

# SCREENING FOR APPROPRIATE ASSESSMENT

FS007062 SEAI SAIPEM Site Investigation for Floating Offshore Wind  
Testing at AMETS Mayo

MGE0778RP0010  
SEAI SAIPEM Site  
Investigation  
Screening for AA  
F02  
26 August 2022

## REPORT

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GMcE

26 August 2022

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# 1 INTRODUCTION

## 1.1 Project Overview

SAIPEM in partnership with the Sustainable Energy Authority of Ireland (SEAI) have submitted a foreshore licence application for site investigations at the Atlantic Marine Energy Test Site (AMETS) off the coast of County Mayo. SAIPEM and SEAI, as part of a consortium, intend to apply for a foreshore licence to deploy a single floating offshore wind (FOW) turbine at AMETS as part of the AFLOWT project – Accelerating market update of Floating Offshore Wind Technology. SEAI was granted a foreshore lease in 2015 to test wave energy devices at AMETS, however, there are currently no wave energy technologies suitable for testing at this site.

The AFLOWT project will involve the installation of a FOW turbine up to 6MW, electrical subsea cable and ancillary equipment. Deployment is intended in 2022/2023, subject to consenting for the project.

Site investigations are required before a detailed design can be completed and will inform the environmental assessments required for the AFLOWT licence application. The proposed SI activities are multi-beam echo sounder (MBES), side-scan sonar (SSS), sub-bottom profiling (SBP), cone penetration testing (CPT) and benthic sampling of subtidal and intertidal sediments.

The SI works are due to take place between May and September subject to suitable weather windows and will take a month to complete. It is anticipated that subtidal benthic sampling will be undertaken in 3-4 days, while intertidal sampling will take place over a single tidal cycle.

## 1.2 Application Documents

The applicant submitted the following documents as part of the application:

- Application Form
- Foreshore Licence Map
- Site Location Map
- Schedule of Works
- AMETS Distance Summary
- Support Document
- Natura Impact Statement (NIS)

The above documents were considered as part of this review, in addition to observations from prescribed bodies (see **Section 2.2**).

## 1.3 Relevant Legislation

Under Article 6(3) of the EU Habitats Directive (92/43/EEC) and the Birds and Natural Habitats Regulations 2011 (S.I. 477 of 2011) as amended, project proponents are required to provide sufficient information to enable a designated public authority to undertake a Screening for Appropriate Assessment (AA) to determine whether or not the proposed project (either alone or in-combination with other projects) is likely to have significant effects on the conservation objectives of designated Natura 2000 (or European) sites<sup>1</sup>. Where significant effects of the project cannot be screened out, the public authority can request the project proponent to submit a Natura Impact Statement (NIS) to inform the AA for the project.

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<sup>1</sup> In Ireland, designated European sites include Special Areas of Conservation (SACs), designated due to their significant ecological importance for species and habitats protected under Annexes I and II respectively of the Habitats Directive, and Special Protected Areas (SPAs), designated for the protection of bird species protected under Annex I of the EU Birds Directive (Council Directive 2009/409/EEC).

In addition to the requirement to consider potential effects of a plan or project on Natura 2000 sites under Article 6(3) of the Habitats Directive, the Directive requires consideration of the potential effects on species listed under Annex IV of the Directive (termed Annex IV species). Under Article 12, Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas.

This technical review and assessment of the AA Screening Report has been undertaken with regard to the appropriate legislation, guidance and departmental circulars.

## 2 TECHNICAL REVIEW

### 2.1 Methodology

This technical review report presents the findings of the RPS review and assessment of SEAI SAIPeM's Foreshore Licence Application for undertaking site investigation activities at the AMETS, Co. Mayo. The Screening for AA was reviewed to assess whether it includes the following:

- Robust scientific information and analysis including the reasoning and justifications for the conclusion.
- Compliance with the tests and standards of AA as presented in European and national guidance.
- The assessment is carried out on the entirety of information submitted as part of consent application; and
- A robust scientific assessment on the likelihood of significant effects.

The European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) outlines the requirements for Screening for AA under Regulation 42(1) and 42(2), as follows:

- 42. (1) *A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site.*
- (2) *A public authority shall carry out a screening for Appropriate Assessment under paragraph (1) before consent for a plan or project is given, or a decision to undertake or adopt a plan or project is taken.*

### 2.2 Consultation Responses

Consultation responses are described in detail in section 2.2 of the accompanying Screening for EIA report, carried out by RPS on behalf of DHLGH. Of relevance for this Screening for AA report are the observations from Inland Fisheries Ireland (IFI) and National Parks and Wildlife Service (NPWS). These observations are described in detail in the Screening for EIA report and briefly summarised below.

#### 2.2.1 National Parks and Wildlife Service

NPWS recommended that the applicant reconsider the findings of their original AA Screening document and carry out a full AA. The applicant subsequently submitted a NIS containing the original AA Screening and an 'Appropriate Assessment' chapter, which has been used to inform this Screening for AA review and the Appropriate Assessment carried out on behalf of DHLGH.

#### 2.2.2 Inland Fisheries Ireland

IFI made a number of recommendations including the application of mitigation measures (soft-start procedures for any sound-generating surveys and a minimum duration for noise-generating surveys) and that a study of fish including migratory species that pass through the area should be carried out.

Mitigation specific to fish is not considered necessary as this Screening for AA concludes that there will be no likely significant effects to migratory Annex II fish species, however, measures to avoid adverse noise effects to marine mammals (i.e. soft starts) will be implemented and this will allow fish to react and move away from the sound source before it reaches full power.

