The Sustainable Energy Authority of Ireland

Accelerating Market Uptake of Floating Offshore Wind Technology (AFLOWT)

Environmental Impact Assessment Scoping Report

603205

JUNE 2022

RSK GENERAL NOTES

Project No.: 603205

Title: **A**ccelerating Market Uptake of **Fl**oating **O**ffshore **W**ind **T**echnology (AFLOWT) - Offshore Energy Test Site Environmental Impact Assessment Scoping Report

Client: The Sustainable Energy Authority of Ireland

Date: 20 June 2022

Office: Dublin

Status: Final

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GLOSSARY

Term	Meaning
AMETS Foreshore Licence Area	The AMETS area in which the Wave Energy Converters, Floating Offshore Wind technology and export cables will be located.
Area of Interest - AOI	The AOI relates to the area surrounding the 'study area' which have been included for EIA Purposes.
Atlantic Marine Energy Test Site	Marine Energy demonstration Test Site which forms part of a national suite of infrastructural facilities set up to enable technology development and progression towards commercial viability.
Bathymetry	The measurement of water depth in lakes, seas and oceans.
Benthic ecology	Benthic ecology encompasses the study of the organisms living in and on the sea floor, the interactions between them and impacts on the surrounding environment.
Biotope	The combination of physical environment (habitat) and its distinctive assemblage of conspicuous species.
Broad habitat and main habitat codes[1]	Developed by EUNIS and JNCC based on habitat factors or gross biological features (e.g. macrophytes and biogenic reefs).
Circalittoral zone	The area of the continental shelf sea-bed that lies below the zone of periodic tidal exposure. It is approximately equivalent to the sublittoral zone.
CPOD	CPODS detect the bio-sonar (echolocation clicks) of odontocetes (toothed whales, dolphins and porpoises), providing temporal (time) data on animal activity, as an indication of presence or habitat usage.
Cumulative Impacts	'The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects' (EPA, 2017).
Designated Landscape	Areas of landscape identified as being of importance at international, national or local levels, either defined by statute or identified in local development plans.
The Developer	The Sustainable Energy Authority of Ireland
Direct Impact	Direct impacts occur through direct interaction of an activity with an environmental, social, or economic component.
"Do Nothing" Scenario	The environment as it would be in the future should the proposed project not be developed.
"Do Something" Scenario	The environment should the proposed project be developed.
ESB	Electricity Supply Board. Ireland's transmission system operator.
ESBN	ESB Networks finances, builds and maintains the transmission system through which electricity flows from generation stations to bulk supply points near cities and towns across Ireland.

[1] See How to use the Marine Habitat Classification for Britain and Ireland version 15.03 (This document is available from https://mhc.jncc.gov.uk/resources#userguide. Edited June 2019).

Term	Meaning
Effect	'A change resulting from the implementation of a project'. (EPA, 2017)
Embedded mitigation	Embedded mitigation provides detail on any mitigation measures that have been. identified and adopted as part of the evolution of the project design (embedded. into the project design envelope) and that are relevant to the topic.
Environmental Impact Assessment-EIA	'The process of examining the anticipated environmental effects of proposed project - from consideration of environmental aspects at design stage, through consultation and preparation of an Environmental Impact Assessment Report (EIAR), evaluation of the EIAR by a competent authority, the subsequent decision as to whether the project should be permitted to proceed, encompassing public response to that decision'. (EPA, 2017).
Environmental Impact Statement (EIS)	Term used under earlier EIA regulations for the report produced at the end of the EIA Process. (In particular the statement dated 1 December 2011 on the effects of the AMETS on the environment and furnished by the Lessee to the Minister pursuant to Section 13A (1) (c) of the Foreshore Act 1933).
Floater	A floater is the floating substructure of a Floating Offshore Wind (FOW) device upon which the wind turbine (including its tower -and blades rotor-nacelle) sit upon. Putting turbines onto floaters gives a developer access to deeper waters, which means more potential project sites and lots more potential capacity.
Foreshore	The area of the land and seabed between the high-water mark of ordinary or medium tides and the 12 nautical mile limit.
Foreshore Lease	Means a lease granted by the Minister pursuant to Section 2 (1) of the Foreshore Act 1933.
Foreshore Licence	Means a licence in substantially the form set out in Schedule 5 granted by the Minister pursuant to Section 3 (1) of the Foreshore Act 1933, for installation of Licensed Equipment within the Leasehold Area.
Foreshore Licensing Unit - FLU	The FLU is part of the Department of Housing, Planning and Heritage within the Irish Government and is currently responsible for dealing with applications for any activities or developments which require a licence under the Foreshore Act 1933. (See also Maritime Area Planning Bill below).
Habitat	'A habitat is described as the area in which an organism or group of organisms lives and is defined by the living (biotic) and non-living (abiotic) components of the environment. The latter includes physical, chemical and geographical factors, in addition to human impact or management.'[2]
Impact	'Change resulting from the implementation of project'. (EPA, 2017)
Impact Magnitude	Size, extent and duration of an impact.
Indirect Impact	'Impacts on the environment, which are not a direct result of the project, often produced away from (the site) or as a result of a complex pathway' (EPA, 2017).
Infauna	The animals living in the sediments of the seabed.

[2] A Guide to Habitats in Ireland, Fossitt, J.A., 2000. Heritage Council

Term	Meaning
Intertidal	of or relating to the littoral region that is above the low-water mark and below the high-water mark.
Landfall	The area in which the offshore export cables make landfall and is the transitional area between the offshore cabling and the onshore cabling.
Licensed Equipment	Means Equipment which may or may not be installed, deployed, erected, deposited and / or placed on the Foreshore without a lease or license from the Minister under Section 2 or 3 of the Foreshore Act, respectively.
Logboats	or dugouts are a type of boat made from a single tree trunk, hollowed out using adzes, wood working tool. Logboats were not seaworthy and were probably used on rivers, lakes and in the fens.
Maritime Area Planning Bill 2021	New maritime planning and consenting legislation in Ireland which once enacted will bring a simpler permitting process for offshore wind development via a Marine Area Consent process.
Mitigation Measure	Measure which would avoid, reduce, or remediate an impact.
Non-statutory stakeholder	Organisations with whom the regulatory authorities may choose to engage who are not designated in law but are likely to have an interest in a proposed development.
Polychaete	A class of segmented worms often known as bristle worms.
The Project	The offshore components associated with the AFLOWT Project at AMETS including Test Areas A and B and export cable.
Project Design Envelope (PDE)	Also known as the Rochdale Envelope, the PDE concept is routinely utilised in both onshore and offshore planning applications to allow for some flexibility in design options, particularly offshore, and more particularly in this instance for the maximum likely size and number of anchors, moorings and FOW turbine types.
Restoring Force	Is the force that is needed to bring a FOW platform back into the desired location following displacement e.g. from hydrodynamic forces, including wind and wave action.
Scouting Survey	Commercial fisheries related surveys undertaken to help identify potting areas and any other relevant static gear areas along the cable route corridor. Can be used to guide surveys so that they can avoid interaction with fishing gears.
Sensitive Receptor	Physical or natural resource, special interest or viewer group that may experience an impact.
Sensitivity	Vulnerability of a receptor to change.
Sequential routes	transport routes, including roads, footpaths, cycleways and ferry routes, from which visual impacts of the of the project may be experienced from a number of viewpoints in sequence, as distinct from simultaneously.
Study area	The study area relates to the Atlantic Marine Energy Test Site off the west coast of Ireland, near Belmullet in Co. Mayo. This includes Test Areas A and B and the associated export cable route. Further definitions are provided where relevant within the text.
Subtidal	Area extending from below low tide.
Test Areas	Refers to the two Test Areas (A and B) at the AMETS.

Term	Meaning
Test Site	Refers to the whole AMETS facility
Unlicensed Equipment	Means Equipment which may be installed, deployed, erected, deposited and / or placed on the Foreshore without a lease or license from the Minister under Section 2 or 3 of the Foreshore Act, respectively.
Unwanted radar returns	are known as 'clutter' which refers simply to unwanted false returns on Primary Surveillance Radar. This can be generated by a number of means, not simply from wind turbines. Issues may be compounded by increasing numbers of wind turbines which could potentially cause greater areas and densities of clutter.
Water Body	A surface water body as defined under the Water Framework Directive (WFD) i.e. a river/stream, lake, transitional, coastal or groundwater body.

ACRONYMS

Term	Definition
AA	Appropriate Assessment
ADCP	Acoustic Doppler Current Profilers
AFLOWT	Accelerating Market Uptake of Floating Offshore Wind Technology
AIS	Automatic Identification System
AMETS	Atlantic Marine Energy Test Site
ATC	Air Traffic Control
BIM	Bord Iascaigh Mhara
CA	Competent Authority
CaLiCyA	Cable Life Cycle Assurance
CAFE	Cleaner Air for Europe programme
CIL	Commissioners of Irish Lights
COLREGs	Convention on the International Regulation for Preventing Collision at Sea
CPA	Coastal Protection Act
CPA	Coastal Planning Authorities
CPT	Cone penetration testing
CSO	Central Statistics Office
DAERA	Department of Agriculture, Environment and Rural Affairs
DCCAE	Department of Communications, Climate Action and Environment
DCENR	Department of Communications, Energy and Natural Resources
DHPLG	Department of Housing, Planning and Local Government
EIA	Environmental Impact Assessment
EIFA	Erris Inshore Fishermen's Association
ELCRA	Erris Lobster Conservation and Restocking Association
EMF	Electromagnetic field
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
EU	European Union
FEPA	Food and Environment Protection Act 1985
FIF	Federation of Irish Fishermen
FIR	Fishing Industry Representatives
FLO	Fisheries Liaison Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables
FMMS	Fisheries Management and Mitigation Strategy

Term	Definition
FOW	Floating Offshore Wind
FSA	Formal Safety Assessment
HAT	Highest Astronomical Tide
IAA	Irish Aviation Authority
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAS	Invasive Alien Species
ICES	International Council for Exploration of the Sea
IFI	Inland Fisheries Ireland
IMO	International Maritime Organization
IPAS	Integrated Petroleum Affairs System
IUCN	International Union for Conservation of Nature
IWDG	Irish Whale and Dolphin Group
IWEA	Irish Wind Energy Association
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
MAC	Maritime Area Consent System
MARA	Maritime Area Regulatory Authority
MARIN	Maritime Research Institute Netherlands
MarLIN	Marine Life Information Network
MCA	Maritime and Coastguard Agency
MCIB	Marine Casualty Investigation Board
MGN	Marine Guidance Note
MMO	Marine Management Organisation
MPDM	Marine Planning and Development Management
MSA	Minimum Safe Altitude
MSO	Marine Survey Office
MSP	Maritime Spatial Planning
NBN	National Biodiversity Network
NIS	Natura Impact Statement
NPMF	National Marine Planning Framework
NPWS	National Parks and Wildlife Service
NtM	Notices to Mariners
OREDP	Offshore Renewable Energy Development Plan
OREI	Offshore Renewable Energy Installations

Term	Definition
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic (Oslo and Paris Convention)
PM	Particulate matter
pSPA	Proposed Special Protection Area
SAC	Special Area of Conservation
SAPMAP	Small Area Population Maps
SAR	Search and Rescue
SBP	Sub-bottom Profiling
SEA	Strategic Environmental Assessment
SEAI	Sustainable Energy Authority of Ireland
SFPA	Sea Fisheries Protection Authority
SMRU Consulting	The commercial consulting business of the Sea Mammal Research Unit at St Andrew's University, Scotland
SOLAS	International Convention for the Safety of Life at Sea
SPA	Special Protection Area
UKFEN	UK Fisheries Economic Network
UKHO	United Kingdom Hydrographic Office
VMS	Vessel monitoring system
WEC	Wave Energy Converters
WFD	Water Framework Directive
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility
Units	
dB	Decibel
MW	Megawatt
m/s	Metres per second
µg	Microgram
µT	Microtelsa (an SI unit of magnetic flux)

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1 INTRODUCTION

1.1 The Developer

The Sustainable Energy Authority of Ireland (SEAI) is Ireland's national sustainable energy authority. SEAI was established by the Irish Government under the Sustainable Energy Act 2002 and has a mission to transform Ireland into a society based on sustainable energy structures, technologies and practices. SEAI's key objectives are:

- implementing strong energy efficiency actions
- accelerating the development and adoption of technologies to utilise renewable energy sources
- supporting innovation and enterprise for Ireland's low-carbon future
- and supporting evidence-based responses that engage all actors.

