland 46
4.5.2 National Parks and Wildlife Service 46
4.5.3 Marine Institute 46
4.6 Mitigation Measures 47

5 DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS 50
5.1 Discussion 50
5.2 Recommended Licence Conditions 50
5.3 Conclusion 51

6 REFERENCES 52

Tables

Table 2.1 Indicative noise sources from project activities 5
Table 2.2 Indicative time periods for the proposed survey activities 6
Table 4.1 Special conservation interests and conservation objectives of the Rockabill SPA [004014] (NPWS, 2013) 8

Table 4.2 Qualifying interests and conservation objectives of the Rockabill to Dalkey Island SAC [003000] 11
Table 4.3 Qualifying interests and conservation objectives of Lambay Island SAC [000204] 12
Table 4.4 Qualifying interests and conservation objectives of the River Boyne and River Blackwater SAC [002299] 13
Table 4.5 Qualifying interests and conservation objectives of North Anglesey Marine / Môn Forol SAC (JNCC, 2019) 15
Table 4.6 Qualifying Interests and Conservation Objectives of Murlough SAC (UK0016612) 16
Table 4.7 Qualifying Interests and Conservation Objectives for harbour porpoise at North Channel SAC (UK0030399) 17
Table 4.8 Qualifying Interests and Conservation Objectives of Strangford Lough SAC (UK0016618) 18
Table 4.9 Functional marine mammal hearing groups for marine mammal species 22
Table 4.10 Summary of PTS and TTS onset thresholds (Southal *et al.* (2019). LF = Low-frequency cetaceans (LF), HF = High-frequency cetaceans, VHF = Very high-frequency cetaceans and PCW = Phocid carnivores in water 24
Table 4.11 Summary of the modelled Southall *et al*. (2019) maximum PTS and TTS impact ranges for marine mammals from all sound sources. LF = Low-frequency cetaceans (LF), HF = High-frequency cetaceans, VHF = Very high-frequency cetaceans and PCW = Phocid carnivores in water 24
Table 4.12 Number of individuals and percentage of reference population estimated to have the potential to be disturbed by geophysical survey equipment 25
Table 4.13 Noise exposure guidelines for group 1 and group 2 fish for selected anthropogenic sound sources 29
Table 4.14 Projects included for assessment of in-combination effects 33
Table 4.15 Integrity of European sites checklist 40
Table 4.16 Mitigation Measures Matrix 48

1 INTRODUCTION

1.1 Project Overview

North Irish Sea Array Windfarm Limited (NISA), a wholly owned subsidiary of Statkraft Ireland (Ltd), (Statkraft) has submitted a foreshore licence application to carry out site investigation works (hereinafter referred to as “the proposed works”) off the coasts of Co. Dublin and Co. Meath.

Statkraft is currently investigating the feasibility of developing the NISA offshore windfarm located off the coasts of Co. Dublin, Co. Meath and Co. Louth. The site investigations are necessary to establish the optimum design and location of the export cable(s) between the array site and the landfall, as well as to determine an appropriate landfall location. Three potential cable route and landfall options will be investigated in order to select a preferred option. The site investigation activities will include geophysical, geotechnical, ecological and archaeological surveys.

The NISA project was granted “relevant status” under a transitional protocol published in the Marine Planning and Development Management Bill in 2020, subsequently the Maritime Area Planning Bill and now enacted as the Maritime Area Planning Act. The aim of this transitional protocol was to enable certain projects, which were sufficiently advanced under the Foreshore Act and/or had an agreed grid connection to move from the Foreshore Act into the new marine consent system under the Maritime Area Planning Act. As a “relevant project”, NISA aims to apply for Maritime Area Consent (MAC) following enactment of the Bill. To feed into the MAC process and the subsequent planning application, NISA intends to undertake site investigations as soon as possible following grant of foreshore licence.

Statkraft has previously submitted a foreshore licence application (FS007031) for site investigations on the array site, which is outside of the scope of the present document.

1.2 Purpose of the Appropriate Assessment Report

The AA will comprise a review of the documentation submitted as part of the foreshore licence application, in particular the accompanying NIS, which should identify the potential impacts of the proposed works on the qualifying interests of European sites.

The European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), provides the following interpretation of what constitutes an NIS: “Natura Impact Statement” means a report comprising the scientific examination of a plan or project and the relevant European Site or European Sites, to identify and characterise any possible implications of the plan or project individually or in combination with other plans or projects in view of the conservation objectives of the site or sites, and any further information including, but not limited to, any plans, maps or drawings, scientific information or data required to enable the carrying out of an Appropriate Assessment.

This technical review and AA have been undertaken with regard to the appropriate legislation, guidance and departmental circulars.

The NIS will be scrutinised to assess whether it includes the following:

- Robust scientific information and analysis including the reasoning and justifications for the conclusion. Other relevant documents submitted by the applicant may be cross-referenced and the findings integrated into the assessment, particularly where analysis of environmental factors is required to determine effects on the structure and function of the European sites;
- Compliance with the tests and standards of AA as presented in European and national guidance;
- The assessment is carried out for the whole project, including all associated and ancillary elements;
- A robust scientific assessment and conclusions are reached relative to:
  - Conservation objectives of site(s), and
  - Integrity of site(s).
- Complete, precise and definitive findings and conclusions, capable of removing all reasonable scientific doubt as to the effects on the European sites.

The NIS and other reviewed documents are taken into account to arrive at a definitive determination under Article 6(3) of the Habitats Directive as to whether the project, on its own or in combination with other plans and projects, would adversely affect the integrity of a European site. In conducting the AA, case-law of the Court of Justice of the European Union (Case C-258/11) has established that the assessment carried out under Article 6(3) cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of a project on a European site.

In the European Communities (Birds and Natural Habitats) Regulations 2011, in carrying out an Appropriate Assessment under paragraph (11) the public authority shall take into account each of the following matters—

a. the Natura Impact Statement,

b. any other plans or projects that may, in combination with the plan or project under consideration, adversely affect the integrity of a European Site,

c. any supplemental information furnished in relation to any such report or statement,

d. if appropriate, any additional information sought by the authority and furnished by the applicant in relation to a Natura Impact Statement,

e. any information or advice obtained by the public authority,

f. if appropriate, any written submissions or observations made to the public authority in relation to the application for consent for proposed plan or project, and

any other relevant information.

1.3 Foreshore Licence Application Update

Following review of the application documents, a request for further information (RFI) was issued to the applicant by DHLGH on 17 December 2021. This RFI requested further detail on the following topics:

- Survey details including timings, duration and total number of survey vessels;
- Further information/evidence regarding disturbance to breeding birds at nesting sites; and,
- A comprehensive underwater noise assessment to assess injury and disturbance to marine mammals.

On 18 January 2022, the applicant provided a document responding to the RFI and an ‘Annex IV and Seals Species Risk Assessment.’ Where relevant, updated information provided in these additional documents has been used to inform this appropriate assessment report.

1.4 Structure of the Appropriate Assessment Report

A summary of the project description is provided in **Chapter 2** and a summary of the Stage 1 Screening for AA is outlined in **Chapter 3.**

The conservation objectives for the European sites screened in for AA are provided in **Section 4.1.**

Assessments of how the project will affect the conservation objectives of qualifying habitats and species of the relevant European sites, acknowledging any uncertainties and any gaps in information are provided in **Sections 4.2 to 4.3** and an assessment of effects on the integrity of the European sites is provided in **Section 4.4**

A summary of the observations and submissions received on the application is provided in **Section 4.5**.

Proposed mitigation measures are provided in **Section 4.6.**

2 PROJECT DESCRIPTION

Statkraft is currently investigating the feasibility of developing the NISA offshore wind farm located off the coasts of Co. Dublin, Meath and Louth, and has previously submitted a separate application for site investigations at the proposed array site (FS007031). The present report is concerned with Statkraft's application for site investigations on the proposed cable corridor area.

The proposed works include geophysical, geotechnical and environmental elements, with the aim of informing the optimal location and design of the export cable route between the NISA windfarm array site and the landfall. Statkraft proposes to investigate three cable route and landfall options in order that an optimal route can be selected.

Hydrographical and geophysical surveys will employ the following techniques:

- A multibeam echosounder (MBES) will collect topographical data of the seabed. It will operate at a typical frequency of 400Hz (700kHz optional) with sound pressure levels in the range of 200-228dB re1µPa @1m. MBES is non-intrusive and therefore does not interact with the seabed;
- Side scan sonar will be used to determine sediment characteristics and seabed features. It has a potential operating frequency range of approximately 300 to 900 kHz with sound pressure levels of 228dB re1µPa @1m;
- A magnetometer will be used to identify magnetic anomalies and hazard mapping for metal obstructions, shipwrecks and unexploded ordnance on the surface and the shallow sub-surface. It is a passive device and does not emit any sound waves into the marine environment;
- Sub-bottom profiler (SBP) will be used to develop an image of the subsurface and identify sediment strata. Typical equipment that might be used operates at frequencies ranging between 2-115 kHz and sound pressure levels up to 247 dB re1µPa @1m;
- Higher energy sub-surface acoustic sources (e.g. sparker systems, e-source) will be used to image the subsurface and categorise sediment strata, creating 2D or 3D images of the subsurface. The intensity of the source may vary depending on the requirements of the survey.

Geotechnical surveys will employ the following techniques:

- Downhole sampling will likely comprise six sampling boreholes to 40 m at each landfall for cable landfall assessment, using a variety of sampling methods. The final number and location of sampling points is still to be confirmed and may be informed by the geophysical survey results or existing information. The work at landfall locations will be performed by a geotechnical drilling rig mobilised onboard a jack-up barge.
- Cone penetration tests (CPT) will be co-located with downhole sampling locations. Up to 70 CPTs will be undertaken to a depth of 6-10 m below the seabed, at a spacing of approximately 500m (to be determined by the geology of the seabed) along the export cable route, until water depths become too high;
- Seabed sampling will comprise up to 70 vibrocore samples with a target depth of six m below the seabed and approximate spacing of 500 m along the export cable route until the depths become too high, and up to 70 grab samples along export cable route area for ground truthing and as part of benthic studies.
- The potential noise sources were summarised by the applicant in Table 8-1 of the Schedule of Works. Following a request for further information (RFI) issued by DHLGH, the applicant issued a 'NISA Cable Assessment Area, Annex IV and Seals Species Risk Assessment' document (hereafter referred to as NISA Annex IV Risk Assessment). This document has been used to inform this AA report where appropriate. The NISA Annex IV Risk Assessment provided updated indicative noise sources, and these are incorporated into

Table 2.1 below.

Table 2.1 Indicative noise sources from project activities

Noise source	Frequency (kHz)	Sound Pressure Level (dB re 1µPa @ 1m)
Geophysical survey noise sources		
Shipping Noise	0.05-0.3	160-175
Multi-beam echo sounder	200-400 (700kHz optional)	200-228
Side scan sonar	300-900	228
Sub -bottom profiler - Innomar	85-115	247 max
Sub-bottom profiler - Pinger	3.5-7.0	220
Ultra-high resolution seismic survey - sparker	Around 1.4	211
Geotechnical survey noise sources		
Vibrocore	0.03	187.4
Cone penetration testing	0.028	118-145
Boreholes	0.12	145

Environmental surveys will include:

- Ecological habitat surveys will comprise subtidal benthic survey as well as intertidal walkover survey and sampling (quadrat sampling) in order to identify the main habitats present. Subtidal sampling locations may be subject to drop down video/ROV inspection in advance of sampling. Up to 70 subtidal and 20 intertidal locations will be sampled, with multiple replicates taken at each location.
- Marine mammal surveys will comprise observational studies as well as deployment of acoustic monitoring devices (CPODs and possibly SoundTrap hydrophones) deployed on the seabed. Two sites will be selected which may be permanent or may be relocated every three months. Deployment of monitoring devices on the seabed constitute intrusive works and will therefore require a foreshore licence, while marine mammal surveys do not require a foreshore licence and are therefore not considered further.
- Bird surveys in order to identify bird species distribution and behaviour within the proposed foreshore licence area. Bird surveys will take place in conjunction with marine mammal observation studies and do not require a foreshore licence and are therefore not considered further.
- Fisheries survey will be undertaken to identify fish species distribution within the proposed site investigations area. exact details of the survey will be confirmed through consultation with relevant authorities and local communities where appropriate. Fisheries surveys do not require a foreshore licence and are therefore not considered further.

Underwater archaeological surveys will be undertaken to identify and assess metallic and other targets. These will be undertaken as part of the marine geophysical surveys using side scan sonar and magnetometer as described above.

It is expected that a maximum of two vessels would be operating at any one time within the application area.

The timing of the surveys is yet to be defined; however, it is known that the survey works schedule will be phased over a total of five years and will be carried out each year between March and October in order to minimise the risks associated with poor winter weather conditions. Statkraft intend to begin survey activities as soon as feasible following award of the foreshore licence.

The applicant provided indicative durations of survey activities in Table 1-1 of their RFI response. These are reproduced in **Table 2.2** below.

Table 2.2 Indicative time periods for the proposed survey activities

Activity	Typical time period required	Total number of site investigation locations	Total duration of site investigations
Hydrographical and geophysical	8-10 weeks (weather dependent)	N/A	8-10 weeks. The survey area and in particular the potential cable routes will be refined prior to undertaking the geophysical survey to minimise the time on site.
Borehole	24-36 hours in any one location	18	Up to 27 days in total hours for actual boreholes across all campaigns. Boreholes will be split between campaigns with a preliminary campaign typically taking up to 6 weeks and an interim campaign typically taking up to 12 weeks.
CPT	30 min-3 hours in any one location	88	Maximum 11 days of actual SI time over all campaigns but is part of same campaign as Boreholes so approximately 8 weeks for a preliminary campaign and 16 weeks for an interim campaign. Some locations will be co-located with borehole locations.
Gravity corer/vibrocorer	45 min – 2 hours in any one location	70	Maximum 6 days of actual SI time but is part of same campaign as Boreholes so approximately 8 weeks for preliminary campaign and 16 weeks for the interim campaign
Benthic grab sampling	Up to 3 hours in any one location	130	Maximum 16 days in actual SI hours however 3 to 4 weeks for the campaign to allow for SI Prep (drop down camera or ROV) and transit between locations. Surveys between May to September.