### 2.3 Further Information Request

The initial RPS review determined that insufficient information had been provided to assess, in view of best scientific knowledge and in view of the conservation objectives of the European sites, whether the proposed site investigation activities, individually or in combination with other plans or projects, is likely to have a

significant effect on a Natura 2000 site, and further information was required to inform the Screening for AA determination, and subsequently the AA.

A Request for Further Information (RFI), in accordance with Regulation 42(3) of the European Communities (Birds and Habitats) Regulations 2011, as amended, was issued by the DHLGH to the applicant. The further information requested related to the details of underwater noise emissions from the proposed equipment, assessment of the likely significant effects of such emissions on mobile species and the provision of a complete in-combination assessment with other plans or projects.

SEAI provided a response to the request for further information, which is published on the DHLGH website.

The further information provided has been incorporated into this Screening for AA, and subsequent AA.

### 3 SCREENING FOR APPROPRIATE ASSESSMENT

#### 3.1 Screening for AA Checklist

As per the EU Guidelines (2002) the checklist below outlines the information necessary to complete the Screening for AA for the proposed project.

**Table 3.1: Information Checklist for the Appropriate Assessment**

Are these known or available?	Yes/No
Size, scale area, land-take, etc.	Yes. Information regarding extent and scale of the project can be found in Section 1.4 of the Application Form, Chapter 2 of the Support Document and Chapter 6 of the NIS document. The extent of the area to be surveyed is clearly presented in the Site location Map.
Project Sector	Yes. This project is in the marine survey sector.
Physical Changes that will flow from the Project (from excavation, piling, dredging etc.)	Yes. The only physical changes will be from removal of sediment for benthic sampling using a grab and intertidal sampling using a 0.01m <sup>2</sup> corer.
Resource Requirements	No. This information is not included in the application documents; however, it is unlikely that the project will require significant resources. The only resources required will be the use of water (freshwater and seawater), fuel for power generation selected chemicals on board the survey vessel, likely to be the Marine Institute <i>Celtic Explorer</i> and/or <i>Celtic Voyager</i> .
Emissions and Waste	No. Discharges from the survey vessels are expected to include treated domestic effluents (comprising grey water, sewage, and food waste) and surface drainage from decks. Atmospheric emissions from the survey vessel in transit are expected. Solid domestic and operational wastes, as are normally associated with shipping activities are not discussed or assessed in the NIS document.  Underwater noise emissions will be caused by acoustic signals emitted during the geophysical elements of the survey (sub-bottom profiling, side scan sonar and multibeam). Broad operating frequency ranges for these noise sources are provided in Section 6.1 of the NIS.
Transportation Requirements	Yes. Transportation of survey equipment will be on board the survey vessel, likely to be the Celtic Explorer.
Duration of Construction, Operation, Decommissioning etc.	Yes. This project consists of an operational phase, with no construction or decommissioning required. The Support Document states that survey duration will be one month.
Project Implementation Period	Yes. The geophysical and geotechnical elements of the site investigations are proposed to take place between May and September 2020, while the ecological elements are proposed to take place between June and August 2020. It is assumed that, if consented, these same implementation periods would apply in 2021.
Distance from Natura 2000 Site	Yes. The likely zones of influence (Zoi) of the project are described in Chapter 8 of the NIS. All Special Areas of Conservation (SAC) within 15 km of and Special Protection Areas (SPA) within 20 km of the proposed project are listed in Table 8.1 of the NIS. The distance of each site from the survey boundary has not been provided by the applicant but has been calculated for this report.
Cumulative Impacts with Other Projects or Plans	Yes. Cumulative impacts are considered in Chapter 14 of the NIS.
Other, as appropriate	A screening conclusion is provided in Chapter 10 of the NIS.



## 3.2 Management of the Natura 2000 Sites

The proposed site investigation activities are not directly connected with or necessary to the management of any European site.

## 3.3 Description of the Project

As outlined in section 1.1 above, the proposed project comprises site investigations, including geophysical, geotechnical and environmental elements, with the aim of informing the design and EIA of a floating offshore wind turbine at the AMETS, Co. Mayo. The geophysical survey will investigate bathymetry using MBES, seabed obstructions and features using SSS and composition of the seafloor using SBP. The geotechnical survey will investigate seabed properties using CPT and the environmental survey will investigate macrofauna, sediment particle size and organic matter utilising benthic grabs for subtidal sampling and cores for intertidal sampling. The SBP will be hull mounted and the CPT will be lowered using a crane at the stern of the vessel.

High resolution MBES will be used (proposed system is Kongsberg EM2040 or similar), emitting a frequency of 200 – 400 kHz. The SSS will emit acoustic signals in a frequency range of between 100 and 900 kHz. For the SBP survey, survey lines will be spaced at a maximum of 230 m. It is proposed that a chirper system in the 100 to 400 kHz frequency range will be utilised, but this is most likely to be used in the low frequency combination of 3.5/12 kHz.

A total of 12 CPTs will be carried out, six CPTs at two anchor locations. Grabs samples will be taken at 25 stations at random locations within Test Area A, Test Area B and the cable route, while 15 random control stations will be sampled outside of these locations. Six intertidal core stations are proposed to characterise the intertidal habitat at Belderra Strand. No significant underwater acoustic signal results from either CPT operation or environmental grab sampling.

Geophysical and geotechnical surveys will take place between May and September for approximately one month, subject to suitable weather windows and vessel availability. The survey vessel is likely to be the Celtic Explorer and/or Celtic Voyager. Grab sampling will be undertaken between June and August. Deeper grab sampling may be carried out in conjunction with geophysical and geotechnical surveys on the Celtic Explorer and/or Celtic Voyager, while the remainder of sampling will be carried out from a smaller licenced survey vessel (8m Rigid Hulled Inflatable).