SEAI has been developing the Atlantic Marine Energy Test Site (AMETS) off Annagh Head, west of Belmullet in County Mayo since 2009. The site location is indicated in Figure 1-1.

Figure 1-1: Atlantic Marine Energy Test Site (AMETS) location – Mullet Pensinula, Ireland

AMETS was initially envisaged as a grid connected Test Site for pre-commercial wave technologies. However, Wave Energy Conversion (WEC) technology has had slower than expected development over the last 10 years. Given the location of the Test Site in one of the world's most energetic environments, and the water depths across the site, AMETS has been identified as also being suitable for testing Floating Offshore Wind (FOW) devices.

AMETS forms part of a national suite of infrastructural facilities set up to enable technology development and progression towards commercial viability. A small-scale site exists at the deep-water basin and test tanks at LIR national Ocean Test facility in Cork, with an intermediate scale site at the SmartBay Marine and Renewable Energy Test Site in Galway Bay. It is intended that full scale marine energy devices could be tested at their final stages of pre-commercial development at AMETS.

To date no testing activity has commenced on AMETS. Work at the site has primarily focussed on data acquisition and obtaining relevant consents and planning applications, the current status of which are as follows:

- foreshore consent (lease) for the offshore element of AMETS was awarded in January 2015, which allows deployment of WEC devices, subject to the necessary pre-approvals. The consent allows for the deployment of electricity export cables. Environmental Impact Assessment Report (EIAR) was completed to support the consent application and formal consultation with statutory consultees and public consultation took place. Documentation related to this lease (including the EIAR) is available at: Sustainable Energy Authority of Ireland (SEAI) | Department of Housing, Planning and Local Government (DHPLG)
- planning permission for the onshore substation was awarded by An Bord Pleanala (ABP) in April 2017. The onshore elements for the site comprise a small substation with office space for developers which will be constructed in the vicinity of Belderra Strand
- the grid connection agreement is in place with Electricity Supply Board Networks (ESBN) since 2011. A grid connection route was included in the substation planning permission application. The connection agreement currently offers up to 10 MW of generating capacity.

In summary, the site already holds a lease for the deployment of WEC technology and work is progressing, including this Scoping Report, to seek a licence to also deploy FOW technologies at the facility. SEAI is responsible for offshore licencing, and for managing the onshore and offshore construction at the site.

1.2 Site and Project Overview

The AMETS site is located on the Belmullet peninsula, offshore Co. Mayo (Figure 1-1). AMETS covers Test Area A which is in 100 m water depth, located ~16 km from the cable landfall at Belderra Strand. The site under lease covers 6.99 km^2. Test Area B is in 50 m water depth, 6 km from Belderra Strand and is 1.52 km^2 in area, see Figure 1-2.

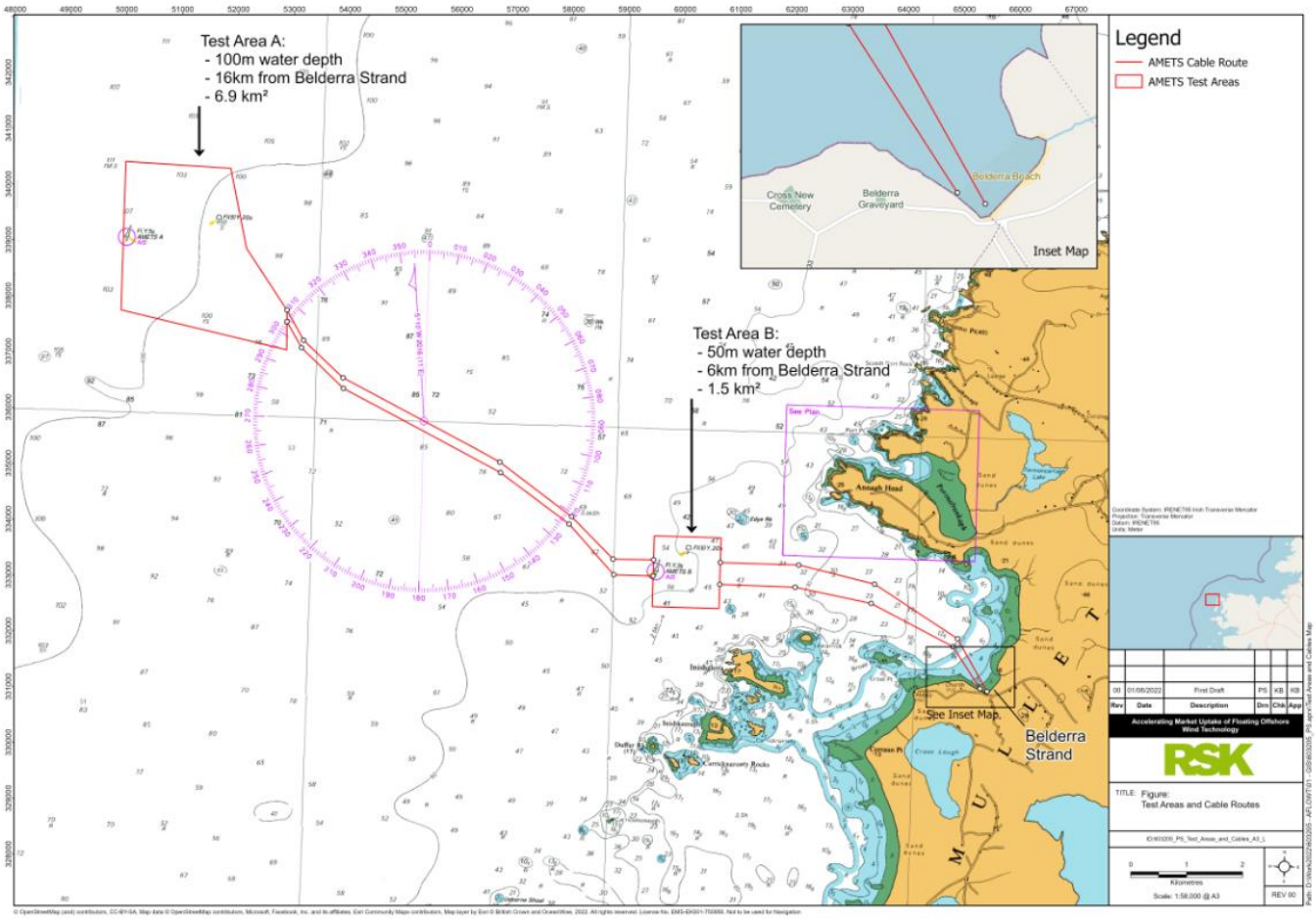

Figure 1-2: AMETS lease map

AMETS was selected as an ideal demonstration site due to its energetic wave climate (significant wave height (H_S) 16.7 m, average wind speed 8.8 m/s, max wind 35.1 m/s), deep water (50 - 100 m) close to the shore, and sandy seabed suitable for cable and moorings. Further information concerning the physical environment is included in Chapter 7. Whilst the already consented WEC Test Sites are considered within this Scoping Report, the main focus relates to the addition of Floating Offshore Wind.

In 2019 the AMETS site, as part of the Interreg **A**ccelerating Market Uptake of **Fl**oating **O**ffshore **W**ind **T**echnology (AFLOWT) project received funding to further progress development of the site. AFLOWT aims to demonstrate the survivability and cost-competitiveness of floating offshore wind technology. Funding for the project is sourced from Interreg North-West Europe. The five-year project is being led by EMEC (European Marine Energy Centre) who were initially working with technology partner SAIPEM and Test Site owner SEAI, along with MARIN (Maritime Research Institute Netherlands), UCC (University College Cork), ESB (Electricity Supply Board), Fraunhofer IWES (Institute for Wind Energy Systems) and CaLiCyA (Cable Life Cycle Assurance). Technology providers SAIPEM had initially proposed to test a device at the AMETS site but subsequently moved their technology demonstration to a test site elsewhere in Europe. A project change was confirmed in early 2021, which prompted a call for expression of

interest for a new developer/s to occupy the site. Further information on the AFLOWT project can be found at https://www.nweurope.eu/projects/project-search/aflowt-accelerating-market-uptake-of-floating-offshore-wind-technology/.

As part of the AFLOWT project SEAI and its project partners have a requirement to complete a new Environmental Impact Assessment Report (EIAR), prior to submitting an application for a licence for floating wind technologies to be tested in Test Areas A and B at AMETS. The EIAR will accompany the relevant consent application due to be submitted in 2023.

SEAI appointed consultants in 2020 to carry out marine surveys at the site and met with relevant authorities to agree survey specifications. The companies appointed were as follows:

1. Irish Whale and Dolphin Group (supported by SMRU Consulting Ltd), Marine Mammals, megafauna and reptiles
2. MERC Consultants Ltd, Benthic Ecology
3. EcoÉireann Ecological Consultants (who are an Irish registered branch of EcoNorth), Marine Ornithology.

SEAI appointed RSK Ireland Ltd to lead the EIA and AA process in December 2021. Subject to the anticipated timescales associated with changes in marine planning and licensing activity in Ireland, a Maritime Area Consent (MAC) will be applied for, covering the deployment of FOW turbine(s) at the site. Current grid capacity is 10 MW, however SEAI will seek to establish if grid connection can be upgraded to 20 MW. In the meantime, this would allow all but the biggest current, and in development, FOW Wind Turbine Generator (WTG) to be tested onsite (assuming no WEC deployment that would occupy part of the grid capacity). The licence will also include the subsea cable deployment and any required equipment and surveys.

Chapter 3, Policy and Legislation considers further the implication of changes to marine planning and licensing in Ireland. The Maritime Area Planning (MAP) Bill 2021 passed through all stages of the Oireachtas on 17th December 2021. The Bill establishes in law a new maritime planning regime and replaces existing State and development consent regimes to streamline arrangements on the basis of a single consent principle, i.e., one State consent (Maritime Area Consent) to enable occupation of the Maritime Area and one development consent (planning permission), with a single environmental assessment.

The MAP Bill also establishes a new Maritime Area Regulatory Authority (MARA). MARA will take over responsibility from the relevant Government Ministers for the issuing of licences to conduct surveys in the marine environment (currently termed foreshore licences). MARA have initially indicated that they will award a MAC within 90 days. Once a MAC has been received, planning for the proposed project needs to be awarded via ABP.

As part of the Scoping process, the Developer seeks confirmation from the Foreshore Licence Unit and in due course the Maritime Area Regulatory Authority (MARA) regarding likely implementation timescales and the form the licence application should take.

To date for the current project, SEAI has submitted a foreshore licence application for site investigation (SI) works, dated 27/01/2020 with an accompanying Natura Impact Statement covering multibeam bathymetry, side scan sonar, sub-bottom profiling (SBP), cone penetration testing (CPT) and benthic sampling. At the time of writing, no licence has yet been granted by Foreshore Licencing Unit (FLU) and a further public consultation has been requested. .

This Scoping Report encompasses the project area previously assessed in 2016, covering Test Areas A and B (Figure 1-2) and refers to the Developer's original Environmental Impact Statement. The current EIA process will cover the overall demonstration site Project Design Envelope (PDE). It is recognised that individual developers wishing to deploy technology at the site, will each be responsible for providing to the regulator, details on the technologies being deployed and the environmental impact associated with these deployments.