3 SUMMARY OF STAGE 1 SCREENING FOR APPROPRIATE ASSESSMENT

A Natura Impact Statement (NIS) was submitted by the applicant on the 1s April 2021as part of the foreshore licence application. The NIS included a chapter (Chapter 5) entitled “Appropriate Assessment Stage 1 Screening”, intended to inform the Screening for AA to be completed by DHLGH. The screening statement included in the aforementioned chapter concluded that likely significant effects either alone or in combination with other plans and projects were screened in for the following Special Protection Area (SPA) and Special Areas of Conservation (SAC) and specific Special Conservation Interests (SCI) and Qualifying Interests (QI):

- Rockabill SPA – Roseate tern (*Sterna dougallii*)
- Rockabill to Dalkey Island SAC – Reefs and harbour porpoise (*Phocoena phocoena*)
- Lambay Island SAC – grey seal (*Halichoerus grypus*) and common seal (*Phoca vitulina*)
- River Boyne and River Blackwater SAC - Otter (*Lutra lutra*)

RPS carried out a Screening for AA on behalf of DHLGH (RPS Report Ref: MGE0778RP0024), which concluded that it cannot be excluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed works, individually or in combination with other plans or projects would have a significant effect on the following sites:

- Rockabill SPA
- Rockabill to Dalkey Island SAC
- Skerries Islands SPA
- Lambay Island SAC
- River Boyne and River Blackwater SAC
- North Anglesey Marine / Gogledd Môn Forol SAC
- Murlough SAC
- North Channel SAC
- Strangford Lough SAC

The elements of the proposed works alone or in combination with other projects or plans that are likely to give rise to significant effects on the above European sites include the following:

- Activities involving removal of sediment (geotechnical and benthic sampling using boreholes, vibrocores and grab samples)
- Vessel movement and activity, including overwater noise associated with project activities
- Underwater noise emissions from geotechnical and geophysical site investigations

Therefore, the project is subject to an AA in accordance with Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora; the Planning and Development Act 2000 (as amended); and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011).

The NIS submitted by the applicant, has been used to inform this review and appropriate assessment carried out on behalf of DHLGH.

4 STAGE 2 APPROPRIATE ASSESSMENT

4.1 European Site Descriptions

4.1.1 Rockabill SPA

A description of Rockabill SPA is provided in the NIS chapter 3 (section 3.2) and its SCIs and conservation objectives provided in the NIS chapter 5. The site overlaps with the proposed foreshore licence area and consists of two small, low-lying, granitic islets situated c. 7km off the Dublin coast and the surrounding seas to a distance of 3.5km from the islands (NPWS, 2015).

The following species are SCIs of the site: purple sandpiper (*Calidris maritima*), roseate tern (*Sterna dougallii*), common tern (*Sterna hirundo*) and Arctic tern (*Sterna paradisaea*) (NPWS, 2020).

Rockabill is an internationally important tern colony and supports the largest colony of roseate tern (*Sterna dougallii*) in Ireland and in northwest Europe (1093 pairs in 2010) as well as the largest colony of common tern (*Sterna hirundo*) in the country (1940 pairs in 2010) and a significant colony of Arctic tern (*Sterna paradisaea*) (NPWS, 2015). The site provides breeding habitats for the terns, which nest amongst the scrubby vegetation and nest boxes. In winter, the site supports a nationally important population of purple sandpiper. Numbers of all three species of terns have steadily increased since 1989 with management and wardening at every breeding season (NPWS, 2020).

The potential for likely significant effects to the SCIs of this SPA as a result of the proposed works was identified at AA screening stage as it overlaps with the survey area. Potential effects are over-water noise disturbance to breeding birds and effects on prey availability. The conservation objectives of the SPA are outlined in the NIS chapter 5 and provided in **Table 4.1** below.

Table 4.1 Special conservation interests and conservation objectives of the Rockabill SPA [004014] (NPWS, 2013)

Special Conservation Interest	Conservation Objective	Attribute	Measure	Target
Purple sandpiper (*Calidris maritima*)	To maintain the favourable conservation condition.	Population trend	Percentage change	Long term population trend stable or increasing
		Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by purple sandpiper other than that occurring from natural patterns of variation
Roseate tern (*Sterna dougallii*)	To maintain the favourable conservation condition.	Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline
		Productivity rate: fledged young per breeding pair	Mean number	No significant decline
		Distribution: breeding colonies	Number; location; area (hectares)	No significant decline
		Prey biomass available	Kilogrammes	No significant decline
		Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase

Special Conservation Interest	Conservation Objective	Attribute	Measure	Target
		Disturbance at breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding roseate tern population
Common tern (*Sterna hirundo*)	To maintain the favourable conservation condition.	Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline
		Productivity rate: fledged young per breeding pair	Mean number	No significant decline
		Distribution: breeding colonies	Number; location; area (Hectares)	No significant decline
		Prey biomass available	Kilogrammes	No significant decline
		Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase
		Disturbance at breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding common tern population
Arctic tern (*Sterna paradisaea*)	To maintain the favourable conservation condition.	Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline
		Productivity rate: fledged young per breeding pair No significant decline	Mean number	No significant decline
		Distribution: breeding colonies	Number; location; area (hectares)	No significant decline
		Prey biomass available	Kilogrammes	No significant decline
		Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase
		Disturbance at breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding Arctic tern population

4.1.2 Skerries Islands SPA

A description of Skerries Islands SPA is provided in the NIS in chapter 3 as well as Chapter 5 (Table 5-1 and p.94).

The Skerries Islands are a group of three small uninhabited islands (Shenick's Island, St Patrick's Island and Colt Island) located between 0.5 km and 1.5km off the north coast of County Dublin. The SPA is located 1.4 km from the proposed foreshore licence area and comprises the three islands and the seas surrounding them to a distance of 200m from the shore. The site is of special conservation importance for wetlands, breeding seabirds and wintering waterfowl.

The site has a nationally important breeding colony of cormorant (*Phalacrocorax carbo*), shag (*Phalacrocorax aristotelis*) and herring gull (*Larus argentatus*). The wintering populations of light-bellied brent goose (*Branta bernicla hrota*) and purple sandpiper (*Calidris maritima*) are of international and national importance respectively (NPWS, 2020a).

The following species are special conservation interests of the site: cormorant, shag, light-bellied brent goose, purple sandpiper, turnstone (*Arenaria interpres*) and herring gull.

The potential for likely significant effects to the SPA was identified at AA screening stage, as the seabirds that are SCIs of the site have the potential to forage or transit through the survey area and may be disturbed during the breeding season.

The conservation objectives for all SCI species are to "maintain or restore the favourable conservation condition" (NPWS, 2021). No species-specific attributes, measures or targets are specified within the NPWS's conservation objectives, however, the conservation objectives document for Skerries Islands SPA includes the following targets (NPWS, 2021):

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

4.1.3 Rockabill to Dalkey Island SAC

This site overlaps with the proposed foreshore licence area and comprises a range of dynamic inshore and coastal waters, including sandy and muddy seabed, reefs, sandbanks and islands. The site extends southwards, in a strip approximately 7km wide and 40km in length from Rockabill, running adjacent to Howth Head and crossing Dublin Bay to Frazer Bank in south county Dublin (NPWS, 2014). The following features are qualifying interests of the site: reefs and harbour porpoise (*Phocoena phocoena*).

Reef habitat is uncommon along the eastern seaboard of Ireland and is mostly found fringing offshore islands along the Dublin coast (NPWS, 2014). A detailed survey of selected suitable islands has shown areas with typical biodiversity for this habitat both intertidally and subtidally (NPWS, 2019). These reefs are subject to strong tidal currents with an abundant supply of suspended matter, resulting in good representation of filter feeding fauna (e.g. sponges, anemones, echinoderms) (NPWS, 2014). Within the Rockabill to Dalkey Island SAC two community types are recorded within the Annex I habitat:

- intertidal reef community complex, recorded on the islands within the site and on the south coast of Howth; and
- subtidal reef community complex, recorded off the islands within the site and off the coast between Lambay Island and Rush village (NPWS, 2013a).

In addition, the area is a key habitat for harbour porpoise within the Irish Sea. Harbour porpoise occurs year-round within the site, with comparatively high group sizes recorded, and calves are observed at favourable, typical reference values. The site contains a variety of habitats of importance to harbour porpoise including inshore shallow sand, mudbanks, and rocky reefs subject to strong currents (NPWS, 2014).

The potential for likely significant effects to QIs of Rockabill to Dalkey Island SAC was identified at AA screening stage, namely likely significant effects to reefs as well as marine mammal QIs (harbour porpoise, grey seal and harbour seal).

The conservation objectives for Rockabilll to Dalkey Island SAC are outlined in the NIS in Chapter 5, p.72 and are provided below.

Table 4.2 Qualifying interests and conservation objectives of the Rockabill to Dalkey Island SAC [003000]

Qualifying Interest	Conservation Objective	Attribute	Measure	Target
Reefs	To maintain the favourable conservation condition.	Habitat area	Hectares	The permanent area is stable or increasing, subject to natural processes.
		Habitat distribution	Occurrence	Distribution is stable or increasing, subject to natural processes.
		Community structure	Biological composition	Conserve the following community types in a natural condition: Intertidal reef community complex; and Subtidal reef community complex
Harbour porpoise (*Phocoena phocoena*)	To maintain the favourable conservation condition.	Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use
		Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site

4.1.4 Lambay Island SAC

Lambay Island is a large, inhabited island located 4km off Portrane on the north county Dublin coast and 5.9 km south of the proposed foreshore licence area. The island rises to 127 m surrounded by steep cliffs on the north, east and south slopes (NPWS, 2014a). The western third of the island is mostly intensively farmed pasture, and the island also contains small areas of parkland, deciduous and coniferous woodland, buildings, walled gardens and a harbour (NPWS, 2019). The remainder of the island consists of less intensively grazed land, rocky outcrops, areas of bracken and bramble and cliff slopes with typical maritime vegetation (NPWS, 2019).

Adjacent to Lambay Island are extensive areas of reef habitat, both intertidally and subtidally. In addition, Lambay Island supports the principal breeding colony of grey seal on the east coast of Ireland (196-252 seals), and regionally significant numbers of common seal (up to 47 seals) (NPWS, 2019). Grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) occur year-round and moulting seals use the island's intertidal shorelines, coves and caves for resting and moulting (NPWS, 2019). Lambay Island's vegetated sea cliffs hold internationally important populations of seabirds (NPWS, 2019).

The following features are qualifying interests of Lambay Island SAC: Reefs, vegetated sea cliffs, grey seal and harbour seal. The site was brought forward to NIS at screening stage as likely significant effects to harbour and grey seals were identified at AA screening stage, as these are mobile species which may forage within the survey area. However, there is no overlap between habitat QIs and the proposed works and thus no likely significant effects to habitat QIs were identified. Therefore, grey seal and harbour seal are the only QIs for this site considered in this AA.

The conservation objectives for Lambay Island SAC are contained in the NIS in chapter 5 (p.77). The conservation objectives for grey seal and common seal are provided in **Table 4.3**.

Table 4.3 Qualifying interests and conservation objectives of Lambay Island SAC [000204]

Qualifying Interest	Conservation Objective	Attribute	Measure	Target
Grey seal (*Halichoerus grypus*)	To maintain the favourable conservation condition.	Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.
		Breeding behaviour	Breeding sites	The breeding sites should be maintained in a natural condition
		Moulting behaviour	Moult haul-out sites	The moult haul-out sites should be maintained in a natural condition
		Resting behaviour	Resting haul-out sites	The resting haul-out sites should be maintained in a natural condition
		Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the grey seal population at the site
Harbour seal (*Phoca vitulina*)	To maintain the favourable conservation condition.	Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.
		Breeding behaviour	Breeding sites	The breeding sites should be maintained in a natural condition.
		Moulting behaviour	Moult haul-out sites	The moult haul-out sites should be maintained in a natural condition.
		Resting behaviour	Resting haul-out sites	The resting haul-out sites should be maintained in a natural condition.
		Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the harbour seal population at the site

4.1.5 River Boyne and River Blackwater SAC

The River Boyne and River Blackwater SAC is located 14.7 km west of the proposed foreshore licence area. The site comprises the freshwater element of the River Boyne as far as the Boyne Aqueduct, the river Blackwater as far as Lough Ramor as well as the Boyne tributaries including the Deel, Stoneyford and Tremblestown rivers (NPWS, 2014b). There are many large towns adjacent but not within the site, including Slane, Navan, Kells, Trim, Athboy and Ballivor. The site is designated for the following qualifying interests: Alkaline fens; alluvial forests; river lamprey; Atlantic salmon ; and otter.

The main areas of alkaline fens are concentrated in the vicinity of Lough Shesk, Freehan Lough and Newton Lough, and contain a high diversity of plant and animal life, including rare plant species with restricted distributions in Ireland. Wet woodland fringes many stretches of the river Boyne as well as the Boyne River Islands

Atlantic salmon run the Boyne almost every month of the year and use the Boyne tributaries and headwaters as spawning grounds (NPWS, 2013a). Although Atlantic salmon is still fished commercially in Ireland, it is considered endangered or locally threatened elsewhere in Europe and thus is listed in Annex II of the Habitats Directive. The Boyne holds large three-sea-winter fish which generally arrive in February, with smaller spring fish arriving in April/May. The grilse come in July, water permitting. The river gets a further run of fish in late August and this run appears to last well after the fishing season (which runs from 1st March to 30th September) (NPWS, 2013a). Salmon in the river Blackwater was affected by an arterial drainage scheme undertaken in the 1970s, and salmon stocks have not yet fully recovered (NPWS, 2013a).

The site is also important for river lamprey and otter. River lamprey is present in the lower reaches of the River Boyne , and otter can be found throughout the site (NPWS, 2013a).

The site was brought forward at screening stage as likely significant effects on the following mobile QI species were identified: otter, Atlantic salmon and river lamprey, all of which have the potential to occur within the proposed foreshore licence area. No connectivity was identified between the proposed works and the habitat QIs (alkaline fens and alluvial forests), due to the distance between these habitats and the project site, and the lack of any likely hydrological connectivity between them. Therefore, only otter, Atlantic salmon and river lamprey have been considered for the purposes of this AA.

Table 4.4 Qualifying interests and conservation objectives of the River Boyne and River Blackwater SAC [002299]

Qualifying Interest	Conservation Objective	Attribute	Measure	Target
River lamprey (*Lampetra fluvialis*)	To restore the favourable conservation condition.	Distribution	Percentage of river accessible	Restore access to all water courses down to first order streams
		Distribution of larvae	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	Not less than 50% of sample sites with suitable habitat positive for larval brook/river lamprey
		Population structure of larvae	Number of age/size classes	At least three age/size classes of larval brook/river lamprey present
		Larval lamprey density in fine sediment	Larval lamprey/m²	Mean density of brook/river larval lamprey in sites with suitable habitat more than 5/m²
		Extent and distribution of spawning nursery habitat	m² and occurrence	No decline in extent and distribution of spawning and nursery beds
Salmon (*Salmo salar*)	To restore the favourable conservation condition	Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary
		Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded
		Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling
		Out-migrating smolt abundance	Number	No significant decline
		Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes

Qualifying Interest	Conservation Objective	Attribute	Measure	Target
		Water quality	EPA Q value	At least Q4 at all sites sampled by EPA
Otter (*Lutra lutra*)	To maintain the favourable conservation condition	Distribution	Percentage positive survey sites	No significant decline
		Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 447.6ha along riverbanks/ lake shoreline/around ponds
		Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 263.3km
		Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 31.6ha
		Couching sites and holts	Number	No significant decline
		Fish biomass available	Kilograms	No significant decline
		Barriers to connectivity	Number	No significant increase

4.1.6 North Anglesey Marine / Môn Forol SAC

The North Anglesey Marine SAC is located 42.2 km east of the proposed foreshore licence area and extends from the northern coast of the Isle of Anglesey into the Irish Sea (between Ireland and the Isle of Man) and its only qualifying interest is harbour porpoise (*Phocoena phocoena*). The site spans water depths which range from mean low water level down to 100 metres along the western boundary and covers a mix of habitats, including areas of rock, coarse and sandy sediments, and mud (NPWS, 2014a).