## 3.4 Characteristics of the European Site

SACs within 15 km of the boundary of the proposed project and SPAs within 20 km were identified and listed in Table 8.1 in the NIS. The qualifying interests (QIs) of SACs and special conservation interests (SCIs) of SPAs are outlined in Table 8.2 of the NIS.

This approach, which is based on the guidelines set out by DEHLG (2009), does not screen in mobile species from European sites further than 15/20 km away which could theoretically interact with the proposed works area, e.g. seabirds, fish and marine mammals. A foraging range of 100 km is commonly observed for marine mammals and different species of seabird can forage considerable distances from their colonies, however, given the limited nature, size and duration of the proposed project, it is considered unlikely that there would be an impact pathway to such foraging species. In this case it is considered that 15 km and 20 km for SACs and SPAs, respectively, demonstrate an appropriate level of precaution.

SACs within 15 km and SPAs within a 20 km radius of the proposed project, and their respective QIs and SCIs are outlined in **Table 3.2** of this report, along with the closest straight-line distance from each European site to the Foreshore Site Investigation Area. The potential for connectivity with the proposed works is also assessed. Where connectivity is identified, potential sources of impacts are described. QIs and SCIs with no potential for connectivity are greyed out and not considered further in this screening assessment.

### 3.4.1 Special Areas of Conservation

Six SACs are identified within 15 km of the proposed project, however, the NIS states that two of these SACs, Erris Head SAC and Broadhaven Bay SAC, are outside of the zone of influence of the proposed project. Based on the project description, the proposed duration, and the scope of works relative to the location of these two sites and the nature of the QIs at these sites, it is considered reasonable to conclude

that there is no impact pathway for receptors at these sites and therefore they are outside of the zone of influence of the project.

Marine mammal QIs at West Connacht Coast SAC, Duvillaun Islands SAC and Inishkea Islands SAC are screened in for the assessment for likely significant effect due to the potential presence of these mobile species within the project area.

The NIS states that no Annex I habitats are considered to be within the zone of influence of the proposed project. This conclusion is made based on expert judgement and the reasoning is not clearly outlined. For the current review, RPS consulted the conservation objectives and supporting documents of the remaining SACs with habitat QIs, namely Inishkea Islands SAC and Mullet/Blacksod Bay Complex SAC, to provide context for this decision.

Mullet/Blacksod Bay Complex SAC is designated for a range of Annex I habitats, many of which are coastal in nature and as such, occur above the high water mark. There is no likely connectivity between the activities of the proposed project and habitats above the high water mark, therefore these habitats have not been screened in for assessment of likely significant effects. Additionally, several of the SAC's Annex I habitats occur only within Blacksod Bay and not along the west coast of the Mullet peninsula where the proposed surveys will take place. As a result, these habitats have also been excluded from the assessment due to a lack of connectivity. This review considers that there is potential for connectivity between the remaining Annex I habitats at Mullet/Blacksod Bay Complex SAC (Mudflats and sandflats not covered by seawater at low tide and reefs) and the proposed project, therefore these habitats have been screened in for assessment of likely significant effects.

The conservation objectives for Mullet/Blacksod Bay Complex SAC state that the favourable conservation condition of otter should be maintained, with a specific target of no significant decline in the extent of marine habitat for otter (NPWS, 2014a). Marine otter habitat is defined in the conservation objectives document as: *"...the area that otters tend to forage within 80 m of the shoreline (high water mark)."* As a precaution, otter should therefore be screened in for assessment of likely significant effect.

Following the provision of further information by the applicant regarding underwater noise impacts, Glenamoy Bog Complex SAC has been screened in for the assessment of likely significant effects to Atlantic salmon. There is no pathway to connectivity for the remaining terrestrial habitats and species, and as a result they have been excluded from Table 3.2 for brevity. No other SACs for migratory fish occur within 20 km of the project and although it is possible that fish from sites further away could pass through the area, it is highly unlikely that they would coincide with the proposed project.

In addition to grey seal, Inishkea Islands SAC is designated for the protection of machairs and petalwort, both of which occur above the high water mark, therefore there is no pathway for connectivity with the proposed project and these QIs have not been considered in the assessment of likely significant effects.

### 3.4.2 Special Protection Areas

Eight SPAs are identified in Table 8.1 of the NIS as being within 20 km of the proposed project. For the current review, the closest straight-line distances between the Foreshore Site Investigation Area and European sites were calculated, using the shapefile available for AMETS on [data.gov.ie](https://data.gov.ie). This confirmed that two of the SPAs identified in the NIS were in fact 24.1 km and 29.8 km from the Foreshore Site Investigation Area (Stags of Broad Haven SPA and Illanmaster SPA, respectively). A further three SPAs were identified within 30 km of the proposed project that were not identified in the NIS: Carrowmore Lake SPA (15.6 km), Doogort Machair SPA (20.8 km) and Owenduff/Nephin Complex SPA (21.9 km).

Due to the limited nature, size and duration of the proposed project, it is considered unlikely that there would be impact pathways to foraging SCIs from SPAs beyond 20 km. As a result, all SPAs further than 20 km from the proposed project have been screened out of assessment for likely significant effect.

Mullet SPA (1.9 km from the proposed project) is designated for corncrake, a species which does not forage in the foreshore area; therefore, Mullet SPA has been screened out of assessment for likely significant effect.

Carrowmore Lake SPA (15.6 km inland from the proposed project) is designated for the protection of Sandwich tern, however, the site synopsis states that the breeding colony is thought to have moved to an island in Broadhaven Bay (NPWS, 2015). As Sandwich tern at Blacksod Bay/Broad Haven SPA has been included in the assessment of likely significant effects, Carrowmore Lake SPA has been screened out.