Meetings held and stakeholder consultation carried out since the decision to change the permitted use of the demonstration site to include FOW technologies (i.e. the initiation of the AFLOWT project) are included in section 4.1 of chapter 4 (Stakeholder Engagement).

During the EIA process site investigations will be carried out at:

- Test Area A
- Test Area B
- locations where the cable route will reach closest to the shore is indicated in Figure 1-1 and Figure 1-2 above and Figure 1-3 below.
- intertidal sediment stations to characterise the Belderra Strand, along the beach/shoreline (SEAI, 2020).

The size of the seabed lease area is approximately 6.9 km^2. It is possible that individual developers could propose one or more technologies to deploy within that area and it is possible that there could be more than one developer operating at the site at any one time, given that Test Areas A and B could be suitable for different technologies.

Most likely Test Area A would be suitable for FOW and Test Area B would be more suitable for WEC testing, due to the depth. However, both WEC and FOW could potentially be deployed within sites A and B, to cover all scenarios. The Scoping Report considers different FOW technologies, and it is assumed that each FOW device could have one or two turbines. This is considered further in Chapter 5, Project Description, however in summary, the proposed criteria for the technology within the PDE is:

- A maximum of 20 MW total site capacity
- A maximum of 6 wind turbines.

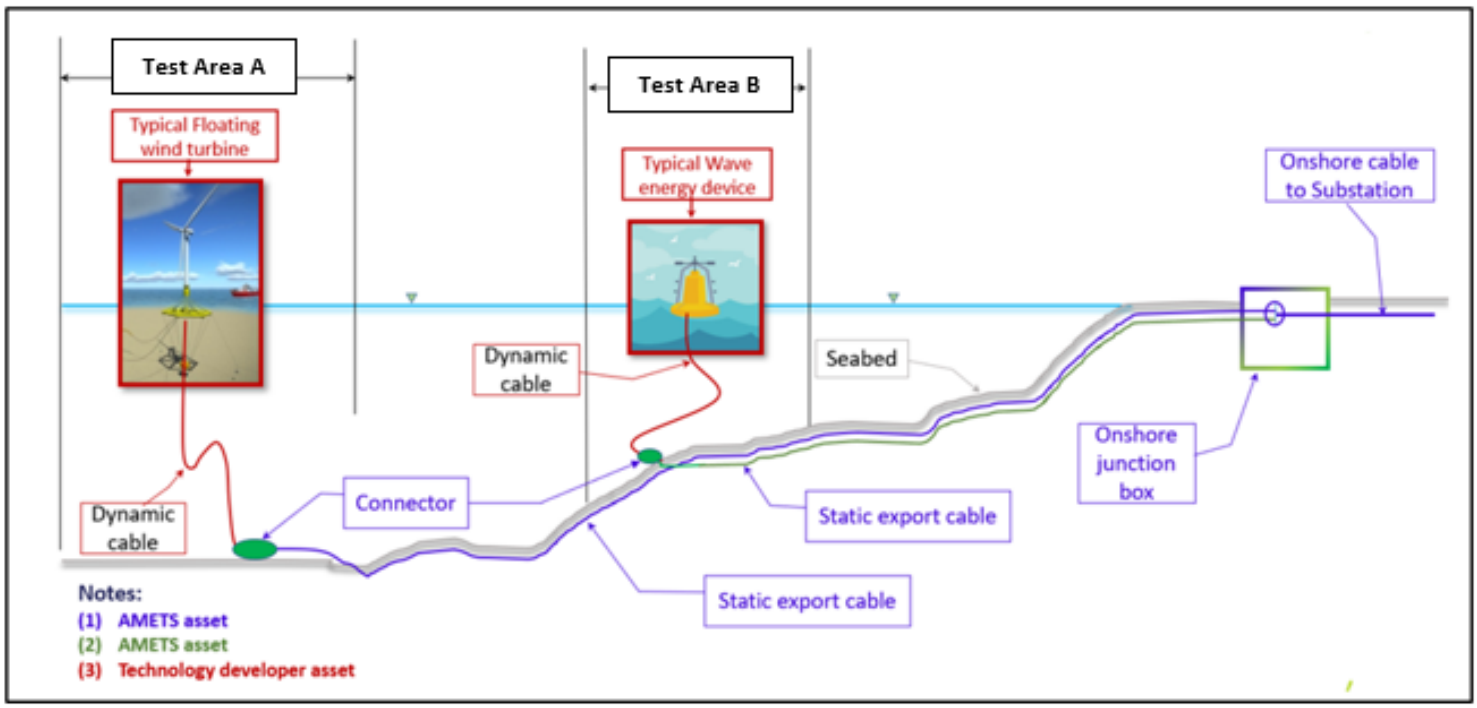

Figure 1-3: Illustration of the site

Source: SEAI, 2021

These parameters will be further refined throughout the EIA process and thereafter within developers' technology specific applications. It is however assumed that a maximum of 6 anchors will be required for each device, with a maximum of two floaters (one floater at the surface and one floater in the water column for stability). For planning purposes we have assumed a worst case scenario of a minimum deployment period for the technologies being a minimum of 12 months, and weekly visits (maximum) being undertaken by a maintenance vessel. However at this stage shorter deployment timescales are not ruled out.

The following documentation will likely be required, in support of the EIAR and AA documents (based on the documentation required for other Test Sites e.g. in the UK for deployments at EMEC sites):

- Project Information Summary
- project-specific Environmental Monitoring Programme
- project-specific Navigational Risk Assessment
- decommissioning Programme.

1.3 Project Proposals

As part of the AFLOWT project SEAI proposes to deploy multiple FOW technologies at the AMETS site, to test and develop them for commercial viability and deployment. FOW devices will likely consist of lightweight structures, with floaters, mooring lines, using a

variety of potential anchor structures and dynamic cables. Turbines are expected to generate between 5 and 20 MW[3].

The project development will involve the following construction, survey and monitoring works:

- deployment and operation of the offshore FOW turbine platforms, turbines and mooring systems
- laying of subsea cables and chartering of vessels (as per previous licence and updated here)
- the interfaces between the on and offshore works
- performance tests and measurements of performance (using equipment such as MetOcean buoys and Acoustic Doppler Current Profilers (ADCPs); plus
- installation of monitoring equipment, for example CPODS to detect the bio-sonar (echolocation clicks) of odontocetes (toothed whales, dolphins and porpoises), providing temporal (time) data on animal activity, as an indication of presence or habitat usage).

The effects associated with maximum of 6 turbines between locations A and B will be considered, with a range of mitigation measures, and impact summary of alternatives.

1.4 Purpose of Scoping Report

This Scoping Report covers offshore elements of the AFLOWT project only. Onshore elements were considered during the original AMETS EIA process and subsequent Environmental Impact Statement. and are not expected to change. During the scoping process environmental and worst-case project design envelope parameters have been utilised for the AMETS site such that it can accommodate a range of FOW technologies in addition to the licensed WECs. The aim of this Scoping Report is:

- to provide environmental and social baseline information and project design parameters so that likely environmental and social impacts could be identified and determination made as to whether these impacts need further investigation in a full EIAR
- to enable feedback to be provided that informs the EIA on scoping and to inform the Environmental Impact Assessment (EIA) and other assessments, including the Appropriate Assessment (AA).

'Scoping', according to the Irish Government, is a process of deciding the information that should be included in the subsequent full EIA, under the EIA Directive and Appropriate Assessment (AA) Screening stage (under Article 6.3 of the Habitats Directive, and a Natura Impact Statement (NIS) if required) (Department of Housing, Planning and Local Government, 2018). The Environmental Impact Assessment Report (EIAR) will accompany the FOW Licence application. This Scoping Report has been prepared in line with applicable legislation and guidelines, under the EIA Directive 2011/92/EU (as amended). The scoping assessment has been carried out by personnel with the relevant experience and technical expertise in FOW projects, and in Ireland's marine environment.

The Scoping Report :

- reviews physical, biological and human characteristics of the surrounding environment, including aspects that are most likely to be significantly impacted by the proposed project, through the site investigations, installation, demonstration/ operation, maintenance and decommissioning phases
- provides a description of the project design envelope
- assesses impacts of the AFLOWT project on the surrounding environment and through extensive experience of similar wave and/or FOW renewable energy projects in order to scope impacts in or out of consideration. If an impact is assessed but is considered insignificant, it will be scoped out of the subsequent EIA. If an impact is assessed and is considered significant, it will be taken forwards to the full subsequent EIA. An assessment will be made as to whether sufficient information is available to undertake a robust EIA assessment with confidence
- reviews the scope of any additional required studies on the surrounding environment.

In addition to the above, in the full subsequent EIA, an assessment of alternative proposals will be undertaken, including any significant impacts. Cumulative impacts will also be considered, with consideration given to any additional/ new projects in the vicinity projects in development and projects awaiting licences. Cumulative impacts will be assessed as for the main project impacts (Barnes, 2017).

The Scoping Report will be provided to relevant stakeholders, the competent authority (CA) (Environmental Protection Agency Ireland (EPA)) and statutory/non-statutory consultees. They will be invited to comment on the Scoping Report and the proposed approach to the development. This scoping approach is in line with the policy and regulations set out in chapter 3.

1.5 Document Structure

The Scoping Report has the following structure, in line with current guidance for EIA in Ireland:

1. Introduction
2. Approach to Scoping
3. Policy and Legislation
4. Stakeholder Engagement
5. Project Description
6. EIA Methodology
7. Offshore Physical Environment
8. Offshore Biodiversity
9. Human Environment
10. Summary of EIA Scoping

References

Appendices

A graphic showing the sub-topics within the specialist chapters is included in Figure 1-4.

Section	Offshore EIA report
Marine Physical Environment	Coastal erosion, sedimentation processes, seabed geology and wind
	Bathymetry and hydrography
	Water and sediment quality
Marine Biodiversity	Protected sites and species
	Benthic (subtidal and intertidal) ecology
	Fish and shellfish ecology
	Marine mammals, megafauna and reptiles
	Marine ornithology
Human Environment	Ports, shipping and navigation
	Aviation safety, military exercise and telecommunications
	Socioeconomics, recreation and tourism
	Commercial fisheries, shellfish and aquaculture
	Airborne noise
	Risk of major accidents and disasters
	Human health
	Cultural and archaeological heritage
	Seascape, landscape and visual impact
	Material assets and activities
	Climate change

Figure 1-4: Offshore EIA chapter structure

Source RSK

2 APPROACH TO SCOPING

2.1 Approach to EIAR Scoping

Under the Directive 2011/92/EU, as amended by the Directive 2014/52/EU, projects listed on Annex 1 and 2 that are likely to have significant effects on the environment, are required to undergo an assessment and consenting process (EU, 2017). The EIA Directive is transposed into Irish law through the Foreshore Act 1933, as amended, and by Part 10 of the Planning and Development Act 2000, as amended. The first stage in the process is 'screening', which will assess whether specified public or private developments are likely to have significant effects on the environment. The second stage in the process is 'scoping', where effects are initially assessed for significance and either scoped in or out of the subsequent EIA. The final stage of the process is the full preparation of the EIA Report (EIAR).

Under the Directive, the following definitions apply:

- 'environmental impact assessment' means a process consisting of:
    - (i) the preparation of an environmental impact assessment report by the developer, as referred to in Article 5(1) and (2);
    - (ii) the carrying out of consultations as referred to in Article 6 and, where relevant, Article 7;
    - (iii) the examination by the competent authority of the information presented in the environmental impact assessment report and any supplementary information provided, where necessary, by the developer in accordance with Article 5(3), and any relevant information received through the consultations under Articles 6 and 7;
    - (iv) the reasoned conclusion by the competent authority on the significant effects of the project on the environment, taking into account the results of the examination referred to in point (iii) and, where appropriate, its own supplementary examination; and
    - (v) the integration of the competent authority's reasoned conclusion into any of the decisions referred to in Article 8a.