The site is estimated to support 2.4% of the UK Celtic and Irish Seas Management Unit population of harbour porpoise,and covers important habitat for porpoises, which was identified as part of the top 10% persistent high density areas for the summer seasons within the UK (JNCC, 2021).

Likely significant effects to harbour porpoise were identified at AA Screening stage as harbour porpoise is mobile and has the potential to travel/forage within the proposed foreshore licence area.

The conservation objectives for harbour porpoise at North Anglesey Marine SAC are contained in chapter 6 (p.105) of the NIS and are summarised in **Table 4.5**.

Table 4.5 Qualifying interests and conservation objectives of North Anglesey Marine / Môn Forol SAC (JNCC, 2019)

Qualifying Interest	Overall conservation Objective	Specific conservation objectives	Description
Harbour porpoise (*Phocoena phocoena*)	To maintain site integrity so that it contributes to maintaining favourable conservation status for harbour porpoise in UK waters.	Harbour porpoise is a viable component of the site	To intent is to minimise the risk of injury and killing or other factors that could restrict the survivability and reproductive potential of harbour porpoise using the site, specifically operations that would result in unacceptable levels of those impacts on harbour porpoises using the site.
		There is no significant disturbance of the species	Operations within or affecting the site should be managed to ensure that the animals' potential usage of the site is maintained – in particular (but not exclusively) noise disturbance Noise disturbance from a plan/project individually or in combination is significant if it excludes harbour porpoises for more than: 1) 20% of the relevant area of the site in any given day; and 2) an average of 10% of the relevant area of the site over a season.
		The condition of supporting habitats and processes, and the availability of prey is maintained.	The maintenance of supporting habitats (i.e. characteristics of the seabed habitat and water column) and processes (i.e. movements and physical properties of the habitat) contributes to ensuring that prey is maintained within the site and is available to harbour porpoises using the site.

4.1.7 Murlough SAC

Murlough SAC is located 47km north of the proposed foreshore licence area. It adjoins Dundrum Bay in County Down and includes the shallow waters of the Bay itself, of importance as the largest area of shallow sub-littoral sandbanks in Northern Ireland. The inter-tidal sands and muds are also extensive. The beach area at Ballykinler is important as a haul out for harbour seal . The site is of international importance for earth science with contemporary coastal processes, including classic ridge and runnel beach forms, associated dune forms, together with features important to understand post-glacial sea-level history.

Murlough SAC was brought forward to AA during the screening stage as likely significant effects to harbour seal were identified at AA Screening stage. While Murlough SAC has other QIs, these are terrestrial habitats and one terrestrial species (marsh fritillary *Euphydryas aurinia*). Due to the distance between these habitats and the proposed works, and the lack of hydrological connectivity, the only QI considered for the purposes of AA is harbour seal.

The conservation objectives for harbour seal at Murlough SAC (DAERA-NI, 2015) are outlined in the NIS Section 6.1.6. and are provided in Table 4.6 below.

Table 4.6 Qualifying Interests and Conservation Objectives of Murlough SAC (UK0016612)

Qualifying Interest	Conservation Objective	*Attribute	Measure	Target
Harbour seal *Phoca vitulina*	Maintain (and if feasible enhance) population numbers and distribution of Harbour (Common) Seal.	*Population	Number of Harbour Seals counted during the autumn moult period	Maintain a population of at least 106 harbour seals.
		Pups	Percentage of pups in relation to number of seals counted in the moult period	Maintain a pup percentage of at least 25%.
	Maintain and enhance, as appropriate, physical features used by Harbour (Common) Seals within the site	*Haul-outs	Integrity of haul-outs	Maintain integrity of traditional haul-outs.
		Disturbance	Disturbance events	Contain disturbance events to a level which do not significantly impact the population.

*=primary attribute

4.1.8 North Channel SAC

The North Channel SAC is located 63.2 km north-east of the proposed foreshore licence area and spans an area of 1,604 km, located along the eastern coast of Northern Ireland. The SAC has been identified for the protection of harbour porpoise, particularly as a wintering area. This SAC supports an estimated 1.2% of the UK Celtic and Irish Seas Management Unit population. Some of the largest groups (100+/-) of harbour porpoise have been observed here. Habitats within the site consist mainly of coarse or sandy sediments, with patches of rock and mud. Survey data collated through the Joint Cetacean Protocol (JCP) were analysed to identify areas with persistently high harbour porpoise occurrence. The area included within the SAC covers important winter habitat which is one of the top 10% persistent high-density areas for this season in the UK (DAERA and JNCC, 2017).

The conservation objectives (COs) for the North Channel SAC (JNCC, 2019) are outlined in the NIS Section 6.1.8. and are provided in **Table 4.7** below.

Table 4.7 Qualifying Interests and Conservation Objectives for harbour porpoise at North Channel SAC (UK0030399)

Qualifying Interest	Overall conservation Objective	Specific conservation objectives	Description
Harbour porpoise (*Phocoena phocoena*)	To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining favourable conservation status for harbour porpoise in UK waters	Harbour porpoise is a viable component of the site	The intent is to minimise the risk of injury and killing or other factors that could restrict the survivability and reproductive potential of harbour porpoise using the site – specifically operations that would result in unacceptable levels of those impacts on harbour porpoises using the site.
		There is no significant disturbance of the species.	Disturbance is considered significant if it leads to the exclusion of harbour porpoise from a significant portion of the site, i.e if it excludes harbour porpoises for more than 1) 20% of the relevant area of the site in any given day, and 2) an average of 10% of the relevant area of the site over a season.
		The condition of supporting habitats and processes, and the availability of prey is maintained.	The maintenance of supporting habitats (i.e. characteristics of the seabed habitat and water column) and processes (i.e. movements and physical properties of the habitat) contributes to ensuring that prey is maintained within the site and is available to harbour porpoises using the site

*=primary attribute

4.1.9 Strangford Lough SAC

Strangford Lough SAC is located 71.9 km north-east of the proposed foreshore licence area. A description of Strangford Lough SAC is provided in the NIS Chapter 3, table 3.5. Strangford Lough SAC is a large, 150km, marine inlet on the east coast of County Down (DAERA-NI, 2015a). The lough supports and impressive range of marine habitats and communities with over 2,000 recorded species. It is important to marine invertebrates, algae and saltmarsh plants, for wintering and breeding wetland birds, and for marine mammals. The site also supports an Annex II species population of harbour seal.

The site was brought forward to AA during the screening stage as likely significant effects to harbour seal were identified, due to the highly mobile nature of this species. Even though Strangford Lough SAC has other QIs, these are habitats and due to their distance to the proposed foreshore licence area no potential connectivity was identified.

The conservation objectives for harbour seal in Strangford Lough SAC (DAERA-NI, 2017) are outlined in the NIS Section 6.1.7. and are provided in **Table 4.8** below. It is important to note that since the conservation objectives were published, a subsequent condition assessment was undertaken which concluded that harbour seal at Strangford Lough SAC is currently in unfavourable – declining condition (DAERA, 2019).

Table 4.8 Qualifying Interests and Conservation Objectives of Strangford Lough SAC (UK0016618)

Qualifying Interest	Conservation Objective	*Attribute	Measure	Target
Harbour seal (*Phoca vitulina*)	Maintain and enhance, as appropriate, the harbour seal population Maintain and enhance, as appropriate, physical features used by harbour seals within the site	*Population.	Number of Harbour Seals counted during the autumn moult period.	Maintain a population of at least 210 Harbour Seals.
		Number of Pups.	Percentage of pups in relation to number of seals counted in the moult period.	Maintain a pup percentage of at least 25%.
		*Haul-outs.	Integrity of haul-outs.	Maintain integrity of traditional haul-outs.
		Disturbance.	Disturbance events.	Contain disturbance events to a level which do not significantly impact the population.

*=primary attribute

4.2 Assessment of Impacts

The following list of QI and SCIs at their respective European sites are brought forward for assessment of impacts:

- Rockabill SPA: purple sandpiper, roseate tern, common tern and Arctic tern;
- Skerries Islands SPA: cormorant, shag, light-bellied brent goose, purple sandpiper, turnstone and herring gull;
- Rockabill to Dalkey Island SAC: reefs and harbour porpoise;
- Lambay Island SAC: grey seal and harbour seal;
- River Boyne and River Blackwater SAC: otter, Atlantic salmon and river lamprey;
- North Anglesey Marine / Môn Forol SAC: harbour porpoise;
- Murlough SAC: harbour seal;
- North Channel SAC: harbour porpoise; and,
- Strangford Lough SAC: harbour seal.

This section comprises the information to inform the Stage 2 AA and provides the further assessment required to determine whether there are likely to be adverse effects on the integrity of these sites as a result of the likely changes to sites identified at AA screening, and having considered the mitigation measures which have been put forward for the project as outlined in the NIS.

The following potential changes to European sites were identified during AA screening and brought forward to AA:

- Changes to reef habitat (habitat loss/physical disturbance) at Rockabill to Dalkey Island SAC
- Changes to SPAs and birds due to:
  - Offshore over-water noise disturbance at Rockabill SPA and Skerries Islands SPA
  - Prey biomass availability to roseate tern at Rockabill SPA
- Changes to SACs designated for marine mammal species due to:
  - Disturbance from underwater noise and vibration (all marine mammal QIs)
  - Risk of collision (all marine mammal QIs)
- Changes to SAC designated for otter (River Boyne and River Blackwater SAC)

- Changes to SAC designated for migratory fish species (River Boyne and River Blackwater SAC)

These potential changes to European sites are assessed in **Sections 4.2.1** to **4.3.5** against the conservation objectives for each relevant European site, and list of attributes and targets where available.

4.2.1 Changes to reef habitat

The Stage 1 Screening for AA concluded that there was the potential for a likely significant effect to Annex I reef habitat at Rockabill to Dalkey Island SAC as a result of direct habitat loss and/or disturbance and increased suspended sediment concentrations caused by intrusive survey techniques (e.g., benthic grab sampling, boreholes, vibrocores and CPTs).

Direct habitat loss may occur if intrusive survey techniques overlap or are in close proximity to reef habitat. Indirect effects to reef habitat may occur as a result of increased suspended sediment concentrations and subsequent smothering of reef. Seabed vibrocore sampling will include up to 70 vibrocore samples with a target depth of 6m. The likely amount of suspended sediment resulting from vibocoring is not known, however there is the potential that, if undertaken at or in close proximity to reef habitat, it may result in suspended sediment deposition on or near reef habitat.

In the absence of mitigation and without defined sampling locations, there is the potential for adverse effects to the subtidal reef community complex.

The proposed survey activities do not make landfall within the site, therefore the intertidal community complex will be affected (see Figure 3-3 of the NIS).

4.2.1.1 Mitigation

The mitigation measures proposed by the applicant in the NIS (page 110) to ensure no extractive survey methods impact the subtidal reef communities at the SAC are as follows:

- An effort will be made, following analysis of geophysical data, to choose geotechnical and ecological sampling locations that avoid reef habitat;
- The number of sampling locations will be kept to a minimum necessary to confirm habitat type and to collect sufficient geotechnical data to minimise habitat disturbance and loss;
- Each sampling location will be visually inspected first with underwater camera or ROV in order to confirm presence or absence of Annex I habitats. If an Annex I habitat is identified (reef), the sampling location will be repositioned and again subject to visual inspection before commencement of any intrusive works;
- If required, ROV may be used for geotechnical and sediment sampling (for phys-chem sediment analysis and core for geotechnical scope of works) in the area where no other sampling equipment can access due to environmental constraints; and
- Intertidal surveys will be undertaken within daylight hours and sensitive species and habitats within the survey area will be identified, recorded and avoided during sampling. Samples taken within the intertidal area will be small and by their nature will be taken from soft sediments only (i.e. reef habitat will be avoided).

The measures proposed by the applicant are considered appropriate, however the following additional measures should be added:

- Consideration should be given to potential effects from anchoring, placement of moorings for metocean services and positioning of CPODs so that any known reef features are avoided.

With the implementation of the mitigation measures proposed, no damaging activities occurring on reef habitat are anticipated. Therefore, it can be concluded that there will be no adverse effect on habitat area, distribution, or community structure of reef habitats.

4.2.2 Changes to Special Protection Areas and bird conservation interests

The Stage 1 Screening for AA concluded that there was the potential for:

- Direct effects to birds at Rockabill SPA and Skerries Islands SPA from offshore over-water noise disturbance; and
- Indirect effects to terns at Rockabill SPA via changes to prey biomass availability.

4.2.2.1 Changes to Rockabill SPA

The physical presence of vessels and noise associated with the operation of survey equipment could result in disturbance to birds in the vicinity of the survey activities, as well as temporary displacement from their chosen feeding locations. Rockabill SPA overlaps with the offshore elements of the proposed works, however, it does not overlap with proposed activities in coastal/intertidal areas. The offshore elements of the proposed works may come into close proximity with nesting grounds (within Rockabill Island) and will likely overlap with existing foraging grounds for the SCI species of Rockabill SPA.

4.2.2.1.1 Purple sandpiper

Rockabill SPA supports a wintering population of purple sandpiper. Overwintering bird species favour wetland and intertidal habitats for foraging and roosting and do not tend to forage in the offshore marine environment. Purple sandpiper in Ireland favour intertidal areas such as rocky shorelines, sandy shorelines with rotting seaweed, headlands, islands and harbours. These habitats are often covered in seaweed and provide a range of prey such as molluscs and kelp flies (Birdwatch Ireland, 2022). As such a spatial overlap between this species and the offshore elements of the proposed works is unlikely.

4.2.2.1.2 Terns

Rockabill SPA supports breeding populations of roseate tern, common tern and Arctic tern.

Roseate terns generally arrive at their breeding colonies from mid-May, leaving again in August[1].Roseate tern's breeding season is from Mid-May to August however, this can be affected by weather conditions and roseate tern have been known to also lay eggs in the late summer, when earlier spring nests fail due to poor weather conditions (Piec *et al*., 2016; RSPB, undated). Common and Arctic terns are summer visitors from March to September to all Irish coasts (Birdwatch Ireland, 2022a; Birdwatch Ireland, 2022b). The nesting season for tern species is generally considered to be April to August.