Doogort Machair SPA (20.8 km from the proposed project) is designated for breeding dunlin, however, three SPAs closer to the proposed project (Blacksod Bay/Broad Haven SPA, Termoncarragh Lake and Annagh

Machair SPA, and Inishkea Islands SPA) are also designated for breeding dunlin. As it is more likely that dunlin present within the proposed project will be from these SPAs, Doogort Machair SPA has been screened out.

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**Table 3.2: European Sites and Qualifying Interests/Special Conservation Interests within Zone of Influence of Proposed Project**

Site Code	Site Name	Site Specific Conservation Objectives Yes/ No	Distance from Application Area(km)	Qualifying Interests / Special Conservation Interests	Potential for connectivity?	Screened in for Stage 1?	Potential source of impact?
002998	West Connacht Coast SAC	Yes	Within	Common Bottlenose Dolphin ( <i>Tursiops truncatus</i> )	Y	Y	Injury/disturbance from underwater noise
000470	Mullet/Blacksod Bay Complex SAC	Yes	Within	Mudflats and sandflats not covered by seawater at low tide	Y	Y	Habitat loss
				Large shallow inlets and bays	N	N	-
				Reefs	Y	Y	Habitat loss
				Salicornia and other annuals colonising mud and sand	N	N	-
				Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)	N	N	-
				Fixed coastal dunes with herbaceous vegetation (grey dunes)	N	N	-
				Atlantic decalcified fixed dunes ( <i>Calluno-Ulicetea</i> )	N	N	-
				Machairs	N	N	-
				Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	N	N	-
				Alkaline fens	N	N	-
				Otter ( <i>Lutra lutra</i> )	Y	Y	Physical disturbance
				Petalwort ( <i>Petalophyllum ralfsii</i> )	N	N	-
001501	Erris Head SAC	Yes	2.0	Vegetated sea cliffs of the Atlantic and Baltic coasts	N	N	-
				Alpine and Boreal heaths			
000472	Broadhaven Bay SAC	Yes	5.3	Mudflats and sandflats not covered by seawater at low tide	N	N	-
				Large shallow inlets and bays	N	N	-
				Reefs	N	N	-

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Site Code	Site Name	Site Specific Conservation Objectives Yes/ No	Distance from Application Area(km)	Qualifying Interests / Special Conservation Interests	Potential for connectivity?	Screened in for Stage 1?	Potential source of impact?
000507	Inishkea Islands SAC	Yes	6.7	Atlantic salt meadows ( <i>Glaucopuccinellietalia maritima</i> )	N	N	-
				Submerged or partially submerged sea caves	N	N	-
				Machairs	N	N	-
000495	Duvillaun Islands SAC	Yes	13.7	Grey Seal ( <i>Halichoerus grypus</i> )	Y	Y	Injury/disturbance from underwater noise
				Petalwort ( <i>Petalophyllum ralfsii</i> )	N	N	-
				Common Bottlenose Dolphin ( <i>Tursiops truncatus</i> )	Y	Y	Injury/disturbance from underwater noise
000500	Glenamoy Bog Complex SAC	Yes	16.3	Grey Seal ( <i>Halichoerus grypus</i> )	Y	Y	Injury/disturbance from underwater noise
				Atlantic salmon ( <i>Salmo salar</i> )	Y	Y	Injury/disturbance from underwater noise
004084	Inishglora and Inishkeeragh SPA	No	0.6	Storm Petrel ( <i>Hydrobates pelagicus</i> )	Y	Y	Disturbance (visual/noise)
				Cormorant ( <i>Phalacrocorax carbo</i> )			
				Shag ( <i>Phalacrocorax aristotelis</i> )			
				Barnacle Goose ( <i>Branta leucopsis</i> )			
				Lesser Black-backed Gull ( <i>Larus fuscus</i> )			
				Herring Gull ( <i>Larus argentatus</i> )			
				Arctic Tern ( <i>Sterna paradisaea</i> )			
004037	Blacksod Bay/Broad Haven SPA	Yes	0.8	Red-throated Diver ( <i>Gavia stellata</i> )	Y	Y	Disturbance (visual/noise)
				Great Northern Diver ( <i>Gavia immer</i> )			
				Slavonian Grebe ( <i>Podiceps auritus</i> )			
				Light-bellied Brent Goose ( <i>Branta bernicla hrota</i> )			
				Common Scoter ( <i>Melanitta nigra</i> )			
				Red-breasted Merganser ( <i>Mergus serrator</i> )			