The steps set out above are mandatory in the EIA process, whereas under the EU Directive, the Scoping stage is not, unless requested by the developer or CA.

The scoping process has been undertaken early in the project development process to ensure that all likely significant environmental effects are identified. The Scoping Report defines the content of the EIA Report and ensures that time is not wasted assessing non-significant effects. The following processes are involved in scoping:

1. Initiation of scoping
2. Review of information required on surrounding environment, technical project design, likely significant and non-significant effects
3. Scoping consultation

4. Outputs: Scoping Opinion by the CA and/or Scoping Report, including alternatives, cumulative impacts, mitigation/monitoring measures and sources of information.

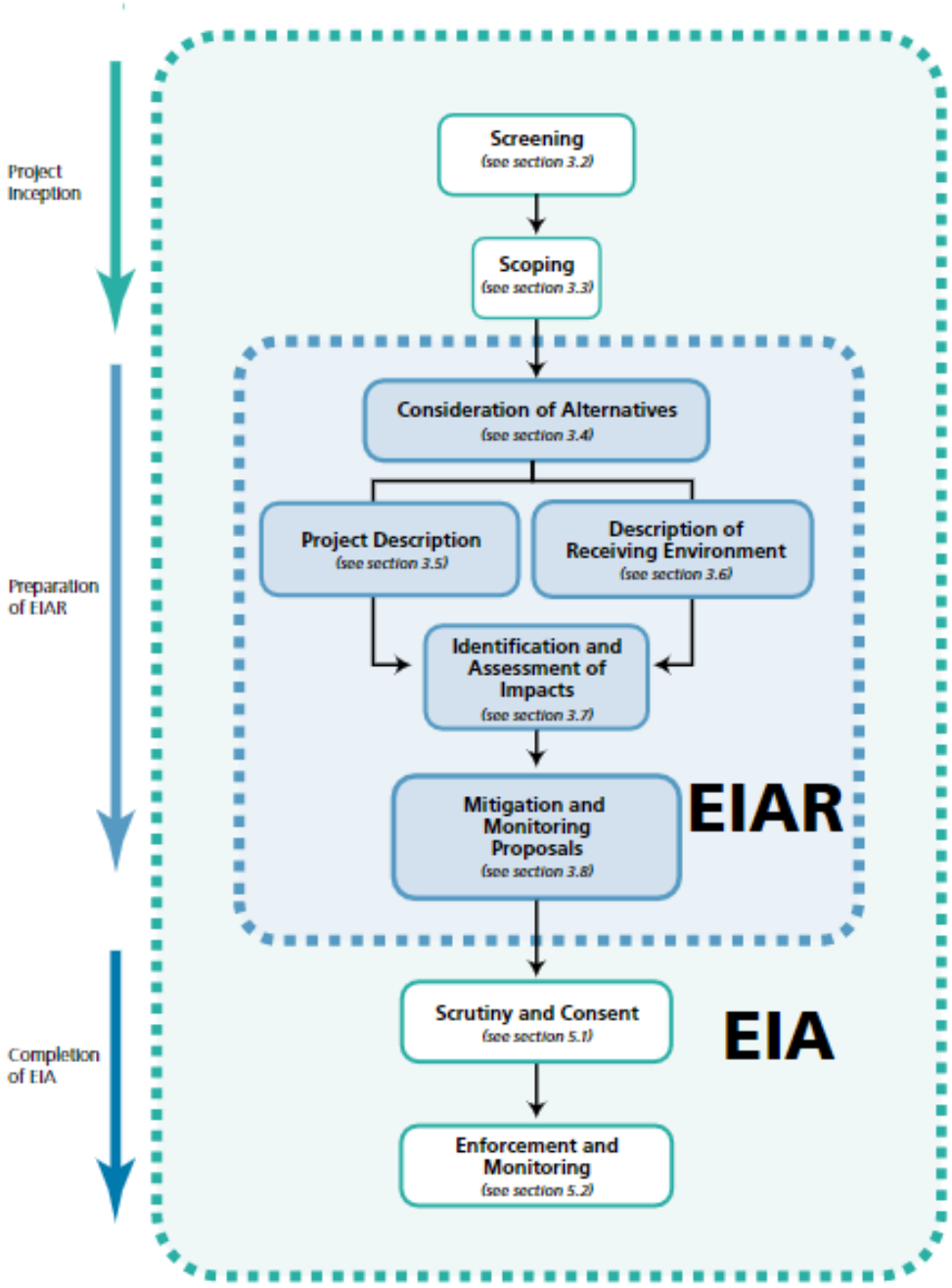

Figure 2-1: The position of Scoping and the EIAR within the EIA Process

Source: Reproduced from Figure 2.2 of the EPA Guideline

Figure 2-1, reproduced from the EPA Guidelines4 shows the principal elements of the EIA process and the role of the Scoping Report and EIAR within that process.

[4] Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA), May 2022

To enable an assessment of the likely significant and non-significant impacts of the project, a baseline description of the surrounding environment is required, as is a description of the project design. When gathering information for the environmental baseline for the Scoping Report, the following typical sources of data have been investigated:

- previous EIAs for similar projects and/or in a similar location
- strategic Environmental Assessments (SEAs) for the project location
- national, European Union (EU) and international databases
- local experts and influential community leaders
- primary data on the surrounding area.

When preparing the project design details, it is required that technologies are adequately described for an informed Scoping Opinion to be made. The 'Rochdale Envelope' principles[5] have been followed for this project. As offshore wind technologies are developing and changing fast, a rigid project description within an EIA may not allow for changes. The Rochdale Envelope approach allows a realistic worst-case scenario to be assessed, to allow for flexibility in the deployment of different technologies to the site, and changes in technology. This approach is followed at other offshore renewables test facilities throughout the world, including the European Marine Energy Centre in Orkney and is particularly useful for test facility developments such as AMETS.

Following the full environmental description and project design stages, the assessment of likely project effects has been made. An appropriate 'zone of influence' has been identified to assess the effects, based on the physical footprint of the project, the surrounding environmental area of the project location where significant effects may occur, and the study area selected for different receptors.

Although scoping can be considered as a discrete stage in the EIA process, one which ends with the issuing of the terms of reference for the EIA Report, the activity of Scoping will continue throughout project development, so that the scope of work can be amended in light of new issues and new information.

On completion of the Scoping Report, it is submitted to the Competent Authority (CA) for a Scoping Opinion. In Ireland, the CA for marine EIA projects affecting the foreshore[6]is currently the Foreshore Licensing Unit (FLU), part of the Department of Housing, Local Government and Heritage (DHLGH). The FLU is also a statutory consultee for An Bord Pleanála (ABP) – Ireland's national independent planning body (EPA, 2021).

As of January 2022 and pending a review of leasing policy with regard to offshore energy developments, it is recognised that applications for commercial Offshore Renewable Energy developments are not currently being accepted by DHLGH. Applications for site investigations and demonstration projects such are AFLOWT at AMETS are still being considered.

[5] http://marine.gov.scot/sites/default/files/chapter_6_-_the_approach_to_eia.pdf
[6] "the bed and shore, below the line of high water of ordinary or medium tides, of the sea and of every tidal river and tidal estuary and of every channel, creek, and bay of the sea or of any such river or estuary".[6]

The guidance below has been followed in the scoping process, in addition to relevant guidance set out in each topic chapter:

- EPA's Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, August 2017 (EPA, 2017)
- EPA's Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, May 2022 (EPA, 2022)
- Department of Housing, Planning and Local Government Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, August 2018 (Government of Ireland, 2018 c)
- EPA's Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), September 2003 (also to be replaced) (EPA, 2003)
- Guidance on EIA Scoping – June 2001 – Office for official publications of the European Communities (European Commission (EC), 2001)
- Guidance on EIS and NIS preparation for Offshore Renewable Energy Projects – April 2017 – Department of Communications, Climate Action and Environment and Sustainable Energy Authority of Ireland, Report for the Environmental Working Group of the Offshore Renewable Energy Steering Group and the Department of Communications, Climate Action and Environment (Barnes, 2017).

2.2 Approach to Scoping of Cumulative Impacts

Under the EIA Regulations (EU EIA Regulations 2018, implementing the European EIA Directives 2011/92/EU and 2014/52/EU and 2017 Department of Communications, Climate Action and Environment (DCCAE[7]) Guidance), there is a requirement to consider the cumulative impacts of a project.

Cumulative impacts are defined as negative effects that result from combined effects from multiple projects, including the proposed project and additional existing and permitted projects. Scoping of cumulative impacts is not a mandatory part of the scoping process but is essential for the subsequent full EIA Report (Christiansen, 2020), thus they are given initial consideration in this document.

2.3 Approach to Scoping Consultation

Stakeholder engagement is considered further in chapter 4. Consultation is an important part of the scoping process and helps to inform the full EIA Report (Christiansen, 2020). Early consultation is considered beneficial, to help identify issues early enough to change the project design with minimal impact to the schedule, and to ensure that consultees are engaged in the project. Though consultation at the scoping stage helps to inform the project design, or in this case, the project design envelope (PDE), the PDE may change during the EIA process, subject to further consultation and development of mitigation measures.

[7] Since 2020 the Department of the Environment, Climate and Communications (DECC)

A Scoping Opinion may also be requested from the Competent Authority by the developer, as per 'Directive 2011/92/EU as amended by Directive 2014/52/EU, Article 5(2): [The Scoping Opinion is prepared by the competent authority] taking into account the information provided by the developer in particular on the specific characteristics of the project, including its location and technical capacity and its likely impacts on the environment.' (EU, 2014 and 2017). This development of the PDE for the AFLOWT Project has been informed from the questionnaire responses from individual companies working in the FOW sector who may be interested in deploying demonstration devices at AMETS.

When preparing their opinion, the Competent Authority 'shall consult the authorities referred to in Article 6(1) before it gives its opinion.' (Article 5(2)).

> "(Directive 2011/92/EU as amended by Directive 2014/52/EU, Article 6(1): Member States shall take the measures necessary to ensure that the authorities likely to be concerned by the project by reason of their specific environmental responsibilities or local and regional competences are given an opportunity to express their opinion [...] To that end, Member States shall designate the authorities to be consulted, either in general terms or on a case-by-case basis. The information gathered pursuant to Article 5 shall be forwarded to those authorities. Detailed arrangements for consultation shall be laid down by the Member States.)."

Consultees and stakeholders so far identified for this project by RSK, Stakeholder managers, BlueWise and SEAI include environmental, regional and local authorities; pollution control and health and safety authorities; planning authorities; neighbouring county authorities; environmental and social interest groups; government departments; trade unions; community groups; fishing agencies; universities and research centres; landowners and residents. The consultees include parties whom the project's activities may potentially affect, who may accept/promote the project, who may oppose the project, who have been involved previously in the project and/or have been influential in the community.

During the EIA process consultees will be provided with sufficient information about the proposed project in order to make informed views and identify concerns and be given adequate time to respond. All consultees' concerns and views are considered fully and are taken forwards in any required changes to the project design, and into the subsequent full EIA Report. If any consultee recommendations are not taken forwards, a full, clear explanation will be given. This approach is line with Article 5(1) of the EIA Directive: '[...] when an [Scoping] opinion is issued, the environmental impact assessment report shall be based on that opinion [...]'.

The approach taken for the AFLOWT project will be to include non-statutory and statutory consultees. Further information is provided in chapter 4.

2.4 Approach to Transboundary Effects

There is potential for offshore renewable energy projects to impact on areas outside of the project footprint and/or study area, reaching into neighbouring jurisdictions (Christiansen, 2020). The EIA Directive requires that transboundary impacts are considered fully in the EIA. Preliminary transboundary impacts are identified and

considered in this Scoping Report to begin the process. It is the responsibility of the Competent Authority to engage with relevant neighbouring jurisdiction authorities for any significant transboundary impacts identified. Transboundary impacts on European habitats and/or species are also be considered for inclusion in an Appropriate Assessment if required, see section 2.5.