Overwater noise disturbance may lead to altered behaviour and impaired communication, which may affect breeding success. The most disruptive activities to birds are those that are sudden, noisy or fast moving and vessels travelling at faster speeds. Vessels performing geotechnical and geophysical investigation works are typically slow, with vessels steaming at low speeds across the survey area. Survey vessels will be moving at a maximum speed of approximately 4-5 knots during surveys. During transit times, the survey vessels will be travelling at speeds greater than 4 knots. Some vessels, namely geotechnical survey vessels and vessels deploying metocean equipment or grab sampling will be stationary for periods of time during survey operations. Survey vessels are likely to be close to nesting sites (scrubby vegetation, cliffs and shoreline of Rockabill SPA) for only a limited amount of time (e.g. up to a few hours at a time while running survey lines). Any potential disturbance to nesting terns would be short term and localised and the level of human impact at breeding sites is not expected to significantly depart from existing levels. As such, no significant changes to breeding behaviour, that would result in a decline in the numbers and distribution of terns are expected.

Potential effects to roseate tern as a result of changes to prey biomass availability were screened into Stage 2 AA. A reduction in prey biomass availability would be a result of direct mortality or displacement of roseate tern's prey (small schooling marine fish and very rarely small crustaceans) (NPWS,2013). In their RFI response, the applicant provided reference to Cook and Burton (2010), which shows that tern species display high to very high sensitivity to displacement as a result of indirect impacts on their prey.

The geotechnical and benthic surveys will remove/affect a negligible proportion of the foreshore licence application area (see Table 1-1 in the applicant's RFI response). Roseate tern has the ability to forage within 12.6km (±10.6 km) (mean max) of its colony, Arctic tern within 25.7km (±14.8 km) and common tern within 18.0 km (±8.9 km) (Woodward *et al*., 2019). It is considered unlikely that the proposed works would significantly affect the wider availability of the prey biomass for this species, however, as foraging ranges are

[1] RSPB (undated) Roseate tern. Available at [https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/roseate-tern/]

likely to be reduced during the breeding season, works within close proximity to nesting sites could affect the conservation objectives of the tern species at Rockabill SPA.

4.2.2.1.3 Mitigation

Mitigation proposed in the NIS (Section 6.2.5, page 110): for Rockabill SPA is as follows

- No geotechnical or benthic site investigation activities will be undertaken within the SPA during the terns' nesting season.

The tern nesting season has not been defined by the applicant, however, it is assumed that this refers to the period April to August, inclusive. Taking into consideration the mitigation measure proposed above, it is considered that both disturbance and prey availability effects during the most sensitive time for breeding terns will be avoided and the conservation objectives of Rockabill SPA will not be adversely affected.

4.2.2.2 Changes to Skerries Islands SPA

Skerries islands SPA is located 1.4km from the proposed foreshore licence area and has a nationally important breeding colony of cormorant, shag and herring gull. The wintering populations of light-bellied brent goose is of international while populations of purple sandpiper and turnstone are of national importance respectively (see **Section 4.1.2**). Likely significant effects to SCIs at Skerries Islands SPA were identified at AA screening stage these species may forage or transit through the proposed foreshore licence area and may be disturbed during the breeding season. The breeding seasons for the abovementioned breeding species are known to be as follows:

- Cormorant start breeding in March. Eggs hatch a month later and young fledge in about two months. After late June in coastal colonies, most cormorants have fledged (Cummins *et al*., 2019).
- The peak breeding season for shag is normally late May to mid-June at coastal colonies (Cummins *et al*., 2019).
- Herring gulls build nests on sea cliff ledges or low-lying islands in vegetation or shingle, as well as flat rooftops and chimneys in urban area, usually in loose colonies. Eggs are incubated for 30 days in May and June (Intertek, 2022). Nestlings are tended by both parents and fledge at about six weeks (Allen & Mellon Environmental Ltd, 2022).

As outlined for Rockabill SPA above, the vessels involved in the surveys will be slow moving, working along pre-defined survey lines, and at times stationary. The foreshore licence area is subject to regular vessel traffic (see Figure 3-11 in the applicant's NIS), therefore, it is reasonable to assume that birds within the SPA are habituated to vessel movements in the area.

Any disturbance, should it occur, will be temporary and of short duration and is unlikely to create any barriers to the movement of individuals within the SPA or reduce the natural range of these species. The foraging range of these species (mean maximum ranges for the SCI species of the SPA ranged between 13.2 and 58.8 km, Woodward *et al*. (2019) means that birds displaced due to vessel movements would be able to relocate to undisturbed areas in the wider area and the habitat available to these populations will not be significantly reduced.

4.2.2.2.1 Mitigation

The applicant screened Skerries Islands SPA out in their report to inform Stage 1 Screening for AA (see Table 5-1 of the NIS) and as such no specific mitigation measures are proposed within the NIS for this site.

However, as the survey activities will take place 1.2km from the SPA and disturbance is not considered likely lead to adverse effects on the conservation objectives. In addition, foraging seabirds from Skerries Islands SPA will be protected from potential impacts to prey availability as intrusive geotechnical and benthic works will not take place during their nesting seasons (see **Section 4.2.2.1.3**).

4.2.3 Changes to SAC designated for marine mammal species

The Stage 1 Screening for AA concluded that there was the potential for likely significant effects to Annex II marine mammal QIs at six SACs: Rockabill to Dalkey Island SAC, Lambay Island SAC, North Anglesey Marine / Gogledd Môn Forol SAC, Murlough SAC, North Channel SAC and Strangford Lough SAC.

Rockabill to Dalkey Island SAC overlaps with the proposed foreshore licence area and is designated for harbour porpoise. The remaining SACs are located within 100km of the site and are designated for marine mammals that may use the proposed foreshore licence area, namely harbour porpoise, grey seal and harbour seal.

The following likely significant effects were brought forward to Stage 2 AA:

- Injury and disturbance from underwater noise and vibration; and
- Risk of collision.

4.2.3.1 Injury and disturbance from underwater noise and vibration

Auditory injury in marine mammals 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 (DAHG, 2014).

There is the potential for underwater noise generated during the geophysical survey to result in injury and/or disturbance to marine mammal species in the vicinity of the proposed works. As outlined in chapter 2 above, the applicant provided a desk-based review of underwater sound changes associated with the proposed survey activities (NISA Annex IV Risk Assessment) and predicted effects on marine mammals.

Marine mammal species can be split into functional hearing groupings, according to their frequency-specific hearing sensitivity. In the NISA Annex IV Risk Assessment, the applicant makes use of functional marine mammal hearing groups as outlined in Southall *et al.* (2019). See the table below for a list of species contained within each functional hearing group.

Table 4.9 Functional marine mammal hearing groups for marine mammal species

Southall *et al.* (2019) hearing group name	Species included in group
Low-frequency cetaceans (LF)	Baleen whales (minke, fin and humpback whale)
High-frequency cetaceans (HF)	Most toothed whales and dolphins (bottlenose, common and Risso's dolphin, killer, and pilot whales)
Very high-frequency cetaceans (VHF)	Certain toothed whales and porpoises (harbour porpoise)
Other marine carnivores in water (OCW)	Includes sea lions, walrus, otters
Phocid carnivores in water (PCW)	Earless seals (including harbour and grey seal)

Potential underwater noise sources were summarised by the applicant in Table 8-1 of the Schedule of Works and updated in the NISA Annex IV Risk Assessment. These are provided in

Table 2.1 and not repeated here. The applicant undertook a noise modelling exercise for the proposed survey activities, which assesses injury and disturbance ranges to marine mammals based on a dual criteria approach (as set out in Southall *et al.* 2019).

In the NISA Annex IV Risk Assessment document, the applicant provided injury criteria for PTS and TTS for groupings of marine mammals from Southall *et al.* (2019) addressing both peak sound pressure levels (SPL) and Sound Exposure Levels (SEL). SEL is recommended for assessing the impacts of non-impulsive (continuous) noise, while a dual approach using SEL and SPL is recommended for impulsive noise (Southall *et al.* 2019). The hearing-weighted function is designed to represent the bandwidth for each group within which acoustic exposures can have auditory effects. SEL is a measure of total sound energy of an event or a number of events (e.g., over the course of a day) normalised to one second. This allows the total acoustic energy contained in events lasting a different amount of time to be compared on a like for like basis. Using SEL for continuous sounds allows exposure duration and the effect of exposure to multiple events over a 24-hour period to be taken into account. Although the DAHG (2014) guidance refers to Southall *et al.* (2007), the more recent Southall *et al.* (2019) outlines more precautionary thresholds than those outlined in 2007 for PTS and TTS. A summary of PTS and TTS inset thresholds from Southall *et al.* (2019) for both impulsive and non-impulsive sounds is provided below in **Table 4.10**.

Table 4.10 Summary of PTS and TTS onset thresholds (Southal *et al.* (2019). LF = Low-frequency cetaceans (LF), HF = High-frequency cetaceans, VHF = Very high-frequency cetaceans and PCW = Phocid carnivores in water

Hearing Group	Parameter	Impulsive		Non-impulsive	
		TTS	PTS	TTS	PTS
Low-frequency (LF) cetaceans	SPL, dB re 1 µPa (unweighted)	213	219	-	-
	SEL, dB re 1 µPa^{2}s (LF weighted)	168	183	179	199
High-frequency (HF) cetaceans	SPL, dB re 1 µPa (unweighted)	224	230	-	-
	SEL, dB re 1 µPa^{2}s (HF weighted)	170	185	178	198
Very High-frequency (VHF) cetaceans	SPL, dB re 1 µPa (unweighted)	196	202	-	-
	SEL, dB re 1 µPa^{2}s (VHF weighted)	140	155	153	173
Phocid carnivores in water (PCW)	SPL, dB re 1 µPa (unweighted)	212	218	-	-
	SEL, dB re 1 µPa^{2}s (PCW weighted)	170	185	181	201

The survey equipment expected to be used is either multiple pulse (MBES, SSS and SBPs) or continuous (boring and coring) and is also expected that several of the noise sources will be operational at the same time. Criteria from Nedwell *et al* (2007 and 2008) were utilised by the application in the development of the noise model to access disturbance/behavioural response to marine mammals. The dB_{ht} (species) metric as applied is defined as an objective measurement of the amount a noise is above the threshold of hearing of an animal. For each modelling scenario it has been assumed that the noise source is located 5 m below the water surface, except for boring and coring where the source is on the seabed. Where cumulative exposure is being calculated, constant operation over 24-hours has been assumed. **Table 4.11** summarises the results presented in the NISA Annex IV Risk Assessment Document for PTS and TTS impact ranges.

Table 4.11 Summary of the modelled Southall *et al*. (2019) maximum PTS and TTS impact ranges for marine mammals from all sound sources. LF = Low-frequency cetaceans (LF), HF = High-frequency cetaceans, VHF = Very high-frequency cetaceans and PCW = Phocid carnivores in water

Sound source	Max. PTS impact ranges				Max. TTS impact ranges			
	LF	HF	VHF	PCW	LF	HF	VHF	PCW
Geophysical survey noise sources								
MBES	< 100 m	< 100 m	< 100 m	< 100 m	< 100 m	< 100 m	170 m	< 100 m
SSS	< 100 m	< 100 m	< 100 m	< 100 m	< 100 m	< 100 m	130 m	< 100 m
Innomar	< 100 m	< 100 m	720 m	< 100 m	< 100 m	370 m	1.1 km	< 100 m
Concurrent (MBES, SSS and Innomar)	< 100 m	< 100 m	720 m	< 100 m	< 100 m	370 m	1.1 km	< 100 m
Pinger	< 100 m	< 100 m	2.5 km	160 m	2.3 km	830 m	6.2 km	2.3 km
Ultra-high resolution seismic survey - sparker	1.1 km*	< 100 m	2.9 km*	730 m*	6.3 km*	1.1 km*	6.9 km*	4.3 km*
Geotechnical survey noise sources								
Boring and Coring	< 100 m	< 100 m	< 100 m	< 100 m	< 100 m	< 100 m	< 100 m	< 100 m

The applicant provided an update from the manufacturer of the ultra-high resolution seismic survey (sparker) that at distances beyond 100m SEL drops below 155 dB re 1 µPa2 and at distances beyond 300m SEL drops below 140 dB re 1 µPa2.

In relation to this assessment, very high frequency cetaceans (i.e. harbour porpoise) and phocid carnivores in water (i.e. harbour seal and grey seal) are of interest. The maximum impact range for PTS in harbour porpoise is estimated to be 2.9km for the sparker and 2.5km for the pinger. The maximum impact range for PTS in seal species is estimated to be 730m for the sparker and 150m for the pinger. Similarly, the sparker and pinger were estimated to induce TTS out to 6.9km in harbour porpoise and 4.3km in seal species.

The applicant provided an update in their NISA Annex IV Risk Assessment that information received from the manufacturer (AAE Technologies) of the sparker system to be used (Duraspark 400) that at distances greater than 100m SEL drops below 155 dB re 1 µPa^2 and at distances greater than 300m SEL drops below 140 dB re 1 µPa^2. This means that for harbour porpoise (see **Table 4.10**), the PTS threshold would not be exceeded beyond 100m the TTS threshold would not be exceeded beyond 300m from the sound source. This indicates that initial results are likely to be an over-estimate of the potential impact. It is not clear whether a similar reduction in impact range can be extended to PTS and TTS in seal species or for the pinger, however, based on previous RPS experience in this area, the PTS and TTS impact ranges provided for the pinger appear highly precautionary.

Table 4.12 summarises behavioural disturbance ranges for the four main cetacean species within 5 km of the as outlined in the NISA Annex IV Risk Assessment. Of interest to the current assessment is harbour porpoise. Disturbance effects on seal species were not separately quantified for seal species, however, in RPS' experience, disturbance ranges tend to apply to all marine mammal species. These numbers are considered to be low as a proportion of their respective reference populations. The most likely behavioural response will be temporary avoidance; however, it is expected that small-scale temporary disturbance will likely occur as a result of the presence of the survey vessel itself.

Table 4.12 Number of individuals and percentage of reference population estimated to have the potential to be disturbed by geophysical survey equipment

Species	Potential impact		No. of individuals within the area of potential impact	% of reference population with potential to be affected
	Range (km)	Area (km^2)		
Harbour porpoise	5	78.5	23	0.02
Minke whale	5	78.5	1	0.01
Bottlenose dolphin	5	78.5	3	0.7
Risso's dolphin	5	78.5	0	0.01

Source: SCANS III (Hammond et al., 2017) and ObSERVE (Rogan et al., 2018) density estimates and reference population abundance estimates used in calculations from IAMMWG (2015)

The applicant states that the model assumes that an animal would remain in the small zone of ensonification for a prolonged period, which is highly unlikely, as animals when exposed to high noise levels, will swim away from the noise source. As the nearest SAC designated for grey or harbour seals is located 5.9 km from the proposed foreshore licence area, the proposed works are not considered to have any potential impact on breeding, moulting and resting seals. However, in the absence of mitigation, permanent and temporary injury to harbour porpoise and harbour and grey seal within the impact ranges of the survey equipment cannot be ruled out.