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Site Code	Site Name	Site Specific Conservation Objectives Yes/ No	Distance from Application Area(km)	Qualifying Interests / Special Conservation Interests	Potential for connectivity?	Screened in for Stage 1?	Potential source of impact?
				<u>Ringed Plover (<i>Charadrius hiaticula</i>)</u> <u>Sanderling (<i>Calidris alba</i>)</u> <u>Dunlin (<i>Calidris alpina</i>)</u> <u>Bar-tailed Godwit (<i>Limosa lapponica</i>)</u> <u>Curlew (<i>Numenius arquata</i>)</u> <u>Sandwich Tern (<i>Sterna sandvicensis</i>)</u> <u>Dunlin (<i>Calidris alpina schinzii</i>)</u> <u>Wetland and Waterbirds</u>			
004093	Termoncarragh Lake and Annagh Machair SPA	No	1.3	<u>Whooper Swan (<i>Cygnus cygnus</i>)</u> <u>Barnacle Goose (<i>Branta leucopsis</i>)</u> <u>Corncrake (<i>Crex crex</i>)</u> <u>Lapwing (<i>Vanellus vanellus</i>)</u> <u>Chough (<i>Pyrrhocorax pyrrhocorax</i>)</u> <u>Greenland White- fronted Goose (<i>Anser albifrons flavirostris</i>)</u> <u>Dunlin (<i>Calidris alpina schinzii</i>)</u> <u>Wetland and Waterbirds</u>	Y	Y	Disturbance (visual/noise)
004227	Mullet Peninsula SPA	No	1.9	<u>Corncrake (<i>Crex crex</i>)</u>	No	No	-
004004	Inishkea Islands SPA	No	6.7	<u>Shag (<i>Phalacrocorax aristotelis</i>)</u> <u>Barnacle Goose (<i>Branta leucopsis</i>)</u> <u>Ringed Plover (<i>Charadrius hiaticula</i>)</u> <u>Sanderling (<i>Calidris alba</i>)</u> <u>Purple Sandpiper (<i>Calidris maritima</i>)</u> <u>Turnstone (<i>Arenaria interpres</i>)</u> <u>Common Gull (<i>Larus canus</i>)</u> <u>Herring Gull (<i>Larus argentatus</i>)</u> <u>Arctic Tern (<i>Sterna paradisaea</i>)</u> <u>Little Tern (<i>Sterna albifrons</i>)</u>	Y	Y	Disturbance (visual/noise)

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Site Code	Site Name	Site Specific Conservation Objectives Yes/ No	Distance from Application Area(km)	Qualifying Interests / Special Conservation Interests	Potential for connectivity?	Screened in for Stage 1?	Potential source of impact?
004111	Duvillaun Islands SPA	No	13.7	Dunlin ( <i>Calidris alpina schinzii</i> )	Y	Y	Disturbance (visual/noise)
				Fulmar ( <i>Fulmarus glacialis</i> )			
				Storm Petrel ( <i>Hydrobates pelagicus</i> )			
				Barnacle Goose ( <i>Branta leucopsis</i> )			
004052	Carrowmore Lake SPA	No	15.6	Sandwich Tern ( <i>Sterna sandvicensis</i> )	N	N	-
004235	Doogort Machair SPA	No	20.8	Dunlin ( <i>Calidris alpina schinzii</i> )	N	N	-
004098	Owenduff/Nephin Complex SPA	No	21.9	Merlin ( <i>Falco columbarius</i> )	N	N	-
				Golden Plover ( <i>Pluvialis apricaria</i> )	N	N	-
004072	Stags of Broad Haven SPA	No	24.1	Storm Petrel ( <i>Hydrobates pelagicus</i> )	N	N	-
				Leach's Storm-petrel ( <i>Oceanodroma leucorhoa</i> )	N	N	-
004074	Illanmaster SPA	No	29.8	Storm Petrel ( <i>Hydrobates pelagicus</i> )	N	N	-

### 3.5 Impact Prediction

**Table 3.3: Information Checklist for the Impact Assessment**

Have these sources been consulted?	Assessment
The Natura 2000 standard data form for the site	Yes. Chapter 3 of the NIS outlines the literature consulted, which includes the available NPWS data sources for all European sites, including site synopses, standard Natura 2000 data forms, conservation objectives and GIS layers of habitats species and marine community mapping.
Existing and historical maps	<p>A site location map and a foreshore site investigation map are provided alongside the Foreshore Licence Application. These figures outline Test Sites A and B, the AMETS Route Corridor. The foreshore site investigation map displays the general location of each element of the proposed project.</p> <p>No figure has been provided displaying the proposed project location in relation to European sites.</p> <p>No historical maps have been provided, but this is not considered necessary given the scope of the proposed project. The document entitled 'AMETS Distance Summary' displays Test Sites A and B in relation to a number of receptors, including shipwrecks.</p>
Land-use and other relevant existing plans	<p>Yes. Chapter 14 of the NIS investigates other projects, plans and activities with the potential to cause cumulative impacts with the proposed project. Future planned development of AMETS is likely to include the installation of floating offshore wind energy devices, a sub-sea cable and an onshore substation.</p> <p>Inshore fishing activities in the area are outlined and the 'AMETS Distance Summary' displays Test Sites A and B in relation to the nearest aquaculture infrastructure, shipwrecks, fish nurseries spawning areas, fishing port, commercial port and ferry route.</p>
Existing site survey material	Existing data from previous surveys (2010 – 2012) carried out as part of the consenting process for the foreshore lease of the AMETS are used. A general overview of benthic sediments, presumably informed by this previous survey data, is provided in section 7.2 of the NIS. No spatial representation of the existing benthic environment is provided.
Existing data on hydrogeology	Not relevant for this project.
Existing data on key species	<p>Section 7.2 states that “<i>the marine mammal community at the AMETS is described from a combination of visual and acoustic surveys as well as published, unpublished and historic data.</i>” References to these data sources is not provided, and although data from surveys carried out in 2010/2011 are presented in Table 7.1, it is not clear where these have been sourced.</p> <p>The NIS references the 'Ecological Assessment for the Proposed Atlantic Marine Energy Test Site (Scally <i>et al.</i>, 2013) and seabird observations from this assessment are provided in Table 7.2 of the NIS. In addition to SCI species from nearby SPAs, the NIS lists migratory species which use the study site and may be linked to distant Irish or UK SPAs.</p>
Environmental statements for similar projects or plans elsewhere	No similar environmental statements for similar projects elsewhere were referenced.
State of the environment reports	The Article 17 reporting for Ireland (NPWS, 2019) is not referenced.
Site management plans	No site management plans available. The specific CO for each of the relevant sites have been consulted, where available.
Geographical information systems	Chapter 3 of the NIS states that GIS layers for habitats, species and marine community mapping were accessed from NPWS to inform the ecological assessment. Data sources are not provided for the spatial data used in the site location map and foreshore site investigation map.
Site history files	No discussion of site history was provided.
Other, as appropriate	n/a