2.5 Approach to Scoping of HRA/AA

Under the European Union Habitats Directive 92/43/EEC (EU, 1992) and Birds Directive 2009/147/EC (EU, 2009), there is an aim to restore the favourable conservation status of designated habitats and species. These directives are transposed into Irish law by the European Communities (Birds and Natural Habitats Regulations 2011 (S. I. No. 477 of 2011) (Government of Ireland, 2011), amended by S.I. No. 499 of 2013, S.I. No. 355 of 2015, Planning, Heritage and Broadcasting (Amendment) Act 2021 and S.I. No. 293 of 2021.

Under these Directives, certain sites are given greater protection due to their importance for nature. These sites are Special Areas of Conservation (SACs) (for the protection of designated qualifying habitats and species), Special Protection Areas (SPAs) (for the protection of designated, qualifying bird species), candidate SACs (cSACs) and proposed SPAs (pSPAs) (candidate and proposed sites are afforded the same level of protections as fully designated sites in the Natura 2000 network). These designated sites form the Natura 2000 network of sites. Under the Habitats Directive, where a proposed project is likely to have a significant effect (Likely Significant Effect – LSE) on a designated site and its' qualifying species and features, either alone or in combination with another project, then for consent to be granted, it must be determined that mitigation measures are in place so that no adverse effects on the site may occur. To determine the above, an Appropriate Assessment (AA) must be undertaken by the Competent Authority (CA), with sufficient information provided by the developer for an informed assessment to take place, via preparation of a report to support Appropriate Assessment (Natura Impact Statement (NIS)). This would include the two key stages of AA (Stage 1 (Screening) and Stage 2 (Assessment). The AA Screening Report/NIS is then submitted to the CA.

According to guidance from the Department of Communications, Climate Action and the Environment (DCCAE) and SEAI (Barnes, 2017), the following steps need to be completed:

- undertaking of an assessment of the LSEs of the project, including any cumulative and transboundary effects
- identification of possible European sites that may be impacted by the project's effects and are considered within the Zone of Influence (ZoI). The ZoI is the spatial extent within which potential project impacts may occur
- for any LSEs identified, a Natura Impact Statement (NIS) will be prepared, to enable a more detailed assessment to be undertaken. The NIS is then submitted to the CA to determine whether any LSEs identified will have an adverse effect on the designated site's integrity.

Within the scoping process, a list of possible European sites is identified, for consideration in the AA screening process. The process also identifies sites that may be impacted through cumulative and transboundary effects. Mobile qualifying species are

considered carefully, such as marine mammals and birds, as these species have the potential to travel long distances from the proposed project area to other distant areas. For any non-Irish designated sites identified, the relevant authorities will be consulted with: Natural England for sites in England, the Northern Ireland Environment Agency (NIEA) and Natural Resources Wales (NRW) for sites in Wales. Further information is provided in the offshore biodiversity chapter.

2.6 Approach to Consideration of Alternatives

Under the EIA Directive, Annex IV(2) of the amended Direction, 'A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects' is required (EU, 2017). Thus 'alternatives' to the project must be assessed in the full EIA Report, they are also considered in this Scoping Report as good practice. These alternatives can be changes to the project's design, location, processes, technology, and/or mitigation measures, which may have potential to avoid, reduce and/or mitigate against the significant effects of the project. A 'Do-nothing scenario' is also considered (Barnes, 2017) as one alternative.

As this project includes consideration of multiple FOW technologies, a broad range appraisal of alternatives is required, and of relating mitigation measures. It is possible that more than one technology may be tested at the site at one time, which is considered to be a 'worst case scenario'.

Consideration of such alternatives along with a 'Do nothing' scenario which leaves the existing licensable activity at AMETS as the demonstration of WEC only, is also included in the consultation process. It is suggested that the 'Do Something' scenario will help Ireland maintain relevancy in the Offshore Renewable Energy sector and allow the demonstration of FOW devices and technology, which will benefit the industry as a whole.

2.7 Approach to Monitoring

Monitoring measures must be included in the full EIA Report if mitigation measures are applied (EU, 2017). In order to begin the process of considering what may be appropriate these are considered in the Scoping Report. Monitoring measures are put in place to test that mitigation measures against likely significant project effects are working, and also identify any addition significant effects that weren't identified earlier in the process.

3 POLICY AND LEGISLATION

3.1 Legislative context

Renewable energy is becoming an increasingly important sustainable energy source as Ireland, and indeed the world, strives towards the attainment of Net Zero. To date, fixed offshore wind has been a major contributor to Europe's energy requirements, but the location of such devices is limited to relatively shallow waters. As technology evolves, there is a significant opportunity to utilise floating offshore wind to allow wind resource to be harnessed in deeper offshore waters. The AMETS site provides an opportunity to test and further develop this technology helping Ireland to meet future carbon reduction and Net Zero targets. The key drivers underpinning this need and the potential for the AMETS site are:

- to help facilitate the Irish Government's commitment that 80% of electricity is to be generated from renewable sources by 2030
- to contribute towards the reduction of greenhouse gas emission by enabling technologies that can increase energy generation from low carbon sources
- to develop sustainable marine renewable technology via expansion of Test Site facilities which in turn helps to secure safe, affordable and reliable local energy generation to support the expected increase in electricity demand whilst meeting climate change commitments.

3.1.1 Legislative and Policy Drivers

With the increased awareness of the impacts of climate change and collective drive to reduce carbon emissions, there have been several recent policy developments that support the need for the proposed AMETs project. These policy developments largely build upon the 2014 Offshore Renewable Energy Development Plan (OREDP) and its ambition for the development of approximately 3 GW of offshore wind in Irish territorial waters. Relevant recent policy developments have increased this ambition (to 5 GW) and include the following, with a more comprehensive list of relevant legislation and policies available in Table 3-1:

- Marine Planning Policy Statement (November 2019) – providing a vision for future development of Ireland's marine planning system, associated policies, principles and strategic priorities
- Marine Planning and Development Management Bill (MPDM), General Scheme (January 2020), updated by the Maritime Area Planning Bill (August 2021) which aims to improve the cohesion in Ireland's marine planning consent regimes, including removing duplication and providing a new single streamlined marine planning and consent process
- Climate Action Plan (November 2021) which provides an ambitious strategy for combating climate disruption and its associated impacts in Ireland. This includes a target to increase the proportion of Ireland's renewable electricity to up to 80% by 2030, which includes an increased target of 5 GW of offshore wind production

- National Marine Planning Framework (NMPF) (May 2021) outlines the Irish Government's vision, objectives, and marine planning policies for all marine activities, including offshore wind, ensuring the sustainable use of marine resources to 2040. The NMPF is Ireland's first marine spatial plan and fulfils its requirements under the EU Maritime Spatial Planning Directive (2014/89/EU). Relevant policies within the NMPF include the increased target for offshore wind of 5 GW by 2030.

Table 3-1: Relevant legislation and policy

Legislation	Description	Relevance to project
International Legislation		
Paris Agreement Under the United Nations Framework Convention on Climate Change	First-ever universal, legally binding global climate change agreement adopted at the Paris climate conference (COP21). Aims to reduce the emission of greenhouse gases and thus limit global warming to below 2°C. It also aims to strengthen countries' ability to deal with the impacts of climate change and support them in their efforts.	The EU submitted an updated and enhanced nationally determined contribution in December 2020, with the target to reduce emissions by at least 55% by 2030 from 1990 levels. The AFLOWT project at AMETS project will help contribute, both directly and indirectly, to this target.
European Legislation		
European Green Deal	As part of the European Green Deal, the EU and its Member States, acting jointly, are committed to a binding target of a net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990.	The AFLOWT project at AMETS project will both directly and indirectly help Ireland to meet their commitments under the European Green Deal and the Renewable Energy Directive.
Renewable Energy Directive (2018/2001/EU)	Member states are committed to at least 32% share of energy from renewable sources by 2030.	
The EU Water Framework Directive (2000/60/EC)	Transposed into Irish law by the European Communities (Water Policy) Regulations 2003, the WFD requires all Member States to protect and improve water quality in WFD water bodies to ensure achievement of good ecological status.	A desk-based WFD compliance assessment will be required to support consent applications. A WFD assessment will be undertaken utilising available data (including from EPA) and information from relevant chapters of the EIAR.

Legislation	Description	Relevance to project
Marine Strategy Framework Directive (MSFD) (2008/56/EC)	Obliges Member States to define a framework to protect the marine environment and develop necessary measures to achieve or maintain good environmental status in the marine environment.	The AFLOWT project at AMETS will need to be developed in line with the principles and policies of the MSFD.
Maritime Spatial Planning (MSP) Directive (2014/89/EU)	EU Directive requiring all member states to develop marine spatial plans to ensure any human activity in the marine environment is carried out in a safe and sustainable way.	The AFLOWT Project at AMETS will be developed in line with the MSP Directive. It will specifically help deliver the Directives' aim of increasing cross-border cooperation between EU countries to develop renewable energy.
EIA Directive 2011/92/EU, as amended by Directive 2014/52/EU and transposed into Irish law in the Planning and Development Act, 2000-2020 and the Planning and Development Regulations 2001-2020 as amended by S.I. No. 296 of 2018.	The directive looks at the environmental impacts of certain qualifying projects under the Planning Act 2000-2020.	The proposed AFLOWT Project at AMETS Floating Offshore Wind Test Site will require an EIAR to support consent application. This scoping report forms a scoping opinion request to determine the potential impacts the development may have on a range of receptors and thus identify any topics that can be scoped out of formal EIA.
Habitats Directive (92/43/EEC) and the Birds Directive (2009). These Directives are transported into law by the European Communities (Birds and Natural habitats) Regulations) Regulations 2011 (as amended) and transposed into Irish Law as Part XAB[8] of the Planning and Development Acts	The Habitats Directive protects rare, threatened or endemic species of plants and animals. It forms part of Europe's nature conservation policy, helping to establish protected areas and providing protection against developments which may have negative impacts on these areas. The Birds Directive provides protection for birds naturally found within European countries. It also protects against habitat loss or damage for areas used by any	The AFLOWT project at AMETS will need to assess whether the proposed Test Site and associated infrastructure will impact on any protected areas or species. This may also include migratory birds.

[8] S.I. No 477/2011 – European Communities (Birds and Natural Habitats) Regulations.

Legislation	Description	Relevance to project
2000 to 2020 and Part 20 of the Planning and Development Regulations 2001-2020).	endangered or migratory bird species.	
Irish Legislation		
The Foreshore Act 1993 to 2014 and the Foreshore Regulation 2011 (S.I. No. 353/2011)	A lease or license is needed for any work carried out on the foreshore, which involves the placing of a structure or the addition or removal of materials.	A foreshore licence is required for site investigation works at AMETS. It should however be noted that post 2023 all site investigation licences will be processed via MARA.
The Offshore Renewable Energy Development Plan (OREDP), OREDP interim review 2018 and OREDPII.	The OREDP provides a framework for the sustainable development of Ireland's Offshore energy resources. This will help reduce greenhouse gases, ensure long term energy can be supplied and create jobs.	The development of the AFLOWT project at AMETS would directly contribute to the OREDP and the updated OREDPII and help to enable future floating offshore wind resource development in Ireland.
Maritime Area Planning Bill 2021	The Maritime Area Planning Bill (2021) updates the Marine Planning and Development Management Bill General Scheme (2020) in providing a legislative framework for a new streamlined development consent process for activities in Ireland's marine area. The Bill proposes to establish a new legal framework for the maritime area, replacing the existing foreshore, planning and environmental processes with a single streamlined consent process.	Consent for the AFLOWT project will fall under MARA, and the Maritime Area Planning Bill. It is our understanding that one state consent (Maritime Area Consent) will be required to enable occupation of the Maritime Area together with one development consent (planning permission), both supported by a single environmental assessment.
Maritime Jurisdiction Act 2021	Act defining Irish Maritime Area which is currently covered under the Foreshore Act 1933, Continental Shelf Act 1968 and the Sea Fisheries and Maritime Jurisdiction Act 2006.	The AFLOWT FOW Test Site proposal will need to take account of the Maritime Jurisdiction Act 2021 (when enacted).