4.2.3.1.1 Mitigation

Mitigation measures for marine mammals were provided by the applicant in the NIS, however these have been updated by those provided in the NISA Annex IV Risk Assessment. The applicant has proposed the following updated measures to mitigate potential impacts on marine mammal species:

- The document "Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters (DAHG, 2014)" will be followed at all times. This entails, *inter alia*, that acoustic surveying shall not commence if marine mammals are detected by an experienced marine mammal observer (MMO) within a defined monitored zone of the sound source.
- A qualified and experienced MMO will be appointed to monitor for marine mammals and to log all relevant events using standardised data forms provided by the DAHG. During daylight hours the MMO(s) will carry out visual observations to monitor for the presence of cetaceans before the soft start commences and will recommend delays in the commencement of the geophysical operations should any species be detected within the appropriate monitored zone.
- The applicant states that, in order to allow 24-hour operation, or for work to commence when visual observation is not possible due to weather conditions or sea state, a proven Passive Acoustic

Monitoring (PAM) system and experienced operator(s) will be employed to undertake pre-start surveys during these times. It is noted that use of PAM for pre-start monitoring is not recommended in the DAHG (2014) guidelines, and therefore, agreement should be sought with NPWS in this regard.

- Pre-start monitoring will be conducted for a pre-soft start search of 30 minutes i.e. prior to the commencement of marine geophysical and geotechnical operations (MBES, SSS, sub-bottom profiling, geotechnical seabed sampling). This will involve a visual assessment to determine if any cetaceans are within 1000 m of the activities for the geophysical survey activities and 500m of the activities for geotechnical surveys. It is noted that the applicant intends to use PAM for night-time or poor visibility. As above, it is recommended that agreement is sought with NPWS in this regard. It is considered that due to the relatively wide impact ranges provided by the applicant, it is suitably precautionary to apply a monitored zone of 1,000m for geophysical surveys instead of the standard 500m, in line with the DAHG (2014) guidelines for seismic surveys. A monitored zone of 500m is considered appropriate for geotechnical activities.
- Should any cetaceans be detected within a radial distance of 1000 m of the survey vessel, commencement of marine geophysical operations will be delayed until their passage, or the transit of the vessel, results in the cetaceans being more than 1000 m away from the vessel. In both cases, there will be a 30-minute delay from the time of the last sighting within 1000 m of the source to the commencement / recommencement of the operations. The MMO will use a distance measuring stick or reticule binoculars to ascertain distances to marine mammals. Note: once started, geophysical/geotechnical operations will not cease should cetaceans approach the survey vessel.
- Soft-start procedures will be implemented in line with DAHG (2014) guidance. A soft start is the gradual ramping of power over a set period of time, to give any cetaceans adequate time to leave the area.

With the implementation of measures to avoid permanent and temporary injury to Annex II marine mammals during geophysical surveys and with any disturbance arising during the geophysical surveys likely to be at low levels and temporary, it is considered that, from the project alone:

- Access to suitable habitat for harbour porpoise at Rockabill to Dalkey Island SAC will be maintained, and the population of harbour porpoise at this site will not suffer significant impacts as a result of project activities. Consequently, the conservation objectives of harbour porpoise at Rockabill to Dalkey Island SAC will be maintained.
- Grey seal and harbour seal at Lambay Island SAC will not suffer significant disturbance from human activity or changes to access to suitable habitat, and will not suffer disturbance at breeding, moulting or resting sites and as such the conservation objectives of Lambay Island SAC will not be affected
- There will be no disturbance to harbour porpoise or barriers to suitable habitat/ prey availability at North Anglesey Marine / Môn Forol SAC and therefore the conservation objectives for this site will be maintained
- Murlough SAC and Strangford Lough SAC: There will be no changes to the harbour seal population sizes and percentage of pups, no significant disturbance to significantly affect the harbour seal populations and no changes to the integrity of haul-out sites at these SACs. Therefore, the conservation objectives for the sites will be maintained
- There will be no significant disturbance to harbour porpoise at North Channel SAC. The project will not reduce the viability of the species at the site, and there will be no significant impact on habitats, processes and prey significant to the site's harbour porpoise population. The conservation objectives of North Channel SAC will be maintained.

4.2.3.2 Risk of collision

Vessel strikes are a known cause of mortality in marine mammals (Laist *et al*., 2001). Non-lethal collisions have also been documented (Van Waerebeek *et al*., 2007). Injuries from such collisions can be divided into two broad categories: blunt trauma from impact and lacerations from propellers. Injuries may result in individuals becoming vulnerable to secondary infections or predation.

It is expected that a maximum of two vessels would be operating at any one time within the foreshore licence application area. Due to the nature of the surveys, the vessels will be travelling at low speeds. Furthermore, for the geophysical survey, the vessels will be travelling in a predefined trajectory. It is considered that this will allow animals to predict the movement of the vessels and therefore avoid collisions. It is likely that the

other survey vessels (i.e., benthic survey vessels, geotechnical survey vessel and metocean equipment deployment vessels) will be stationary for extended periods throughout their operations which will reduce the potential for collision with these vessels.

As outlined in the NIS (Section 3.5), AIS data for a six-month period from July to December 2018 shows that this wider area of the Irish Sea is exposed to regular marine traffic (see NIS Section 3.5) and therefore it is reasonable to assume that marine mammals in the area are exposed to vessel traffic on a regular basis and may exhibit some habituation. In addition, the increase in vessel traffic at any one time, resulting from the proposed works, is considered to be very low (i.e. up to two vessels operating within the proposed site investigations area) and is unlikely to lead to a significant increase in vessel traffic in the area. On this basis it is predicted that collisions between survey vessels and marine mammals originating from all relevant SACs will be extremely unlikely and as such, no adverse effects are predicted.

4.2.3.2.1 Mitigation

No mitigation is considered necessary as collision with survey vessels and equipment is considered unlikely.

4.2.4 Changes to SAC designated for otter

River Boyne and River Blackwater SAC was screened in by the applicant for Stage 2 AA on a precautionary basis due to the potential for otter to travel to and enter the proposed foreshore licence area. There is potential for otter to occur within the intertidal zone, commuting or foraging on fish, crabs, and molluscs.

Otter territories can vary in size according to availability of food resources. Where resources are abundant a territory can be 1-2km or extend to 10-15km in less abundant areas. Movement and distribution of otters in marine environments dependent on freshwater availability. Home ranges in freshwater can be longer than those along the coast due to the differences in food availability (Kruuk, 1995). In mesotrophic Irish rivers female otter home ranges averaged to 7.5 ±1.5km (O Néill et al. 2009). In oligotrophic rivers in Scotland home ranges averaged to 18.7km ±3.5km (Kruuk, 2006).

This SAC is located 14.7 km from the proposed foreshore licence area and it is unlikely that otter would commute to the landfall survey area and along the coast, given that suitable habitat is available along the Rivers Blackwater and Boyne, and within the Boyne estuary. Otter's basic habitat requirements include availability of aquatic prey, habitat cover for refuge from predators and sources of freshwater to wash their coats, with most coastal holts and couches located adjacent to freshwater streams (NPWS, 2009). Otters tend to forage within 80 metres of the shoreline (NPWS, 2009). They can occasionally be found some distance from a stream or lake, however this has been described as "several hundred metres from their usual territory" (NPWS, 2009).

Geotechnical survey activities in this area are likely to comprise co-located borehole drilling and CPTs (six at each of the three potential landfall locations). According to the applicant's Schedule of Works, a rotary drilling rig onboard a jack-up barge will be located in 'shallow water depths', although these are not defined. Underwater sound pressure levels (SPL) from rotary drilling are given as 190 dB re 1µPa @ 1m with a frequency range of 2Hz to 50kHz. Vibro-coring will not take place at the landfall sampling locations. An ecological walkover survey to enable habitat classification will be carried out at the chosen landfall location. Given the location of the closest landfall and the distance to the SAC (14.7 km), it is considered highly unlikely that otter from the SAC will be foraging within the impact range of underwater drilling noise, however, it is possible.

Given the nature of activities to be carried out within the intertidal zone, it is considered that no deterioration or destruction of otter habitat within the SAC, couching sites or holts will occur. There is a low potential for slight overwater noise disturbance of otters using the landfall areas to rest, commute or forage in, however, given the temporary nature of the works, the highly mobile and crepuscular nature of the species, and their favourable conservation status, it is highly unlikely that significant disturbance will occur.

Given the availability of alternative freshwater and coastal foraging habitat, it is considered that there will be no changes to fish biomass availability. There will be no increase in barriers to connectivity as a result of the proposed works. As such it can be concluded that the conservation objective for otter will not be affected by the project alone and no adverse effects are predicted.

4.2.4.1 Mitigation

The applicant stated that while no mitigation measures specific to otter were proposed, compliance with the DAHG (2014) guidance will ensure that no otter are present in the area prior to undertaking surveys. It is noted that the DAHG (2014) guidance does not refer specifically to otter, however, as best practise, MMO monitoring activities should take account of otter, where relevant.

4.2.5 Changes to SAC designated for migratory fish species

Likely significant effects on Atlantic salmon and river lamprey (QIs of the River Boyne and River Blackwater SAC) from underwater noise changes were identified by RPS at Stage 1 AA Screening. The applicant's screening assessment concluded that no significant effects were anticipated to these species on the basis that they are not sensitive to sound. However, in light of:

- currently available knowledge on the anthropogenic effects of noise on fish – it is known that fish, including Atlantic salmon, are sensitive to changes in particle motion, which is integral to hearing in all fish (Hawkins and Popper, 2017);
- the observations of Inland Fisheries Ireland (IFI) which expressed concern that the project may result in disturbance to migratory fish species; and
- the complexity of assessing underwater noise impacts,

likely significant effects to migratory fish species at River Boyne and River Blackwater SAC were brought forward to Stage 2 AA by RPS on a precautionary basis.

River Boyne and River Blackwater SAC is located 14.7km west of the proposed foreshore licence area. Although this SAC is not marine, the migratory fish for which it is designated have a marine phase of their lifecycle. These species rely on the sea to migrate to feeding grounds before returning to rivers to spawn. The proposed works will produce underwater noise, which has the potential to impact these migratory fish.

Hearing plays an important role for fishes in providing information, often from great distances. Sound is used for communication between fishes, mating behaviour, detection of prey and predators, orientation, migration and habitat selection (Popper and Hawkins, 2019). Most fish species are capable of hearing within a frequency range of 50 Hz up to 500 to 1,500 Hz. A smaller number of species (notably clupeids) can detect sounds to over 3 kHz while a few species can detect sounds to well over 100 kHz (Popper and Hastings, 2009). Exposure to very intense sounds may result in mortal injuries, whereas less intensive sounds that are nevertheless detectable by fish may lead to altered behaviour, such as moving away from migration routes or favourite habitats were they feed and breed, affecting sound-based communication (such as mating behaviour), or prevent the detection of other biologically important sounds (Popper and Hawkins, 2019).

Fish are typically grouped into the following hearing categories based on the presence or absence of a swim bladder and on the potential for that swim bladder to improve the hearing sensitivity and range of hearing (Popper *et al*., 2014):

- Group 1 fish: fish with no swim bladder or other gas chamber. With respect to migratory fish, this includes sea lamprey and river lamprey. These species are less susceptible to barotrauma and only detect particle motion, not sound pressure.
- Group 2 fish: fish with swim bladders in which hearing does not involve the swim bladder or other gas volume. With respect to migratory fish, this category includes Atlantic salmon. These species are susceptible to barotrauma although hearing only involves particle motion, not sound pressure.
- Group 3 fish: fish in which hearing involves a swim bladder or other gas volume. With respect to migratory fish, this category includes species such as allis shad and twaite shad. These species are susceptible to barotrauma and detect sound pressure as well as particle motion; and
- Fish eggs and larvae.

Group 1 fish (e.g. flatfish and elasmobranchs), Group 2 fish (e.g. salmonids) and shellfish are less sensitive to sound pressure, with these species detecting sound in the environment through particle motion (Popper *et al*., 2014).

The thresholds for harm to fish species have been based on the sound exposure guidelines for fish proposed by the ANSI-Accredited Standards Committee S3/SC 1, Animal Bioacoustics Working Group (Popper *et al*., 2014). The guidelines represent the Working Group's consensus efforts to establish broadly applicable

guidelines for fish and sea turtles, with specific criteria relating to mortality and potential mortal injury, recoverable injury and TTS. The Working Group defines the criteria for injury and TTS as follows:

- **mortality and mortal injury**
- **Impairment**, including
  - **recoverable injury** – injuries, including hair cell damage, minor internal or external hematoma, etc. None of these injuries is likely to result in mortality
  - **TTS** – short or long-term changes in hearing sensitivity that may or may not reduce fitness (defined as any persistent change in hearing of 6 dB or greater).
- **Behavioural change**: at sound levels lower than those that may cause mortality or impairment, noise may also cause behavioural effects on a species, for example, avoidance of an area or changes in swimming speed (Mueller-Blenkle, 2010). This may be significant if it causes, for example, a migratory species to be delayed or diverted from their course.

For the purposes of this Stage 2 AA, Group 1 (river lamprey) and Group 2 (Atlantic salmon) fish are of interest. The current available sound exposure guidelines for Group 1 and Group 2 fish (interim guidelines based on available research) are summarised in **Table 4.13**. Guidelines were available for seismic, sonar and shipping activities but were not available specifically for sub-bottom profiling, multibeam echosounder and geotechnical drilling. It is important to note that these guidelines are indicative only and are not species-specific. However, in the absence of a noise assessment, they provide indicative information with regards to potential effects on river lamprey and Atlantic salmon.

Table 4.13 Noise exposure guidelines for group 1 and group 2 fish for selected anthropogenic sound sources[2]

	Mortality and potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Low frequency naval sonar					
Fish: no swim bladder (particle motion detection) (inc river lamprey)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	> 193 dB rms	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low
Fish: swim bladder not involved in hearing (particle motion detection) (inc. Atlantic salmon)	> 193 dB rms	> 193 dB rms	> 193 dB rms	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low
Mid frequency sonar					
Fish: no swim bladder (particle motion detection) (inc river lamprey)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	NA	NA	NA
Fish: swim bladder not involved in hearing (particle	>210 dB rms	>210 dB rms	NA	NA	NA

[2] peak and rms sound pressure levels dB re 1 µPa; SEL dB re 1 µPa 2 ·s. All criteria are presented as sound pressure even for fish without swim bladders since no data for particle motion exist. Relative risk (high, moderate, low) is given for animals at three distances from the source defi ned in relative terms as near (N = nearfield, tens of metres), intermediate (I = hundreds of metres), and far (F = thousands of metres).

	Mortality and potential mortal injury		Impairment		Behaviour
motion detection) (inc. Atlantic salmon)					
Shipping and other continuous noises (can mask signal detection and alter fish behaviour)					
Fish: no swim bladder (particle motion detection) (inc river lamprey)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder not involved in hearing (particle motion detection) (inc. Atlantic salmon)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low

Overall, for Groups 1 and 2, mortality risk from shipping and other continuous noises is expected to be low in the near, intermediate and far fields. Shipping has the potential to lead to TTS, in particular in the vicinity of the source, and has a moderate to high likelihood of masking (decreasing with distance from source) which could alter fish behaviour.