### 3.6 Screening for Appropriate Assessment Matrix

**Table 3.4: Screening for Appropriate Assessment**

Appropriate Assessment Screening Criteria	Response
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 Sites	<p>The individual elements of the proposed project likely to give rise to impacts on European sites alone and in-combination have not been clearly outlined in the application documents. Based on the information provided, this review considers that the elements likely to give rise to impacts on European sites are:</p> <ul style="list-style-type: none"> <li>• The physical presence of the survey vessel(s).</li> <li>• Removal/disturbance of benthic and intertidal habitats.</li> <li>• Underwater noise emissions from the vessel and acoustic equipment.</li> </ul>
<p>Describe any likely direct, indirect or secondary impacts of the project on the Natura 2000 Sites by virtue of:</p> <ul style="list-style-type: none"> <li>• Size and Scale</li> <li>• Land Take</li> <li>• Distance from Natura 2000 sites or key features of the site</li> <li>• Resource Requirements</li> <li>• Emissions</li> <li>• Excavation Requirements</li> <li>• Transport Requirements</li> <li>• Duration of construction, operation and decommissioning</li> <li>• Other.</li> </ul>	<p>The likely direct, indirect or secondary impacts of the project on the European sites are considered in Section 9.1 of the NIS. This review expands on the information provided by the applicant. Potential sources of impact are outlined in Table 3.2 and discussed in the following sections in the context of potential receptors (QIs and SCIs of European sites).</p> <p><b>Size, Scale and Land take:</b></p> <p>The scope and scale of the proposed surveys are described in <b>Section 3.3</b> of this report.</p> <p><b>Distance from European sites or key features of the site:</b> The distances of European sites within the Zol to the proposed activities are provided in <b>Table 3.2</b>. This review identified potential sources of impacts from the survey activities for QIs/SCIs of five SACs and five SPAs within the project Zol.</p> <p>The potential impacts identified were injury/disturbance from underwater noise, habitat loss/alteration and physical disturbance.</p> <p><b>Resource Requirements:</b> Resources are discussed in <b>Table 3.1</b> of this report. There will be no likely significant effects due to the resources used by the proposed project.</p> <p><b>Emissions:</b> Hydrocarbon spills (diesel fuel, hydraulic oil and lubricants) may arise from accidental events during survey operations, including the handling of oil drums, mechanical failure (such as a fault in the oil/ water separator) and the deck drainage system. Given the offshore location of the survey area, minor hydrocarbon spills will be rapidly and widely dispersed and any environmental impacts (if any) are unlikely to be significant. Consequently, likely significant effects are excluded.</p> <p>There is potential that a larger scale fuel spill due to unplanned events such as vessel collision may occur. However, the likelihood of such an event occurring is remote. Consequently, likely significant effects related to accidental pollution are excluded.</p> <p>Underwater noise emissions will be caused by acoustic signals emitted during the geophysical elements of the survey (sub-bottom profiling, side scan sonar and multibeam).</p> <p><b>Excavation Requirements:</b> Removal of small amounts of sediment will occur during grab and core sampling, some of which will occur within Mullet/Blacksod Bay Complex SAC.</p> <p><b>Transport Requirements:</b> No transport other than vessel movement will be required.</p> <p><b>Duration of operation:</b> The Support Document states that survey duration will be one month, taking place between May and September 2020. It is assumed that, if consented, these same implementation periods would apply in 2021.</p>
<p>Describe any likely changes to the site arising as a result of:</p> <ul style="list-style-type: none"> <li>• Reduction of Habitat</li> <li>• Disturbance to Key Species</li> </ul>	<p>Taking account of the above information, this assessment considers that the following potential impacts are likely:</p> <ul style="list-style-type: none"> <li>• Potential injury/disturbance to migratory fish and marine mammals through underwater noise emissions.</li> <li>• Disturbance to mobile species (seabirds, otter) through physical presence of survey vessel(s).</li> </ul>