Legislation	Description	Relevance to project
Marine Planning Policy Statement (November 2019)	Policy statement outlining the current marine planning system and future vision. The statement provides overarching policies and principles of the marine planning system.	The AFLOWT project will need to be developed in-line with the policies and principals within the Marine Planning Policy Statement.
National Marine Planning Framework (NMPF) (May 2021)	The NMPF is Ireland's Marine Spatial Plan and delivers the requirements of the EU MSP Directive. It considers human use of the marine environment and how activities can be carried out in a sustainable way.	The proposed AFLOWT project at AMETS is in line with the plans and policies within the NMPF and will help Ireland reach its ambition of 5 GW of offshore wind by 2030.
Climate Action Plan 2021	This outlines actions on how Ireland can reduce greenhouse gas emissions to meet 2030 climate commitments and achieve net zero emissions by 2050.	The AFLOWT project at AMETS will help the Irish Government deliver their target of 5 GW of offshore wind production by 2030, both directly through the deployment of devices on site and indirectly by enabling the development of floating offshore wind technology.
Planning and Development Act, 2000, as amended, (See S.177AA(4), S.177R, S.177W(7) and S.177AA(8),	Allows for planning issues and legislation to be covered in one place, providing guidance on how to carry out required planning permission.	Onshore elements of the AFLOWT project at AMETS would traditionally have been consented under the Planning and Development Act with offshore elements under the Foreshore Act. However, it is assumed that the Maritime Area Planning Bill 2021 will facilitate streamlined development consent. The onshore elements of the project have already been consented.
Schedule 5 of the Planning and Development Regulations, 2001, as amended	Sets the project type and scale thresholds at which an EIS and resultant EIA is mandatory. Offshore renewable energy developments are not specifically mentioned in the Regulations, however, for hydroelectric energy production, the scale threshold requiring a mandatory EIA is an output of 20MW or more. The threshold for wind farms is 5 turbines or a total output of greater than 5MW.	Decisions relating to new technologies will have to be made as to their classifications for EIA thresholds.(See comment above regarding MARA.

Legislation	Description	Relevance to project
Electricity Regulation Act 1999	The Act gives the Commission for Regulation of Utilities (CRU) the necessary powers to licence and regulate the generation, distribution, transmission and supply of electricity in Ireland.	As the generating capacity of the proposed technologies at the Test Site are greater than 1 MW, it is likely that deploying developers will need to apply for a CRU generating licence. ESB Networks (ESBN) is responsible for operating and maintaining the electricity network in Ireland.

3.1.2 Required consents and associated process

The standard consents previously required for offshore renewable energy projects in Ireland include foreshore licences and leases (under the Foreshore Act 1933/ Foreshore Regulation 2011), terrestrial planning permission and a licence to construct and operate electricity generation stations. These required consents are outlined in the guidance on EIS and NIS Preparation for Offshore Renewable Energy Projects (Barnes, 2017). However, as previously noted, a new streamlined development consent process for maritime activities is currently progressing through legislative scrutiny before enactment via the Maritime Area Planning Bill 2021. The new consenting regime set out in the Bill consists of three parts:

1. Maritime Area Consent System (MAC)
2. Licencing for maritime usages (which do not require planning permission or an EIA)
3. Planning permission (development consent).

Under the Bill a new Maritime Area Regulatory Authority (MARA) will be established which will grant MACs and licences for specified maritime usages (licences for lower order activities, e.g., dredging and environmental surveys).

MACs replace the existing foreshore consent system and cover the whole maritime area (high-water mark to the outer limit of Ireland's continental shelf). MARA will be responsible for enforcing and maintaining compliance with the MACs and licences.

Development consent or planning permission for the maritime area will be based on Ireland's terrestrial planning system regulated under the Planning and Development Act 2000 (as amended and the Planning and Development Regulations 2001 (as amended)) and augmented with marine specific considerations. Coastal Planning Authorities (CPAs) will be responsible for regulating the planning process for certain marine activities in the nearshore (high water mark out to three nautical miles) whilst An Bord Pleanála will take responsibility for all other activities (including all projects requiring an EIA).

3.1.2.1 Permitting and Licensing Requirements

Given the immediate nature of the AFLOWT project at AMETS, we have assumed that the marine site investigation surveys will be consented via a foreshore licence under the existing procedures (until MARA is established). We have assumed that the permanent works (and thus this scoping report) will be considered by the MARA and An Bord Pleanála under the new streamlined development consent process for activities in

Ireland's maritime area (Figure 3-1). Further information about Marine Area Consent Assessment is included in the Irish Governments consultation document published in January 2022[9].

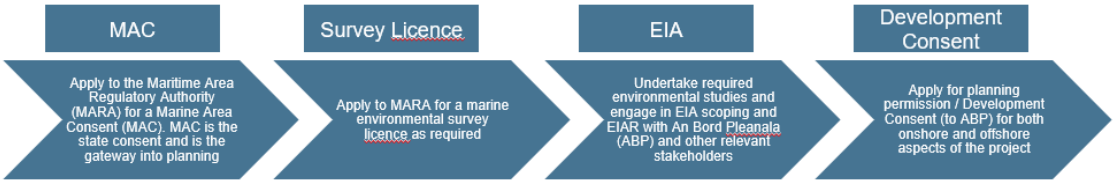

Figure 3-1: Proposed streamlined marine consenting regime under the Maritime Area Planning Bill 2021

[9] Offshore Renewable Energy Maritime Area Consent Assessment for Relevant Projects Consultation Document January 2022, available at https://www.gov.ie/en/consultation/1f918-offshore-renewable-energy-maritime-area-consent-mac-assessment-for-phase-one-projects/

4 STAKEHOLDER ENGAGEMENT

4.1 Engagement to date

The objectives of stakeholder engagement are to effectively communicate the proposed project to all stakeholders, build support, identify opportunities for community benefit and incorporate stakeholder feedback into future plans.

Stakeholder groups include those directly impacted by the project, e.g., fishermen and local residents; local government and other organisations; wider national government bodies and other organisations; politicians; key interest groups; other energy organisations; and the media.

All engagement activities will be run/produced in the Irish language and English.

To date, the following engagement activities have been undertaken by SEAI. Meetings between SEAI's third party consultants with relevant authorities were undertaken to agree marine survey scopes in 2020. Details of such meetings are included in individual chapters within this report as relevant and included in Table 4-1, where known. Feedback from activities carried out in 2012 related to existing foreshore licence for WEC at the site. An industry wide questionnaire with associated project report was also published on the project website between 06 September and 08 October 2021. This aimed to gauge the level of interest in all marine technology developers utilising the AMETS site. Some results from the questionnaire are summarised in Appendix A, along with a list of stakeholder organisations and consultees (note individual responses were not included due to GDPR). Individual responses providing technology specifications were used to help define the PDE. Further information is included in chapter 5, Project Description.

Table 4-1: Engagement activities taken place to date for the AFLOWT project

Date (where recorded)	Consultee	Purpose	Outcome
2012	Sea Fisheries Protection Authority	Identify concerns and feedback for proposed site investigation surveys	Possible interactions of Test Area B with fishing activities were identified, due to its proximity to Inishglora and Eyde Rock.
29 Sep. 2019	Foreshore Licence Unit	Pre-application meeting. Seek legal advice (December 2019) on the licencing regime required.	Conscious of change in consent process with the new Marine Planning and Development Bill.

Date (where recorded)	Consultee	Purpose	Outcome
25 Sep., 2019	Marine Institute, Mayo County Council, Bord Iascaigh Mhara (BIM), National Parks and Wildlife Service (NPWS), Western Development Commission,Bord na Mona; Udaras na Gaeltactha, SEAI and SAIPEM.	The meeting began discussions with local fishermen and foreshore users.	Gave an update on the overall project and planned development.
10 December, 2019 (Ballina)	SEAI & the North West Regional Inshore Fisheries Forum (NWRIFF)	Meeting to give an update on the project and start discussions with local fishermen and foreshore users.	Further meetings planned.
2019	ESB Networks	Meetings to discuss the grid connections	10 MW Connection agreed. (An associated planning application has also been approved for development of the onshore cable route).
4 February 2020 (Belmullet),	Fisheries:	SEAI gave an update on the overall project and planned development.	Further meetings planned
5 Feb 2020 (Belmullet)	Mayo County Council:	Gave an update on the overall project and planned development	General update
5 February, 2020	CFID (Blacksod)	SEAI gave an update on the overall project and planned development.	Further meetings planned
May, 2020	Inland Fisheries Ireland	Identify concerns and feedback for	Mitigation measures should be included for

Date (where recorded)	Consultee	Purpose	Outcome
		proposed site investigation surveys.	the timing of works, and level/duration of noise generation. Mitigation measures for marine mammals are not transferrable to fish species. The short sampling window proposed will help to mitigate effects on fish, yet further mitigation measures should include the use of soft-start and ramp-up procedures and minimising the duration of noise generating surveys to the minimum necessary. Advice should be sought from the Sea Fisheries Protection Authority (SFPA) in regard to commercial fish. Ecology surveys include the study of fish and migratory species in the area. The use of the area as a recreational fishing spot should be noted, and the local Belmullet angling club should be engaged with.
2020	Marine Institute, Ireland	Identify concerns and feedback for proposed site investigation surveys.	Impacts on the seabed are likely from surveys, yet significant impacts are unlikely, and the Marine Institute has no objections. Part of Foreshore Licence process

Date (where recorded)	Consultee	Purpose	Outcome
June, 2020	Department of Culture, Heritage and Gaeltacht	Identify concerns and feedback for proposed site investigation surveys.	Following the screening assessment for the proposed site investigation surveys, there is a likely impact on bottlenose dolphin (an Annex II species) in the West Connacht SAC, thus a full Appropriate Assessment (AA) will be required. Mitigation measures should be developed from the findings of the AA. Part of Foreshore Licence process
2020	Marine Survey Office	Identify concerns and feedback for proposed site investigation surveys.	No adverse impact from site investigation surveys identified. Suggestion of more detailed consultation with the local fishing community. Part of Foreshore Licence process
June, 2020	Department of Housing, Planning and Local Government	Identify concerns and feedback for proposed site investigation surveys.	SACs within 15 km identified, and SPAs within 20 km.
2020	Public submissions in response to Foreshore Licence Application	Identify concerns and feedback for proposed project.	Concerns raised by stakeholders included: disturbance from potential onshore works, noise disturbances, increased traffic, use of hazardous materials, ocean pollution, impacted views along the coast, a waste of taxes and a decline in

Date (where recorded)	Consultee	Purpose	Outcome
			nature. These concerns were addressed in client responses.
30 Nov 2020	National Parks & Wildlife Service	Informal meeting to outline and present: the AFLOWT project in AMETS; the current foreshore license application required for deployment of the floating turbine technology offshore; ecological data and survey work which will inform preparation of the AA and EIAR. benthos, ornithology and marine mammals.	Project must be clearly defined to facilitate scoping for EIAR and AA Data provided must enable robust and reasoned scientific assessment to justify if 12 months data sufficient (given existence of historical data) It must be clear that the current data validates the historical data, as the concept has been proved and requirement is to ensure no departure from the habitat.
14 Jan 2021 (Online)	Fisheries:	Informal Meeting to update on project status	Further updates planned
18 May 2021	Marine Institute, EMEC, UCC/MaRei, ESBI, ESBN, EirgridCRU, BlueWise.	Workshop to discuss the project and technologies.	Highlighting of technologies, energy connections, partnerships and funding requirements.
19 May 2021	IT Sligo, Erris Sustainable Energy Community, Údarás na Gaeltachta, Letterkenny IT and Mayo County Council.	Workshop to discuss how the project would impact the local community and Ireland.	Highlighting of importance of project to North West Ireland – and possible partnerships and funding opportunities.
May, 2021	Enterprise Ireland, MRIA, NOW, Wind	Workshop	Highlighting need for exemptions for research and test/demonstration