Low and mid frequency sonar are unlikely to lead to mortality or injury to group 1 fishes for near, intermediate and far fields. It may lead to mortality or impairment of group 2 fishes at sound levels >193-210 dB.

In summary, there is the potential that low to mid frequency sources may lead to impairment or altered behaviour in Atlantic salmon and river lamprey. It is likely that any such effects would be limited to the vicinity of the noise source, however, for shipping and other continuous noise sources the guidelines indicate that moderate to high masking may occur, with moderate masking a potential effect even at thousands of metres from the noise source.

It is, however, acknowledged that environmental conditions are likely to further reduce the propagation of sound. It is also acknowledged that for geophysical works, the potential zone of influence would be transient and temporary as the geophysical vessel moves slowly in a constant direction along the survey line.

River lamprey completes the spawning and nursery part of its life cycle in the marine environment; however, this is mainly restricted to estuaries. After one to two years in estuaries, river lampreys stop feeding in autumn and move upstream. Due to their preference for estuarine waters, and due to the distance between the SAC and the foreshore licence area, it is unlikely that river lamprey will be found within the impact ranges of the surveys.

Detailed information on the migration route of Atlantic salmon from this SAC is not available, however, with reference to the conservation objectives, it is considered unlikely that altered behaviour as a result of underwater noise produced by the proposed site investigations would lead to a significant decline in the number of out-migrating smolt.

The following conclusions can be made:

- With regard to the specific attributes pertaining to the conservation objectives for river lamprey at River Boyne and River Blackwater SAC, it is considered that the proposed works would not significantly affect the distribution (percentage of river accessible) of river lamprey, its larval distribution, density and population structure and the extent and distribution of spawning nursery habitat. As such it is considered that the conservation objectives for river lamprey will not be affected.
- With regard to the specific attributes pertaining to the conservation objectives for Atlantic salmon at River Boyne and River Blackwater SAC, it is considered that the distribution of salmon (extent of anadromy) will not be significantly affected as no artificial barriers will clock salmons upstream migration. Similarly, the numbers of adult spawning fish, salmon fry, the presence of redds in riparian

environments and out-migrating smolt are not expected to significantly change. Water quality will not be affected by the proposed works.

4.2.5.1 Mitigation

The applicant does not outline specific mitigation measures for impacts to migratory fish from underwater noise, however, observations from IFI recommended the following measures:

- Engaging with Braymore Point site investigation surveys on mitigation measures.
- Mitigation measures in regard to the timing of works and levels and duration of noise generation should be agreed with the foreshore division of DHLGH and form part of any foreshore licence and should cover use of soft-start and ramp-up procedures for sound generating surveys, bringing the duration of noise generating surveys to a minimum necessary and agree the timing of works so that it does not interfere with migration times or with any scientific studies currently taking place in the foreshore licence application area.

As advised by the IFI, a precautionary approach should be undertaken to prevent or minimise impacts on migratory fish. The applicant stated in the NIS that soft-start procedures will be used to ensure minimal disturbance to marine mammals. In the absence of high-quality species-specific data on impacts of anthropogenic noise on fish, the implementation of soft start procedures as best practice would in theory also mitigate potential impacts on fish species. The applicant did not confirm in its response that survey works will take place outside migration times. River lamprey migration is unlikely to overlap spatially with the proposed site investigations and although the exact migration route of Atlantic salmon from the SAC is unknown, it is considered highly precautionary to avoid surveying during their migration, given the intervening distance between the survey location and the SAC. This is a recommended condition set out by the IFI and as such it is recommended that the DHLGH consult further with the IFI on this matter.

4.3 Assessment of In-Combination Effects

The applicant's Stage 1 Screening for AA identified seven licence applications (submitted to the DHLGH) overlapping or in close proximity to the proposed foreshore licence area, including:

- three applications which overlap spatially with the proposed foreshore licence area: Braymore Point offshore wind farm site investigations (FS006973), Celtix Connect fibre optic cable site investigations (FS006915) and Pipiper fibre optic cable site investigations (FS006762). A licence was granted for Braymore Point in 2020; a determination is still outstanding for the other two projects.
- three applications for site investigation works for offshore wind farms in the vicinity of the FLAA (approximately 4.6km to 21.5km from the proposed foreshore licence area), for which there may be temporal overlap with the NISA proposed works: Oriel (FS006840 - licence granted in 2019), Cooley Point (FS006852 - licence granted in 2019) and Clogherhead (FS006787 - licence granted in 2018).
- the NISA offshore wind farm array site application for site investigation works (FS007031) – submitted in January 2020, awaiting determination.

These projects were considered for the likelihood of in-combination effects with the proposed works. Six projects were then screened out by the applicant, largely on the grounds that any spatial or temporal overlap with the proposed works was considered unlikely (see NIS section 3.7), and one project was screened in on the grounds of a potential temporal overlap (Braymore Point).

However, as detailed in RPS's Screening for Appropriate Assessment Technical Review, detailed project information as well as the proposed timing of works was not known for the abovementioned projects and as in-combination effects could not be ruled out, these projects were brought forward to be considered in Stage 2 AA.

In addition, since submission of the application documents for the proposed works, a further check of the DHLGH website for new foreshore licence applications was undertaken in June 2022. This identified an the following additional relevant submissions which may overlap temporally or spatially with the proposed works:

- RWE Renewables: site investigations off counties Dublin and Wicklow (FS007188).
- Mainstream Renewable Power Ltd- Site Investigations (FS007373)
- ESB Wind Development Limited Site Investigations at Sea Stacks Offshore Wind (FS007134)

The projects considered for the assessment of in-combination effects are summarised in **Table 4.14**. Only projects where a temporal overlap is classified as “possible” in the table were considered for the in-combination assessment.

Table 4.14 Projects included for assessment of in-combination effects

Name of Development (Licence Ref)	Approximate Distance to Foreshore Licence Investigation Area (km)	County	Description	Date received	Commencement Date /Duration	Status	Temporal overlap	Spatial overlap
SSE Renewables Braymore Point (FS006973)	Overlaps	Louth	Geophysical, Geotechnical and Environmental Site Investigation works	19 March 2019	2019 over 5 years	Determined	Possible	Yes
Celtix Connect - Havhingsten Telecommunicatio n Cable Dublin (FS006915)	Overlaps	Dublin	Installation and maintenance of a fibre-optic Havhingsten Telecommunications Cable - landing site is at Loughshinny, Fingal, Co Dublin.	9 January 2020	TBC (7 days in total)	Determination	Possible	Yes
PiPiper Infrastructure Ltd (FS006762)	Overlaps	Meath	Foreshore Licence application for geophysical survey and localised site investigation for a submarine fibre optic cable.	25 April 2017	2017	Consultation	Unlikely – application appears not to have been progressed.	Yes
Mainstream Renewable Power Ltd- Site Investigations (FS007373)	Overlaps	Dublin	Foreshore Licence application for geotechnical and geophysical site investigations and ecological, wind, wave and current monitoring for an offshore wind farm	03/06/2021	2022 - 2027	Applied	Possible	Yes
Oriel Windfarm Ltd (FS006840)	21.5 N	Louth	Foreshore Licence application for geophysical, geotechnical, ecological and metocean site investigation works.	16 October 2018	Completed (see Marine Notice No.29 of 2019)[3]	Determination	No	No
Hibernian Wind Power - Cooley Point, Co Louth (FS006852)	4.62 N	Louth	Foreshore Licence application for site investigation works to inform the development of an offshore windfarm.	4 July 2018	Intended: 2019. Appears outstanding	Determination	Possible	No

[3] Department of Transport, Tourism and Sport, Marine Notice No. 29 of 2019. [c22f073db16f47c090e34c9c7bddf69b.pdf (www.gov.ie)]

FS007358 Statkraft North Irish Sea Array (NISA) Site Investigations for Export Cable Route

Name of Development (Licence Ref)	Approximate Distance to Foreshore Licence Investigation Area (km)	County	Description	Date received	Commencement Date /Duration	Status	Temporal overlap	Spatial overlap
Hibernian Wind Power - Clogher Head (FS006787)	5.75 N	Louth	Foreshore Licence application for site investigation works to inform the development of an offshore windfarm.	21 November 2017	Intended: 2019. Appears outstanding	Determination	Possible	No
NISA offshore wind farm array site – site investigation works (FS007031)	Bordering	Louth and Dublin	Foreshore Licence application for site investigation works to inform the development of an offshore windfarm	14 January 2020	Benthic survey completed (see marine notice No. 52 of 2021)[4]. Geophysical surveys presumed likely to start upon determination of the present application.	Determination	Possible	No (bordering)
RWE Renewables: site investigations (FS007188)	12.05 S (estimate) / 11.6 S (estimate)	Dublin and Wicklow	Foreshore Licence application for geotechnical and geophysical site investigations and ecological wind, wave and current monitoring for an offshore wind farm.	21 June 2021	Intended: summer 2022 Surveys: 8 months 3 weeks Monitoring: 12-24 months Ecological monitoring: up to 3 years- SAM deployment 2 weeks and stay for duration of Foreshore licence	Determination	Unknown	No

[4] Afloat, Marine Notice: Benthic Survey Campaign for North Irish Sea Array [https://afloat.ie/resources/news-update/item/52111-marine-notice-benthic-survey-campaign-for-north-irish-sea-array]

FS007358 Statkraft North Irish Sea Array (NISA) Site Investigations for Export Cable Route

Name of Development (Licence Ref)	Approximate Distance to Foreshore Licence Investigation Area (km)	County	Description	Date received	Commencement Date /Duration	Status	Temporal overlap	Spatial overlap
ESB Wind Development Limited Site Investigations at Sea Stacks Offshore Wind (FS007134)	25 S	Dublin and Wicklow	Foreshore Licence application for geotechnical, geophysical, oceanographic and metocean surveys and ecological and archaeological site investigation surveys.	23/11/2020	Intended: Geophysical 3 to 4 months in Q2/3 2022 or 2023 Geotechnical 2 to 3 months Q2/2 2023 or 2024 Ecological and archaeological periodically across 12-to-24-month duration Q2/2 2022 or 2023 Oceanographic and metocean fixed 12-to-36-month period Q2/2 2022 or 2023	Consultation	Possible	No

4.3.1 Reef habitat at Rockabill to Dalkey Island SAC

There is a spatial overlap between the proposed foreshore licence area and the Braymore Point and Mainstream site investigations areas and as such there is the potential for in-combination effects on reef habitats. Mitigation measures have been proposed for the NISA site investigation works that avoid any direct interaction between intrusive works and reef habitat (see **Section 4.2.1.1**). In addition, the supporting documentation for Braymore Point states that the survey has been designed to avoid locating intrusive seabed stations on areas of reef (see Braymore Point Foreshore License Application for Marine Survey Work – Supporting Document, section 4.2.1.1). Screening for AA/NIS documents for the Mainstream site investigations are not yet available.

There is a small partial overlap between the proposed foreshore licence area and the Celtix Connect cable installation project (0.017 km^2, see NIS Table 5-3). The Celtix Connect installation area crosses Rockabill to Dalkey Island SAC in an east to west manner and as such has the potential to impact reef habitat within the SAC. The Celtix Connect stage 1 screening for appropriate assessment states that the location of reef habitat has not been identified within the installation corridor during desk-based reviews and marine surveys, but should reef be subsequently identified, the cable will be micro-routed within the corridor to avoid reef areas through the SAC (see Alcatel Submarine Networks – Stage 1 screening for appropriate assessment, Table 5-3).

It is considered that if the mitigation measures mentioned above are adequately implemented, in-combination effects on reef habitats will not occur.

4.3.2 Special Protection Areas

Potential cumulative effects on Rockabill SPA and Skerries Islands SPA may occur from overlap (spatial and/or temporal) of the proposed works with other nearby projects that lead to overwater noise disturbance and/or displacement of prey biomass.

RPS's Stage 1 Screening for AA concluded that, given the nature of the surveys and the existing background activity in the region, it is highly unlikely that overwater noise from the proposed works would disturb nesting birds beyond 2 km. Projects within an approximate distance of 2km of the SPAs are:

For Rockabill SPA:

- NISA Array site investigations
- Mainstream site investigations

For Skerries Islands SPA:

- Celtix Connect telecoms cable installation
- NISA Array site investigations
- Mainstream site investigations

The Stage 1 Screening for AA for the Celtic Connect cable project concluded that for the Skerries Islands SPA, the activities are temporary events which will not significantly reduce the feeding opportunities or natural range of cormorant and shag. Cable installation and maintenance activities are not expected to reduce the range or effect the population dynamics of either cormorant or shag breeding Island, ensuring the conservation objectives for the site are maintained (Alcatel Submarine Networks, 2019). The cable installation is projected to last seven days, therefore the likelihood of temporal overlap with the proposed NISA cable route site investigations is low.

The Stage 1 Screening for AA for the NISA site investigations concluded that there was no potential for likely significant effects to the special conservation interests of the Rockabill SPA or Skerries Islands SPA from disturbance effects. This was based on the nature, short duration and limited emissions of the surveys (Statkraft, 2020). It is likely that site investigation surveys for the NISA array and cable route areas will occur sequentially as part of one survey campaign, and therefore it is considered unlikely that there will be in-combination effects.

Application documents such as the AA Screening and NIS are not yet available for the Mainstream site investigations.

It is considered unlikely that all of the projects included in this in-combination assessment would be undertaken at the same time on the basis of the different stages they are all at in the consenting process and due to the potential for impairment of data collection. The works required close to Rockabill SPA and Skerries Islands SPA will be of short-term duration and temporary in nature for each of the projects. Therefore, circumstances where vessel related activities were occurring at the same time within the disturbance range of the SPAs, resulting in in-combination disturbance effects on breeding birds which are SCIs of the SPAs, is considered unlikely. No adverse effect on the integrity of the Rockabill SPA or Skerries Islands SPA are predicted either alone or in combination with other plans or projects.

4.3.3 Marine Mammal SACs

Cumulative effects on marine mammals may occur if there is an overlap (spatial and/or temporal) between any of the projects identified in **Table 4.14** and the proposed site investigations.

A temporal overlap between two or more projects may potentially lead to displacement and/or barrier effect that may reduce access to marine mammals' preferred foraging areas.

The Stage 1 screening for AA undertaken for the Celtix Connect project (Alcatel Submarine Networks, 2019) concluded that there was no potential for likely significant effects to marine mammal QIs of SACs as a result of the cable installation works on the basis of the temporary nature of the project (seven days) and the limited impact range (130 m) associated with the works. Given the short duration of the Celtix Connect works, a temporal overlap is considered highly unlikely.