Appropriate Assessment Screening Criteria	Response
<ul style="list-style-type: none"> <li>Habitat or Species Fragmentation</li> <li>Reduction in Species Diversity</li> <li>Changes in Key Indicators of Conservation Value</li> <li>Climate Change</li> </ul>	<ul style="list-style-type: none"> <li>Loss/disturbance of habitats.</li> </ul> <p>These impacts are explored in terms of the following potential changes to European sites:</p> <p><b>Reduction of Habitat:</b> Grab sampling will occur at 40 locations within AMETS Areas A and B, the AMETS route corridor and control area using a Day grab, assumed to be a standard 0.1m<sup>2</sup> size. Grab sampling locations have not been confirmed, however, due to the scale of the project, it is highly likely that the majority will be outside the boundary of Mullet/Blacksod Bay Complex SAC.</p> <p>Six intertidal stations will be sampled at Belderra Strand within the SAC. Five replicate 0.01m<sup>2</sup> cores will be sampled at each location, totalling removal of approximately 0.3m<sup>2</sup> of sediment. The section of the SAC which overlaps with the proposed project has been classified as 'mobile sand with <i>Bathyporeia guilliamsoniana</i> community', a constituent community type of the Annex I habitat 'mudflats and sandflats not covered by seawater at low tide'. The conservation objectives supporting document (NPWS, 2014b) states that this community is recorded on exposed intertidal and shallow subtidal shores resulting in a highly mobile sediment, with variable distributions of crustacean species in generally low abundances, conditions which suggest high recoverability. Therefore, given the small-scale nature of the works and the recoverability of the community, no likely significant effects to the QI 'mudflats and sandflats not covered by seawater at low tide' are expected.</p> <p>No SAC reef habitat occurs within the boundary of the proposed project; therefore, no likely significant effects to reefs are expected.</p> <p><b>Disturbance to Key Species:</b></p> <p><u>Migratory fish</u></p> <p>The proposed geophysical surveys will produce underwater noise which has the potential to impact Annex II migratory fish. There is a risk that fish could experience effects as they migrate to/from their natal rivers and transit through the foreshore licence area. Atlantic salmon is the only relevant migratory fish QI included in this Screening.</p> <p>Due to the high frequency ranges of the survey equipment (supplied as further information by the applicant), the underwater noise produced by the survey is expected to be outside the relatively narrow bandwidth of Atlantic salmon hearing (300 – 500 Hz). Additionally, Atlantic salmon are only sensitive to particle motion, due to the distance between its ear and swim bladder (Popper and Hawkins, 2019). As a result, mortality, injury, and behavioural effects are unlikely.</p> <p><u>Marine mammals</u></p> <p>Marine mammal species in the vicinity of the proposed project may be disturbed or displaced as a result of underwater noise generation during the geophysical survey operations. Without mitigation measures being implemented, likely significant effects to the following sites cannot be excluded:</p> <ul style="list-style-type: none"> <li>West Connacht Coast SAC.</li> <li>Inishkea Islands SAC.</li> <li>Duvillaun Islands SAC.</li> </ul> <p><u>Seabirds</u></p> <p>The physical presence of the survey vessel(s), and noise associated with the operation of survey equipment, could result in a small degree of disturbance to birds in the vicinity of the vessel(s) or intertidal activities. Birds feeding or resting on surface waters could be temporarily displaced from their chosen locations.</p> <p>The proposed project will take place during the months of May to September, during which time overwintering birds will not be present. Therefore, there will be no pathway for likely significant effect to wintering SCI species.</p> <p>The presence of vessels and operation of equipment have the potential to temporarily disturb foraging and loafing birds and birds on transit. However, given the short duration and small-scale nature (one survey vessel in operation at any time) of the proposed</p>

Appropriate Assessment Screening Criteria	Response
	<p>activities in open offshore waters with abundant alternative foraging area, significant effects on SCI and/or migratory seabirds are not considered likely.</p> <p>Intertidal sampling activities will occur on Belderra Strand, which does not overlap with any SPAs. Intertidal core sampling will take place over a single tidal cycle during daylight hours between June and August. This low-level of activity will be similar to levels of general recreational use of the beach during these months, and no significant effects to breeding SCI species at nearby SPAs are considered likely.</p> <p><u>Otter</u></p> <p>The conservation objectives for Mullet/Blacksod Bay Complex SAC state that there should be no significant decline in the extent of marine habitat for otter, which is defined as within 80 m of the shoreline (NPWS, 2014a). An extremely small area of sedimentary habitat (0.3m<sup>2</sup>) will be sampled within the intertidal zone. Due to the recoverability of the habitat and short duration of the sampling activity, no significant effects are considered likely.</p> <p><b>Habitat or Species Fragmentation:</b> It is unlikely that there will be any habitat fragmentation as a result of the survey activities. The physical presence of the vessels may influence the distribution and movements of sensitive species in the water column, namely marine mammals, and may potentially cause temporary displacement and/or other behavioural responses in seabirds when the survey is being conducted.</p> <p><b>Reduction in Species Diversity:</b> It is unlikely that there will be any reduction in species diversity as a result of the survey activities.</p> <p><b>Changes in Key Indicators of Conservation Value:</b> No changes in key indicators of conservation value are expected.</p> <p><b>Climate Change:</b> No impacts are expected in relation to climate change.</p>
<p>Describe any likely impacts on the Natura 2000 Sites as a whole in terms of:</p> <ul style="list-style-type: none"> <li>• Interference with key relationships that define the structure of the site</li> <li>• Interference with key relationships that define the function of the site</li> </ul>	<p>Injury and disturbance to marine mammals are identified as the likely impacts to the structure and function of the nearby European sites.</p>
<p>Indicators of significance as a result of the identification of effects set out above in terms of:</p> <ul style="list-style-type: none"> <li>• Loss</li> <li>• Fragmentation</li> <li>• Disruption</li> <li>• Disturbance</li> <li>• Change to Key Elements of the Site</li> </ul>	<p>Estimated degree of injury and disturbance/displacement caused by the proposed works to marine mammals in the area.</p>
<p>Describe from the above those elements of the project or plan, or combination of elements,</p>	<p>Significant effects are likely to arise from, or the scale or magnitude of impacts is not known, from the following impacts:</p>

Appropriate Assessment Screening Criteria	Response
where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known	<ul style="list-style-type: none"><li>Underwater noise emissions.</li></ul>

## 4 CONCLUSION

### 4.1 Article 6(3) Appropriate Assessment Screening Conclusion

Based on the information available on the project, it **cannot** be excluded, on the basis of objective scientific information, following screening under the European Communities (Birds and Natural Habitats) Regulations 2011 as amended, that the proposed project, individually or in combination with other plans or projects will have a significant effect on the following European sites:

- West Coast Connacht SAC
- Inishkea Islands SAC
- Duvillaun Islands SAC

It can therefore be determined that an Appropriate Assessment (AA) of the project is required. A Natura Impact Statement has been provided by the Applicant to inform the AA and is reviewed by RPS in the Appropriate Assessment report, submitted with this Screening for AA Technical Review.

## 5 ARTICLE 12 ASSESSMENT

### 5.1 Annex IV Species

Under Article 12, Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas.