Date (where recorded)	Consultee	Purpose	Outcome
	Energy Ireland, IDA and Ocean Energy Europe.		sites in the Maritime Area Planning Bill, and consideration of technologies, partnerships and industry requirements.
Sept 2021	All stakeholders	Press release to publicise the project and the industry questionnaire.	Positive feedback received.
Sept 2021	Energy companies	Industry questionnaire was circulated to identify views of technology to be developed at the Test Sites.	Nine FOW energy organisations responded, with positive responses received. As well as 4 subcontractors including piling, auxiliary services, a cable supplier and a crane supplier. These were incorporated into the proposed Project Design Envelope.
22 June 2022	Belmullet, various fisheries groups	Project updates in advance of the Public consultation event on 23/06/2022	TBC
23 June 2022	Belmullet Public consultation event	Public Consultation Event associated with submission of the EIA Scoping Report	TBC

4.2 Ongoing engagement

RSK Ireland Ltd (RSK) appointed BlueWise Marine Limited to assist with stakeholder engagement activities for the project for the duration of the EIA process. RSK and BlueWise have prepared a Stakeholder Management Plan, including compiling a Stakeholder Register; and have prepared a Stakeholder Engagement and Communications Strategy. The Strategy sets out the main stakeholder groups and the appropriate engagement and communication methods for each. The Engagement and

Communications Strategy is based on best practice guidance from the Aarhus Convention which provides that the public will have access to environmental information; that they are facilitated to participate in environmental decision making; and that they have access to justice.

Recent engagement events planned for the project include two public engagement events and concurrent stakeholder engagement meetings. The first set of public and stakeholder engagement activities are scheduled for June 2022 as indicated in Table 4-1 above. The purpose of this early engagement is to get a head start with the engagement activities associated with the formal submission of the request for a Scoping Opinion. The second set of public and stakeholder engagement meetings which will take place in in winter 2022/ spring 2023, this will provide an opportunity for public and stakeholder consultation on the final EIAR, AA and consent application prior to its submission.

The feedback received from stakeholders during the consultation, and how it is responded to in the final project and its design, will be reported in the EIAR. Once the consent application is submitted, there will be a further opportunity for stakeholders to engage during the statutory consultation period which will be for a period of eight weeks following the publication of the relevant notices.

5 PROJECT DESCRIPTION

5.1 Introduction

This chapter describes the likely key infrastructure and design parameters of the proposed Test Site development in the form of a high-level project description, indicative project programme and potential deployment, operation, maintenance and decommissioning considerations.

The FOW sector is developing rapidly, and technologies are constantly evolving. Given this evolving landscape and the fact that the AMETS is to be a FOW Test Site, which facilitates a broad range of innovative and new technologies, the approach in this Scoping Report is to develop a project design envelope which will address and base environmental assessments on a "worst-case scenario" basis. The design envelope provided is indicative and will be refined in consultation with individual FOW developers, who may be interested in deploying to the site, stakeholders and regulators as the project evolves. The final project design envelope will be clearly presented within the EIAR, forming the basis for the environmental impact assessment. It is envisaged that prior to deploying to the site individual developers will carry out their own assessments which will include consideration of the potential impacts and mitigations of the deployment of their specific technologies, in support of the information supplied and assessed in this EIAR. This approach is similar to that followed at the European Marine Energy Centre in Orkney. Developers would submit more detailed design information relating to individual technologies to the relevant authorities prior to occupying the Test Site.

This project proposes to make a separate and independent application under a new regime in addition to the existing wave lease consent for the AMETS Test Site for a wave energy converter (WEC) testing facility, in order to allow the site to be used as a floating offshore wind (FOW) Test Site as well. Wave consent for the two WEC sites A and B (Figure 1-3) was granted in November 2015. If a subsequent additional consent is granted for FOW technology, the AMETS site will offer a full-scale grid connected site with two sub-sites, one at 100 m (Site A) water depth and the other in 50 m of water (Site B). It is anticipated that the site will allow for testing of full scale single FOW Wind Turbine Generator (WTG) or small arrays up to a total of 6 devices (Table 5-4).

The proposed development will involve deploying FOW devices (as described in section 5.3.1), potentially in conjunction with the already consented WECs. FOW devices will be anchored within the designated Test Areas and will be connected to the electricity grid onshore via submarine cables installed between the Test Areas and the already consented onshore electricity substation. The project will have the following components (Figure 5-1):

- two offshore Test Areas delineated by cardinal marker and other buoys - Test Area A with 100 m water depth and Test Area B with 50 m water depth
- FOW devices and/or WECs will be deployed within the Test Areas once these have been established
- mooring and anchorage systems for FOW devices and/or WECs within the Test Areas

- up to four sub-sea export cables of 33 / 66kv (or the most up to date technology / voltage at the time of installation) from Belderra Strand, maximum of two to Test Area A and two to Test Area B
- maximum of two (one circuit) inter-array cable(s) from one device at Test Area A and/or B to another device (FOW or WEC), with a maximum length of 6 nm each
- one meteorological mast with 1-2 meteorological measuring devices mounted at Test Area A. (Note: metocean buoys are included in the previous foreshore licence (DE230/015/AC#14849959.11) from November 2015)
- onshore junction/transformer box to link the static cables to the onshore cable (this is not included in the marine scope as it is already consented as part of the onshore infrastructure).

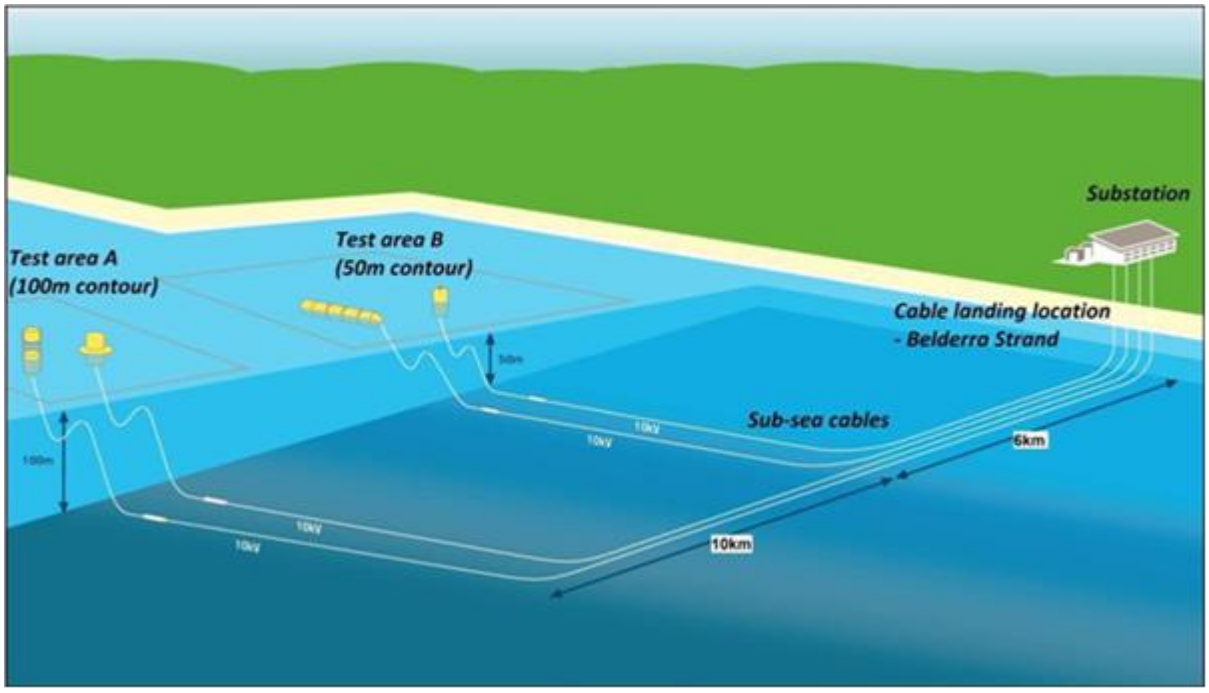

Figure 5-1: Project Component Schematic

The following project elements are not considered further within this project description or the EIA Scoping Report as they have been assessed and already consented in the 2015 Foreshore Licence for the WEC technology:

- placement of full-scale wave energy converters (WECs)
- onshore infrastructure, including onshore cabling and substation
- land-side cable transition joint bay located adjacent to Belderra Strand to allow connection of submarine electricity cables to land-side electricity cables
- oceanographic monitoring equipment as follows (for anchorage assessment purposes):
    - Test Area A: Met Ocean buoy to record the waves and other data such as wind, pressure and direction. In addition, an Acoustic Doppler Current

Profiler (ADCP) is located adjacent to the weather buoy. (This is a temporary device and only used sporadically)

- Test Area B: Waverider buoy[10] moored to measure the wave resource at this location. It is intended to deploy a second Waverider and a further ADCP (SEAI, 2011 and 021)
- one ADCP may be deployed on the seabed at 20 m depth (SEAI, 2011 and 2021).

- Office base in Belmullet.

5.2 Location

The AMETS site is situated off Annagh Head, west of Belmullet in County Mayo (Figure 5-2). Although WEC consent has been granted, to date, work on site has been limited due to lack of developer interest (no WECs have been capable of withstanding the harsh metocean conditions at AMETS).

The site is 7 km from Belmullet and stretches offshore from Belderra Strand at the southern end of the bay south of Annagh Head. Access to the proposed landfall site at Belderra Strand is good with main access off the R313 which passes through Belmullet. From there, the R5233 leads to Belderra Strand by tarmac road along the coast. A small hard standing parking area for recreational users has been provided by Mayo County Council near the southern end of Belderra Strand.

The immediate land side of the Bay is mainly within the Natura 2000 site Mullet/ Blacksod Bay complex (cSAC Site Code 000470) and will be traversed for a short distance by the cable landing in the shore area at Belderra. The land side of the L5233 adjacent to Belderra strand is outside of any designations.

The AMETS site will be developed for FOW testing as well as the current WEC testing facilities. There are two separate locations within the overall project boundary at differing water depths to allow for a range of devices to be tested.

- Test Area A is at 100 m water depth and is located approximately 16 km from Belderra Strand (total area 6.9 km^2)
- Test Area B is at 50 m water depth and is located approximately 6 km from Belderra Strand (total area 1.5 km^2).

The Test Areas were designed following consultation with developers and marine users and were based on Marine Institute survey data and other survey data for the area (ESBI, 2011). Test Area A consists of an irregular ‘boot’ shape designed to allow anchoring of the FOW devices and/or WECs on sediments ranging up to 7 m in depth, while avoiding fishing grounds in the area as much as possible. Test Area B consists of a rectangular area and is also located on sediments up to 7 m in depth. It will accommodate WECs and/or FOW devices.

[10] In order to help prevent collision damage to these oceanographic buoys, each of the two Test Areas has a large Special Mark buoy moored close to them. The Special Mark buoys warn passing vessels to keep their distance. The Special Mark at Test Area B can be seen from the adjacent mainland on a clear day.

Test Areas A and B are shown in Figure 5-3 and Figure 5-4 respectively and will be delineated by both cardinal marker buoys and other marker buoys in accordance with international regulations and consultation with the Marine Survey Office (MSO) and the Commissioners of Irish Lights (CIL).