The Stage 1 Screening for AA for the Braymore Point site investigations concluded that there will be no potential for likely significant effects from underwater noise for any European site on the basis of the small zones of impact and the adherence to best practice and the DAHG (2014) guidelines. Similarly, the AA reports published with the determination of the Foreshore Licences for the Cooley Point and Clogherhead site surveys concluded that significant impacts on all relevant European sites with marine mammal QIs were not likely and these were screened out from further assessment. The AA reports for both Cooley Point and Clogherhead stated that the DAHG (2014) guidelines will be implemented, including the employment of a Marine Mammal Observer.

The AA for NISA offshore windfarm array site stated that the DAHG (2014) guidelines will be implemented, including the presence of an MMO for pre-survey monitoring and the use of soft start/ramp up procedures.

The supporting documentation for the RWE Dublin Array site investigations states that all geophysical and geotechnical surveys will be undertaken in accordance with the DAHG (2014) guidelines, including the presence of MMOs for pre-survey monitoring, and the use of soft start/ramp up procedures.

Application documents such as the AA Screening and NIS are not yet available for the Mainstream site investigations.

It is considered that as all projects have committed to implementing the above mitigation measures, that additional TTS or PTS are likely to occur as a result of a potential temporal overlap between the proposed works and any of the above projects. It is highly unlikely that a spatial overlap or even nearby temporal overlap would occur between two or more geophysical surveys, as data acquisition can be impaired if surveys occur concurrently, therefore the likelihood of an overlap between these projects is in reality very low. Therefore, circumstances where noise producing activities will occur at the same time, resulting in in-combination underwater noise disturbance effects on individuals of species of marine mammals which are qualifying interests of SACs, are considered unlikely.

4.3.3.1 Mitigation

Assuming that the projects would not occur concurrently, the combined mitigation measures for the proposed works and those outlined for other projects (adherence to DAHG (2014) guidelines by implementation of soft starts and MMO) will ensure that there will be no adverse effects to the conservation objectives of the marine mammal qualifying interests of any European site.

In the NIS, the applicant committed to engagement with the holders of the Braymore Point foreshore licence to ensure that surveys are scheduled in such a way as to mitigate against harmful effects to marine mammals, including ensuring that activities are a sufficient distance apart to prevent in-combination effects. It is noted that since the submission of this application, a further site investigation application has been made by Mainstream, and it is recommended that engagement includes all potential licence holders for site investigations which overlap spatially with the proposed survey.

It is noted the Marine Institute recommend that DHLGH should identify any similar geophysical surveys that may be carried out along the east coast and that they should not coincide with this survey so as to avoid potential cumulative effects on marine mammals. It is therefore recommended that, if possible, the DHLGH maintains a strategic overview of the timing of site investigations in the Irish Sea as a precautionary measure to avoid potential temporal overlaps between adjacent projects.

4.3.4 SACs designated for otter

River Boyne and River Blackwater SAC was brought forward to Stage 2 AA for potential effects to otter. As discussed in **Section 4.2.4**, otters are territorial and tend to forage along the shoreline. They do not tend to forage further away than a few hundred metres from their usual habitat or more than 80m away from the shoreline (NPWS, 2009). It is therefore highly unlikely that otter that are QIs of River Boyne and River Blackwater SAC would be present within the potential zone of injury or disturbance of any of the projects that were considered for in-combination effects. As such it is considered that there is no potential for in-combination effects to otter QIs of this SAC from noise underwater noise disturbance.

4.3.5 SACs designated for migratory fish

Cumulative effects on migratory fish may occur if there is an overlap (spatial and/or temporal) between any of the projects identified in **Table 4.14** and the proposed site investigations.

As all the projects that may overlap with the proposed works have committed to implement soft start/ramp up procedures and given the localised and temporary nature of site investigation and cable laying works, it is considered that these projects are unlikely to lead to TTS/PTS on migratory fish if they occur in-combination with the proposed works. It is also considered unlikely that all of the projects included in this in-combination assessment would be undertaken at the same time on the basis of the different stages they are all at in the consenting process and due to the potential for impairment of data collection.

The applicant does not outline specific mitigation measures for impacts to migratory fish from underwater noise, however, observations from IFI recommended the following measures:

- Engaging with Braymore Point site investigation surveys on mitigation measures.
- Mitigation measures in regard to the timing of works and levels and duration of noise generation should be agreed with the foreshore division of DHLGH and form part of any foreshore licence and should cover use of soft-start and ramp-up procedures for sound generating surveys, bringing the duration of noise generating surveys to a minimum necessary and agree the timing of works so that it does not interfere with migration times or with any scientific studies currently taking place in the foreshore licence application area.

As advised by the IFI, a precautionary approach should be undertaken to prevent or minimise impacts on migratory fish. The applicant stated in the NIS that soft-start procedures will be used to ensure minimal disturbance to marine mammals. In the absence of high-quality species-specific data on impacts of anthropogenic noise on fish, the implementation of soft start procedures as best practice would in theory also mitigate potential impacts on fish species. The applicant did not confirm in its response that survey works will take place outside migration times. River lamprey migration is unlikely to overlap spatially with the proposed site investigations and although the exact migration route of Atlantic salmon from the SAC is unknown, it is considered highly precautionary to avoid surveying during their migration, given the intervening distance between the survey location and the SAC. This is a recommended condition set out by the IFI and as such it is recommended that the DHLGH consult further with the IFI on this matter.

4.4 Assessment of Impacts on the Integrity of European Sites

From the 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 (EC, 2002), the meaning of integrity is described as follows:

> *'The integrity of a site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives' (MN2000, paragraph 4.6(3))'.*

Site specific conservation objectives have been prepared for each European site, where available, and are summarised in **Table 4.1** to **Table 4.8**.

From the information gathered and the predictions made about the changes that are likely to result from the construction and operation stages of the project, the integrity of site checklist is completed for the European sites screened in for AA in **Table 4.15** below.

Table 4.15 Integrity of European sites checklist

	European Sites				
Does the project have the potential to:	**Reefs(Rockabill to Dalkey Island SAC)**	**Birds (Rockabill SPA and Skerries Islands SPA)**	**Marine mammals(Rockabill to Dalkey Island SAC, Lambay Island SAC, North Anglesey Marine/Môn Forol SAC, Murlough SAC, North Channel SAC, Strangford Lough SAC)**	**Otter (River Boyne and River Blackwater SAC)**	**Migratory fish (River Boyne and River Blackwater SAC)**
Cause delays in progress towards achieving the conservation objectives of the site?	No. Site is currently in favourable condition and potential effects will be mitigated by micrositing survey works to avoid areas of reef habitat	No. The SCI species of Rockabill SPA are currently in favourable conservation condition. No species-specific conservation condition assessment is available for Skerries Islands SPA. Disturbance and prey availability effects on seabirds will be avoided through the avoidance of nesting season.	No. The sites are currently in favourable condition, except for Strangford Lough SAC where harbour seal is in unfavourable declining condition. It is considered that with mitigation measures in place, surveys will not cause any changes in the condition of supporting habitats or the availability of foraging sites or prey. Strangford Lough is located 71.9km from the proposed works and due to the intervening distance, it is considered that the surveys will not significantly affect harbour seal's access to foraging areas.	No. Otter are in favourable conservation condition and due to the distance between the proposed works and the SAC, otters from the SAC are highly unlikely to be present in the survey area. The viability of otter at the SAC will not be affected by the proposed works.	No. Atlantic salmon and river lamprey at River Boyne and River Blackwater SAC are in unfavourable condition. The proposed surveys are unlikely to overlap with river lamprey spawning and nursery habitat and therefore will not delay progress towards achieving the conservation objectives. While migration routes of Atlantic salmon are unknown, it is highly unlikely that these temporary surveys will cause further delays in achieving the conservation objectives.
Interrupt progress towards achieving the conservation objectives of the site?	No. Site is currently in favourable condition and potential effects will be mitigated by micrositing survey works to avoid areas of reef habitat	No. Disturbance and prey availability effects on seabirds will be avoided through the avoidance of nesting season.	No. It is considered that with mitigation measures in place, surveys will not lead to changes in population composition or adverse levels of disturbance to marine mammals or change the sites'	No. Otter are currently in favourable condition at the site and are highly unlikely to travel to the proposed foreshore licence area. Otter will remain a	No. Atlantic salmon and river lamprey at River Boyne and River Blackwater SAC are in unfavourable condition. The

	European Sites				
Does the project have the potential to:	**Reefs(Rockabill to Dalkey Island SAC)**	**Birds (Rockabill SPA and Skerries Islands SPA)**	**Marine mammals(Rockabill to Dalkey Island SAC, Lambay Island SAC, North Anglesey Marine/Môn Forol SAC, Murlough SAC, North Channel SAC, Strangford Lough SAC)**	**Otter (River Boyne and River Blackwater SAC)**	**Migratory fish (River Boyne and River Blackwater SAC)**
			ability to provide suitable habitat and prey.	viable component of the River Boyne and River Blackwater SAC.	proposed surveys are unlikely to overlap with river lamprey spawning and nursery habitat and therefore will not delay progress towards achieving the conservation objectives. While migration routes of Atlantic salmon are unknown, it is highly unlikely that these temporary surveys will interrupt in achieving the conservation objectives.
Disrupt those factors that help to maintain the favourable conditions of the site?	No. Habitat area, distribution and community structure will remain unchanged as reef habitats will be completely avoided during survey works.	No. As the surveys will be temporary in nature and the nesting season will be avoided, it is considered that the factors that contribute to the favourable condition of the SCI species (access to foraging and nesting grounds, prey availability, preservation of breeding behaviour and sites) will not be affected.	No. It is considered that with mitigation measures in place, that surveys will not lead to changes in the sites' ability to provide suitable habitat and prey to marine mammals.	No. Due to the distance between the SAC and the proposed foreshore licence area (14.7km) otter habitat or prey availability at the SAC will not be affected.	N/A. Atlantic salmon and river lamprey are in unfavourable condition in River Boyne and River Blackwater SAC and conservation objectives for these species are to restore the favourable condition.
Interfere with the balance, distribution and density of key species that are the indicators	No. Habitat area, distribution and community structure will remain unchanged as reef	No. As the surveys will be temporary in nature and the nesting season will be avoided, it is considered that the factors	No. With the implementation of mitigation, the potential for marine mammals to be present in the potential zone of injury or	No. Due to the distance between the SAC and the proposed works (14.7km) otter habitat	No. The proposed surveys will not interfere with any

Does the project have the potential to:	European Sites Reefs(Rockabill to Dalkey Island SAC)	Birds (Rockabill SPA and Skerries Islands SPA)	Marine mammals(Rockabill to Dalkey Island SAC, Lambay Island SAC, North Anglesey Marine/Môn Forol SAC, Murlough SAC, North Channel SAC, Strangford Lough SAC)	Otter (River Boyne and River Blackwater SAC)	Migratory fish (River Boyne and River Blackwater SAC)
of the favourable condition of the site?	habitats will be completely avoided during survey works.	that contribute to the favourable condition of the SCI species (access to foraging and nesting grounds, prey availability, preservation of breeding behaviour and sites) will not be affected and the abundance and distribution breeding birds will not be affected.	disturbance will be significantly reduced. Measures will be implemented to detect marine mammals pre-survey and to encourage them to leave prior to surveys beginning. The timing of the works will minimise different projects happening concurrently which should minimise displacement. Any significant interference with the density and distribution of marine mammals is considered unlikely.	or prey availability at the SAC will not be affected.	key indicator species.
Cause changes to the vital defining aspects (e.g., nutrient balance) that determine how the site functions as a habitat or ecosystem?	No. Reefs are subject to strong tidal currents with an abundant supply of suspended matter, leading to high faunal diversity. The hydrodynamics of the site will not be affected by the site investigation surveys.	No. Disturbance and prey availability effects on seabirds will be avoided through the avoidance of nesting season. There will be no change to habitat or ecosystem functioning.	There will be no change to habitat or ecosystem functioning.	There will be no change to habitat or ecosystem functioning.	There will be no change to habitat or ecosystem functioning.
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	Reef fauna depends on strong tidal currents and abundant suspended matter, which will not be affected by the proposed works.	No. Breeding sites will not be disturbed and any displacement of prey will be minimal, temporary and will not affect overall prey biomass availability to SCI species.	No. There will be no impacts capable of changing relationships that define the structure or function of the sites.	No. There will be no impacts capable of changing relationships that define the structure or function of the site	No. There will be no impacts capable of changing relationships that define the structure or function of the site.
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No. Reefs are subject to strong tidal currents with an abundant supply of suspended matter, leading to high faunal diversity. The hydrodynamics of the site will	No. The survey works will not affect the terrestrial portions of the SPA and will not affect the hydrodynamics of the marine portions of the SPA.	No. There will be no impacts that interfere with predicted or expected natural changes at the sites.	No. There will be no impacts that interfere with predicted or expected natural changes at the site.	No. There will be no impacts that interfere with predicted or expected natural changes at the site.

Does the project have the potential to:	European Sites Reefs(Rockabill to Dalkey Island SAC)	Birds (Rockabill SPA and Skerries Islands SPA)	Marine mammals(Rockabill to Dalkey Island SAC, Lambay Island SAC, North Anglesey Marine/Môn Forol SAC, Murlough SAC, North Channel SAC, Strangford Lough SAC)	Otter (River Boyne and River Blackwater SAC)	Migratory fish (River Boyne and River Blackwater SAC)
	not be affected by the site investigation surveys.				
Reduce the area of key habitats?	No. Reef habitat will be avoided during the proposed works through micro-siting of sampling locations.	No. The survey works will be temporary in nature and no habitats will be permanently affected. Marine sedimentary habitats affected by intrusive surveys are considered relatively resilient and likely to recover.	No. The survey works will be temporary in nature and no habitats will be permanently affected. Marine sedimentary habitats affected by intrusive surveys are considered relatively resilient and likely to recover.	No. The survey works will be temporary in nature and no habitats will be permanently affected. Marine sedimentary habitats affected by intrusive surveys are considered relatively resilient and likely to recover.	No. The survey works will be temporary in nature and no habitats will be permanently affected. Marine sedimentary habitats affected by intrusive surveys are considered relatively resilient and likely to recover.
Reduce the population of key species?	No. Reef habitat will be avoided during the proposed works through micro-siting of sampling locations	No. As the surveys will be temporary in nature and the nesting season will be avoided, it is considered that the factors that contribute to the favourable condition of the SCI species (access to foraging and nesting grounds, prey availability, preservation of breeding behaviour and sites) will not be affected and the numbers, abundance and distribution breeding birds will not be affected.	No. Measures will be implemented to detect marine mammals pre survey and encourage them to leave the area prior to surveys commencing as such no permanent injury to marine mammals is expected. Any significant reduction in access to prey and foraging areas is also not expected and as such any population-level impacts are highly unlikely.	No. Otter are currently in favourable condition at the site and are highly unlikely to travel to the proposed foreshore licence area (14.7km distance). No population-level impacts will occur.	No. The proposed surveys will not reduce the populations of river lamprey or Atlantic salmon.
Change the balance between key species?	No. Reef habitat will be avoided during the proposed works through micro-siting of sampling locations	No. As the surveys will be temporary in nature and the nesting season will be avoided, it is considered that the factors that contribute to the favourable condition of the SCI species	No. There will be no change in the balance between key species.	No. There will be no change in the balance between key species.	No. There will be no change in the balance between key species.