A baseline description on marine mammals and megafauna is provided in Chapter 7 of the NIS, with Table 7.1 providing a summary of species observed within or adjacent to the proposed project location between 2010 and 2011. Cetacean species most regularly occurring within the area were harbour porpoise, common dolphin, bottlenose dolphin and minke whale. Grey seal, common seal and basking shark were also abundant, although, these species do not appear of Annex IV of the Habitats Directive.

### 5.2 Article 12 Assessment

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 survey. 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.

The potential effects to marine mammals from underwater noise impacts are considered in section 9.1.1 of the NIS, proposed mitigation measures are outlined in Chapter 12 and a summary of impacts after consideration of mitigation is provided in Chapter 13.

Section 6.1 of the NIS provides the following detail on the acoustic equipment to be utilised during the proposed geophysical survey:

- MBES: Kongsberg EM2040 (or similar) with frequency range of 200 – 400 kHz.
- SBP: Knudsen Chirp 3260, most likely to be used in the low frequency combination of 3.5/12 kHz.
- SSS: Edgetech SSS (or similar) with frequency range of 100 -900kHz.

Following the Request for Further Information, the applicant provided further and updated information on noise sources of the proposed surveys. These have been provided in **Table 5.1**.

**Table 5.1 Summary of noise source (taken from Further Information document supplied by SEAI)**

Noise Source	Frequency Range (kHz)	SPL: dB re 1 $\mu$ Pa @1m	SEL: dB re 1 $\mu$ Pa2s @1m
USBL	26.5 to 33.5	206.3	154.6
SBES	38/200	227	181
MBES	300	210	185
SSS	100/400	210	162
SBP (Voyager)	3.5	212	188
SBP (Explorer)	1.7 to 5.5	215	191
Vessel (both)	<1		<151.1

A noise assessment was not provided by the applicant, however, a summary of the frequency ranges and sound source levels associated with the acoustic equipment to be used for these site investigations was provided as further information by the applicant. These are considered industry standard for scientific surveys. Although the applicant identified all sound arising from the geophysical survey as impulsive, SBES, MBES, SSS and SBP (chirp/pinger) are all non-impulsive underwater sound sources with directional, short duration output which is attenuated with distance from the sound source. Examples of impulsive noise types are seismic air guns, impact piling or underwater explosions.

A summary of PTS and TTS inset thresholds from Southall *et al.* (2019) for both impulsive and non-impulsive sounds is given in **Table 5.2**.

**Table 5.2 Summary of PTS and TTS onset thresholds (Southall *et al.*, 2019)**

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

The applicant has not provided an assessment of likely ranges of injury or disturbance for marine mammals, however, based on industry experience of similar geophysical noise sources, it can be assumed that injury in the form of PTS and TTS in most marine mammal species, including high frequency cetaceans like bottlenose dolphin, could be expected to occur within tens of metres from these sound sources. Very high frequency cetaceans (e.g. harbour porpoise) could experience TTS out to 100 m from the sound source. There is a low likelihood that cetaceans will be present within these likely zones of influence for PTS and TTS as the presence of the vessel is likely to disturb animals beyond these distances and cause them to leave the area. In addition, the risk of injury will be further reduced by the implementation of appropriate mitigation as described by the applicant in Chapter 12 of the NIS.

In the absence of mitigation, behavioural disturbance to marine mammals from similar non-impulsive sound sources could be expected to occur out to 200 m from the sound source. However, the presence of the vessel is likely to disturb animals beyond 200 m and cause them to leave the area, and the implementation of mitigation measures will further reduce the risk of behavioural disturbance.

In line with the DAHG (2014) guidelines, Chapter 12 of the NIS states that unless information specific to the location is otherwise available to inform the mitigation process and a distance modification is agreed with the Regulatory Authority, acoustic surveying shall not commence if marine mammals are detected within a 500 m radial distance of the sound source. A search zone of 500 m will allow an experienced marine mammal observer (MMO) to monitor for marine mammals within the zones of influence for injury and disturbance.

### 5.3 Article 12 Conclusion

Underwater noise from acoustic survey equipment is not expected to exceed PTS and TTS for all marine mammals beyond approximately 100 m from the source and is not expected to lead to behavioural disturbance beyond approximately 200 m from the source. It is likely that the presence of the vessel equipment will disturb marine mammals beyond 200 m and cause them to leave the immediate area. In addition, mitigation measures in line with DAHG (2014) guidelines for geophysical acoustic surveys will be implemented.

Subject to compliance with the proposed mitigation, it is concluded that the proposed survey will not give rise to significant impacts to species listed under Annex IV of the Habitats Directive.

It is noted that formal determination of whether further assessment of Annex IV species is required will be made by the Minister for the DHLGH. The Minister's determination will not be prejudiced by this review.

## 6 REFERENCES

Department of Arts, Heritage and the Gaeltacht (DAHG), 2014. Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters.

Department of Environment, Heritage and Local Government (DEHLG), 2009. Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities.

European Commission (EC), 2002. Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EC.

NPWS, 2014a. Conservation Objectives: Mullet/Blacksod Bay Complex SAC 000470. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS, 2014b. Mullet/Blacksod Bay Complex SAC (site code 470) Conservation objectives supporting document -coastal habitats. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS, 2015. Carrowmore Lake SPA Site Synopsis (Site Code 004052). National Parks and Wildlife Service.

Popper, A.N. and Hawkins, A.D. 2019. An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes. *Journal of Fish Biology*. 2019;94:6925-713.

Southall, Brandon L., James J. Finneran, Colleen Reichmuth, Paul E. Nachtigall, Darlene R. Ketten, Ann E. Bowles, William T. Ellison, Douglas P. Nowacek, and Peter L. Tyack. 2019. "Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects." *Aquatic Mammals* 45 (2): 125–232.