Does the project have the potential to:	European Sites Reefs(Rockabill to Dalkey Island SAC)	Birds (Rockabill SPA and Skerries Islands SPA)	Marine mammals(Rockabill to Dalkey Island SAC, Lambay Island SAC, North Anglesey Marine/Môn Forol SAC, Murlough SAC, North Channel SAC, Strangford Lough SAC)	Otter (River Boyne and River Blackwater SAC)	Migratory fish (River Boyne and River Blackwater SAC)
		(access to foraging and nesting grounds, prey availability, preservation of breeding behaviour and sites) will not be affected and the abundance and distribution breeding birds will not be affected.			
Reduce diversity of the site?	No. Reef habitat will be avoided during the proposed works through micro-siting of sampling locations	No. As the surveys will be temporary in nature and the nesting season will be avoided, it is considered that the factors that contribute to the favourable condition of the SCI species (access to foraging and nesting grounds, prey availability, preservation of breeding behaviour and sites) will not be affected and the abundance and distribution breeding birds will not be affected.	No. The surveys will be temporary and mitigation measures will ensure that any temporary displacement effects are minimised. There is no pathway that could permanently reduce marine mammal diversity.	No. Due to the marine nature of the project and distance from this SAC, there will be no interaction between the proposed works and QIs of the site. No pathway has been identified that could reduce diversity.	No. Due to the marine nature of the project and distance from this SAC, there will be no overlap between the proposed works and the site. No pathway has been identified that could reduce diversity.
Result in disturbance that could affect population size or density or the balance between key species?	No. Reef habitat will be avoided during the proposed works through micro-siting of sampling locations	No. As the surveys will be temporary in nature and the nesting season will be avoided, it is considered that the factors that contribute to the favourable condition of the SCI species (access to foraging and nesting grounds, prey availability, preservation of breeding behaviour and sites) will not be affected and the abundance and distribution breeding birds will not be affected.	No. The surveys will be temporary in nature and mitigation will has been proposed to avoid direct impacts on QI habitats as well as to minimise displacement of marine mammals and fish.	No. Otter are currently in favourable condition at the site and are highly unlikely to travel to the proposed foreshore licence area (14.7km distance). Due to the distance and the marine nature of the survey works, no impact pathway has been identified that would affect key species at the site.	No. Due to the marine nature of the project and distance from this SAC, there will be no overlap between the proposed works and the site. No pathway has been identified that could affect population size, density or balance between key species at the site.

	European Sites				
Does the project have the potential to:	**Reefs(Rockabill to Dalkey Island SAC)**	**Birds (Rockabill SPA and Skerries Islands SPA)**	**Marine mammals(Rockabill to Dalkey Island SAC, Lambay Island SAC, North Anglesey Marine/Môn Forol SAC, Murlough SAC, North Channel SAC, Strangford Lough SAC)**	**Otter (River Boyne and River Blackwater SAC)**	**Migratory fish (River Boyne and River Blackwater SAC)**
Result in fragmentation?	No. The proposed works are temporary in nature. Reef habitat will be avoided during the proposed works through micro-siting of sampling locations.	No. The proposed works are temporary in nature and will not lead to site or habitat fragmentation.	No. The surveys will be temporary in nature and, as outlined above, will not result in habitat or species population fragmentation	No. Fragmentation of habitats will not occur due to the distance between the proposed foreshore licence area and the site. Fragmentation of species is not expected, and as outlined above, population level impacts are not expected.	No. Fragmentation of habitats will not occur due to the distance between the proposed foreshore licence area and the site.
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc.)?	No. The hydrodynamics of the site will not be affected and reef habitat will be avoided through micrositing of sampling locations.	No. The proposed works are temporary in nature and will not lead to permanent loss of reduction of key features such as nesting or foraging grounds.	No. the proposed works are temporary in nature and will not lead to permanent loss of reduction of key features such as nesting or foraging grounds.	No. as outlined above, there is no impact pathway between the proposed works and the SAC that would result in any loss or reduction of key features.	No. There is no interaction between the project and key features of these sites.

4.5 Observations and Submissions

Consultations are described in detail in Section 4 of the accompanying Screening for Environmental Impact Assessment Technical Review carried out by RPS on behalf of DHLGH. Of relevance for this AA report are the observations from the IFI, the Marine Institute and the NPWS. A summary of these observations is provided in Section 3.2 of the screening for appropriate assessment technical review (Doc. MGE0778RP0024).

4.5.1 Inland Fisheries Ireland

In their statutory observation on the 16 August 2021, the IFI a number of observations which are relevant to the AA process, namely:

- The mitigation measures to engage with Braymore Point operators are welcomed with every effort to reduce the impact on the local fish population.
- Sound generation and transmission during the proposed surveys has the potential to propagate into the migration paths of diadromous fish species.
- Mitigation measures in regard to the timing of works and also in regard to levels and duration of noise generation and potential for adverse impact on fish species should be agreed with the foreshore division of DHLGH and form part of any foreshore licence. The mitigation measures and guidance of NPWS with regards to marine mammals are not transferrable to fish species.
- Mitigation measures should aim to reduce the sound generated, in intensity and duration.
- Seasonality of the sampling and a short sampling window may provide mitigation
- Mitigations should cover:
  - The use of soft-start and ramp-up procedures for any sound generating surveys undertaken – both on a day-to-day basis and on restart after any stoppages within any day
  - Duration of any noise-generating surveys to be reduced to the minimum necessary to collect results of sufficient quality
  - Agreed timing of works so as not to interfere with migration times of fish life stages or with scientific studies currently in place in the proposed survey area.

4.5.2 National Parks and Wildlife Service

In their statutory observation on the 21 September 2021, the National Parks and Wildlife Service (NPWS) stated that they concur with the conclusion of the applicant's NIS that the proposed works are unlikely to pose a significant risk to nature conservation, and recommended that:

- "Potential interaction with marine mammals can be ameliorated by the application of "Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters"; and
- The mitigation outlined in section 6.2 of the NIS be implemented in full.

4.5.3 Marine Institute

In their statutory observation on the 14th September 2021, the Marine Institute stated they are satisfied that the measures proposed within the NIS, including a soft start protocol and the use of marine mammal observers, are sufficient to mitigate any risk to marine mammals. The Marine Institute also advised that any other similar surveys should not be carried out concurrently so as to avoid cumulative effects on marine mammals. The Marine Institute recommended a number of conditions – the following are of relevance to the present NIS:

- The licensee shall use that part of the foreshore the subject matter of this licence for the purposes outlined in the application and for no other purposes whatsoever.
- The licensee shall ensure that the works are carried out and completed in accordance with the plans and particulars lodged with the application.

- The licensee will engage the services of a MMO who will ensure the protocols specified in the marine mammal mitigation plan are fully implemented.

4.6 Mitigation Measures

The applicant has committed to a number of mitigation measures in the NIS and in the subsequent NISA Annex IV Risk Assessment. These mitigation measures have been assessed as part of the AAs in Chapter 4 and Table 4.16 provides an assessment matrix as a means of summarising the mitigation measures proposed in the NIS as well as additional measures proposed by statutory consultees.

Table 4.16 Mitigation Measures Matrix

List measures to be introduced	Summary of measure	Explain how the measures will avoid the adverse effects on the integrity of the site.	Explain how the measures will reduce the adverse effects on the integrity of the site.	Provide evidence of how they will be implemented and by whom.
Exclusion of reef features from extractive survey locations	• Analysis of geophysical data will be used to select geotechnical and ecological sampling locations • The number of sampling locations will be kept to a minimum necessary • Pre-sampling visual inspection of sampling location with underwater camera/ROV to confirm presence or absence of Annex I habitats and subsequent repositioning of sampling location if reef habitat identified ahead of extractive survey activities, anchoring, placement of moorings for metocean services and positioning of CPODs. • Use of ROV in areas where intrusive sampling is not permitted due to environmental constraints Intertidal survey to be undertaken during daylight hours and sensitive species and habitats within the survey area to be identified, recorded and avoided during sampling.	This measure will ensure that no intrusive works will be undertaken within areas of reef habitat	N/A	Will be conditioned as part of foreshore licence
Seasonal restrictions	The sampling window will be minimised as far as practicable. In addition, the following seasonal restrictions will apply: Avoidance of bird nesting seasons: • No geotechnical or benthic site investigation activities will be undertaken within the nesting seasons of terns (SCI species of Rockabill SPA) (April to August inclusive) Avoidance of fish migration seasons: • To be agreed with IFI based on their recommendations: No site investigation activities will be undertaken during the migration times of Atlantic salmon and river lamprey. The proposed timing of the site investigations must be previously agreed with the Foreshore Division of DHLGH.	These restrictions will avoid the sensitive nesting seasons of birds at Rockabill SPA and Skerries Island SPAs, and the migration seasons of Atlantic salmon and river lamprey (if mitigation is deemed appropriate).	N/A	Will be conditioned as part of foreshore licence

FS007358 Statkraft North Irish Sea Array (NISA) Site Investigations for Export Cable Route

List measures to be introduced	Summary of measure	Explain how the measures will avoid the adverse effects on the integrity of the site.	Explain how the measures will reduce the adverse effects on the integrity of the site.	Provide evidence of how they will be implemented and by whom.
DAHG (2014) mitigation procedures for geophysical and geotechnical survey followed by suitable qualified Marine Mammal Observer (MMO)	Geophysical and geotechnical surveys A 30-minute watch for marine mammals will be conducted prior to the start of operations. If a marine mammal is sighted within 500 m of the vessel, start-up will be delayed until the animal is outside the 500m zone. Following the pre-start watch, the ramp-up/soft start procedure outlined in Section 4.3.4 (ii) of DAHG (2014) will be followed. The above procedure will be repeated if there is a break in sound output for longer than 30 minutes. Note that use of PAM as a method of pre-start monitoring should be agreed with NPWS.	The MMO will ensure that no marine mammals are within the mitigation zone prior to geophysical operations commencing. The ramp-up procedure will allow fish and marine mammals to leave the potential zone of injury before full power output. The MMO will ensure that no marine mammals are within the mitigation zone prior to surveys commencing	N/A	Will be conditioned as part of foreshore licence. Full reporting on MMO operations and mitigation undertaken must be provided to the Regulatory Authority.
Engagement with other licence applicants or licence holders	The applicant will engage with the licence holders for the following projects, to ensure that no temporal overlap between two or more projects occurs: Braymore Point (FS006973) Cooley Point (FS006852) Clogher Head (FS006787) Mainstream (FS007373) ESB Sea Stacks (FS007134) RWE renewables (FS007188).	This will ensure that there is no potential for cumulative disturbance or displacement effects to marine mammals, seabirds and migratory fish as a result of a temporal overlap between projects.		Will be conditioned as part of foreshore licence, if appropriate.

5 DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS

5.1 Discussion

The applicant's NIS identified and described the likely significant effects of the proposed works on the existing environments of the following European sites:

- Rockabill SPA
- Rockabill to Dalkey Island SAC
- Lambay Island SAC
- River Boyne and River Blackwater SAC

This AA technical review assessed likely significant effects on the above sites and the following additional site:

- Rockabill SPA
- Rockabill to Dalkey Island SAC
- Skerries Islands SPA
- Lambay Island SAC
- River Boyne and River Blackwater SAC
- North Anglesey Marine / Gogledd Môn Forol SAC
- Murlough SAC
- North Channel SAC
- Strangford Lough SAC

The impact of the proposed site investigations on the conservation objectives of the above sites alone and in-combination with other plans or projects was assessed. The NIS sets out specific mitigation measures, considered to be industry best practise, which will avoid and reduce the potential impacts. A number of additional measures were proposed by statutory consultees and have been included in this assessment. All mitigation measures proposed are summarised in **Table 4.16**.

5.2 Recommended Licence Conditions

Based on this assessment and the conditions proposed by statutory consultees, RPS considers that the following conditions should be attached to any decision by the DHLGH to consent the proposed works. The purpose of these conditions is to avoid, reduce and offset any significant effects on European sites as a result of the proposed works. Conditions which do not relate specifically to European sites are recommended in the Environmental Report (MGE0078RP0025) carried out by RPS, which accompanies this report to DHLGH.

1. The following measures should be implemented by the licensee in order to avoid and/or reduce impacts to fish species from underwater noise generation:
    a. Use of soft-start/ramp-up procedures for any sound-generating surveys undertaken – both on a day-today basis and on re-start after any stoppages within any day.
    b. Duration of noise-generating surveys to be reduced to the minimum necessary to collect results of sufficient quality.
    c. Agree timing of works with Inland Fisheries Ireland so as not to interfere with migration times of fish life stage or with scientific studies currently in place in the proposed survey area.
2. The following measures should be implemented by the licensee in order to avoid and/or reduce impacts to marine mammals from underwater noise generation:

a. The licensee shall adhere to the project-specific guidance outlined in DAHG (2014) “Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters” and will ensure that a suitably qualified visual observer is present for the duration of all acoustic surveying to minimise risk to marine mammals in the local environment. A monitored zone of 1,000m should be surveyed for geophysical surveys, while a monitored zone of 500m should be surveyed for geotechnical surveys.

b. The licensee should consult with NPWS regarding the development of a marine mammal mitigation plan and regarding the use of acoustic monitoring. During site investigations, the marine mammal observer should ensure the protocols specified in the marine mammal mitigation plan are fully implemented.

3. In order to avoid impact on sensitive reef habitat, the following measures should be implemented during intrusive geotechnical and grab sampling:

   a. Analysis of geophysical data will be used to select geotechnical and ecological sampling locations

   b. The number of sampling locations will be kept to a minimum necessary

   c. Pre-sampling visual inspection of sampling location with underwater camera/ROV to confirm presence or absence of Annex I habitats and subsequent repositioning of sampling location if reef habitat identified ahead of extractive survey activities, anchoring, placement of moorings for metocean services and positioning of CPODs.

4. In order to avoid impact on nesting birds at Rockabill SPA, the period 01 April to 31 August of any year should be avoided.

5. In order to avoid the potential for cumulative impacts on marine mammals, seabirds and migratory fish, the applicant will engage with other licence holders for the following projects to ensure that no temporal overlap between two or more projects occurs.

5.3 Conclusion

It can be concluded beyond reasonable scientific doubt that the proposed NISA site investigation works, individually or in combination with other plans or projects will not have adverse effects on the integrity of the following European sites:

- Rockabill SPA
- Rockabill to Dalkey Island SAC
- Lambay Island SAC
- River Boyne and River Blackwater SAC
- North Anglesey Marine / Gogledd Môn Forol SAC
- Murlough SAC
- Strangford Lough SAC
- North Channel SAC
- Skerries Islands SPA

It is noted that the Minister for the DHLGH’s formal determination shall not be prejudiced by this review.

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