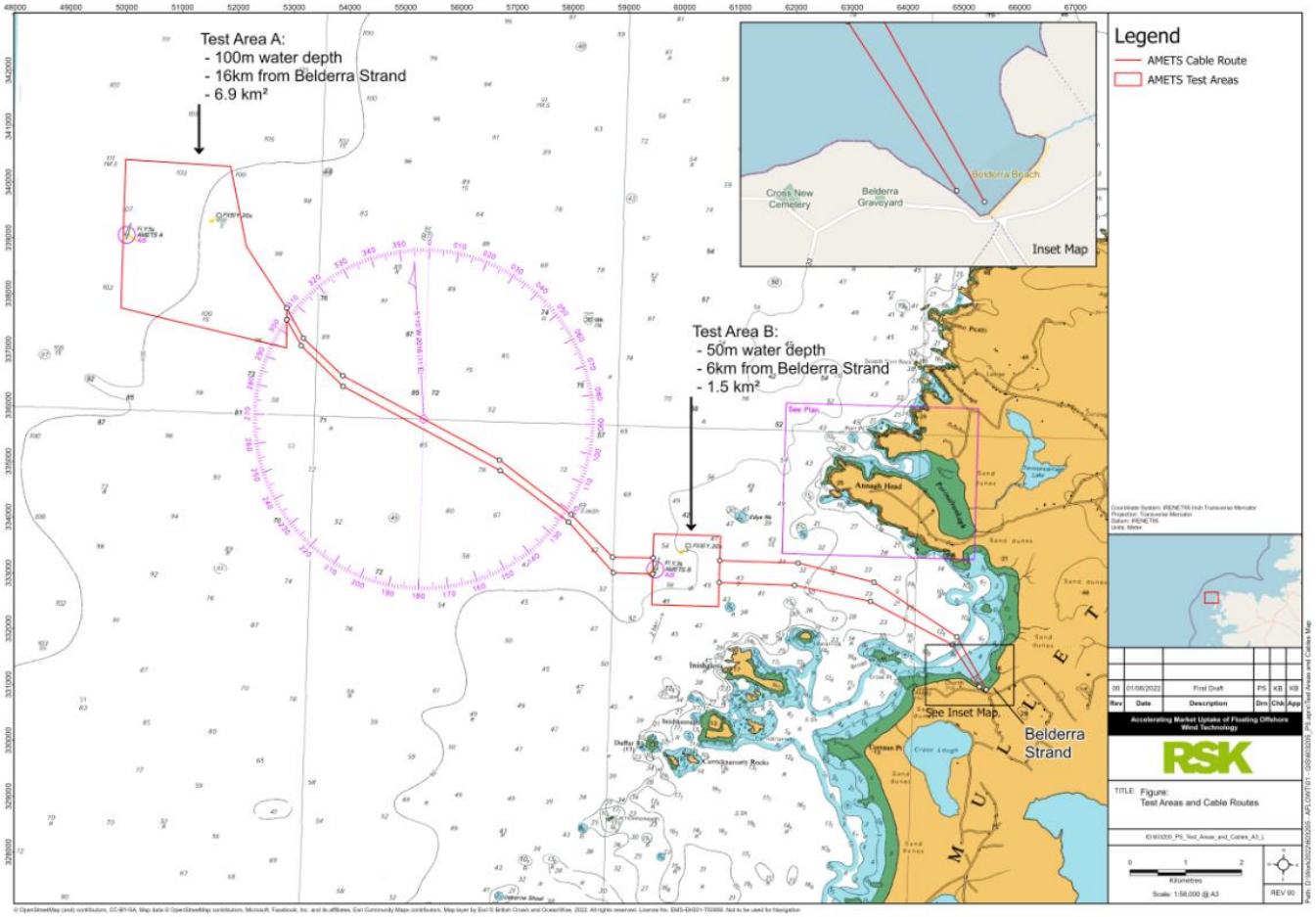

Figure 5-2: AMETS Lease Map

Table 5-1: Co-ordinates for Test Area A

Location	Latitude	Longitude
1	- 10° 18' 16"	54° 17' 25"
2	- 10° 16' 31"	54° 17' 23"
3	- 10° 16' 13"	54° 16' 37"
4	- 10° 15' 31"	54° 16' 2"
5	- 10° 15' 30"	54° 15' 39"
6	- 10° 18' 15"	54° 15' 59"

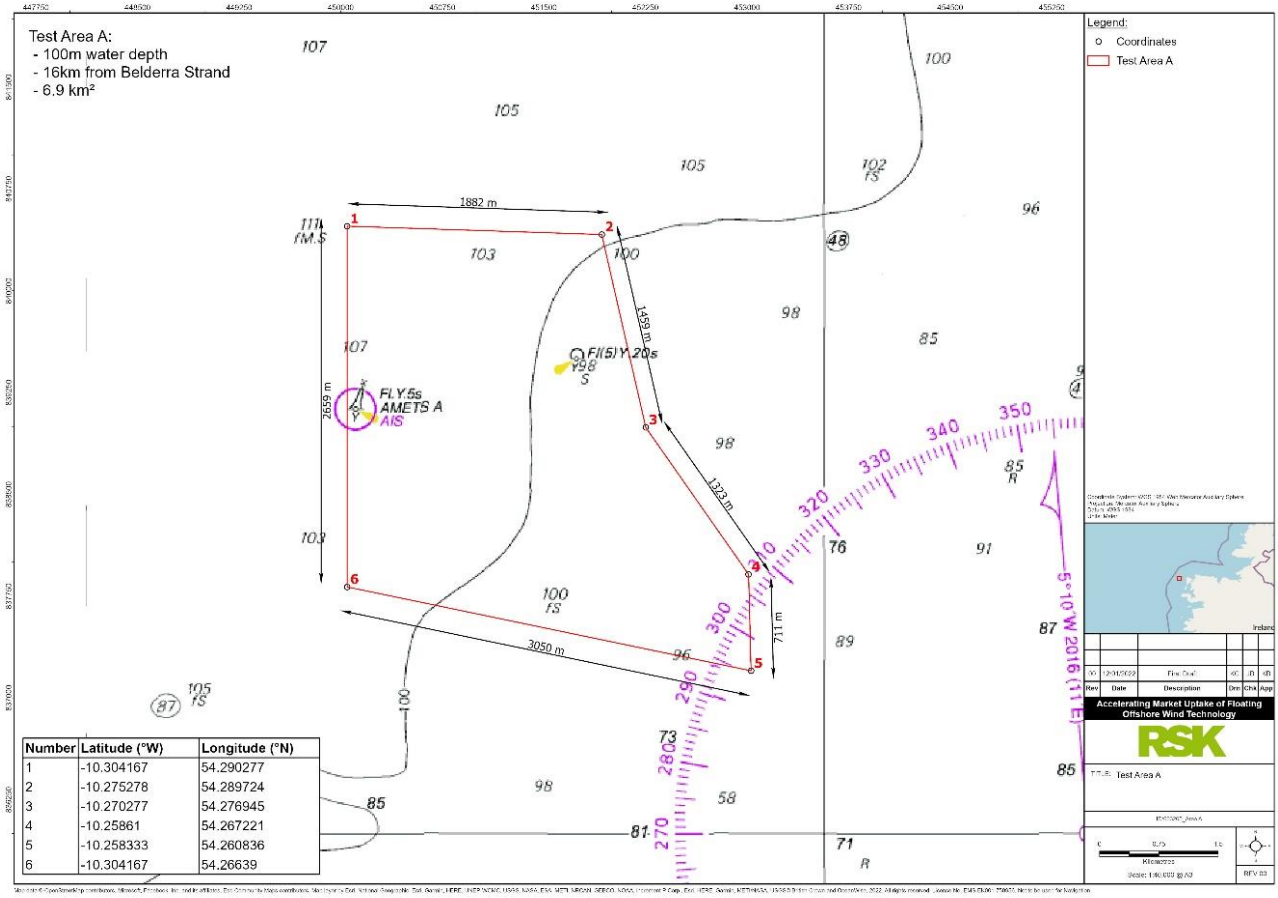

Figure 5-3: AMETS Test Area A

Table 5-2: Co-ordinates for Test Area B

Location	Longitude	Latitude
7	- 10° 09' 21"	54° 13' 17"
8	- 10° 08' 15"	54° 13' 17"
9	- 10° 08' 15"	54° 13' 58"
10	- 10° 09' 21"	54° 13' 58"

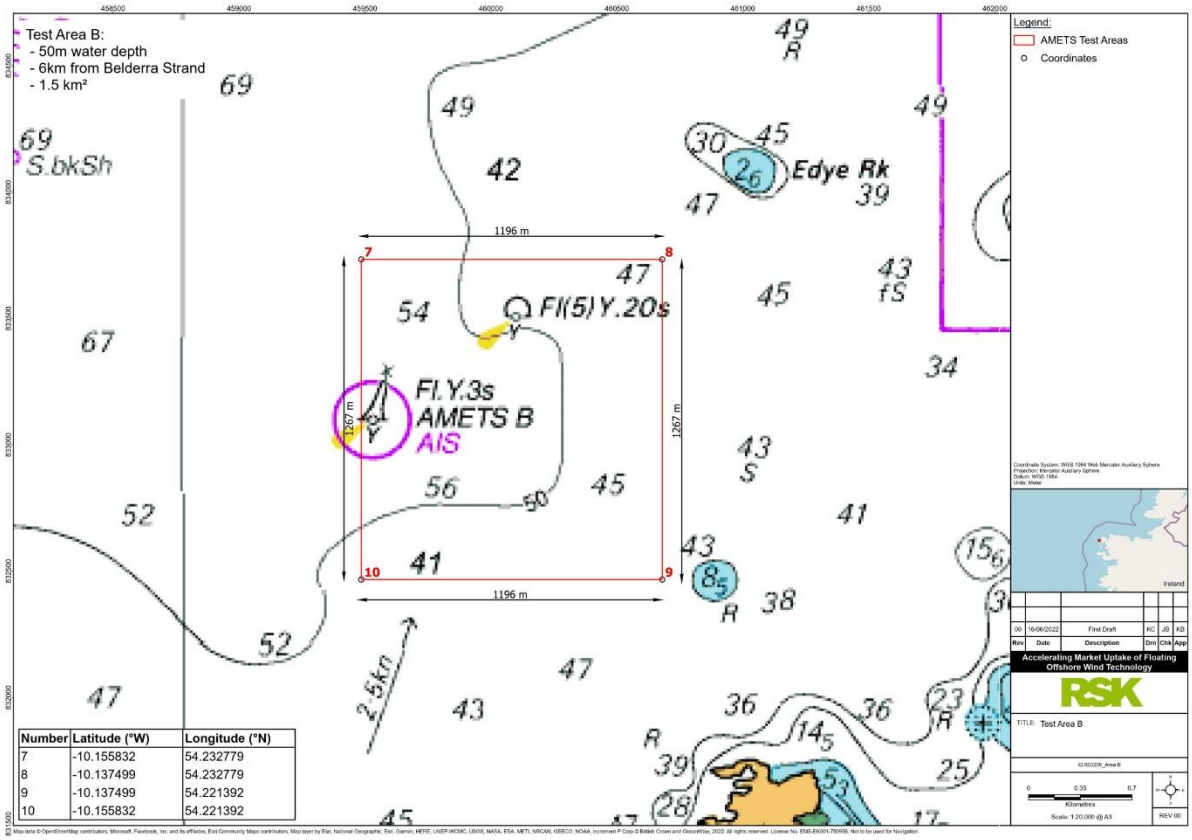

Figure 5-4: AMETS Test Area B

5.3 Test Area Infrastructure

During the lifetime of the project the total number of FOW devices and WECs deployed will vary depending on demand from developers. There may however be WECs and FOW devices on site at the same time. WECs are more suitable to the shallower water in Test Area B and FOW devices to Test Area A.

The 'worst case scenario' number of FOW devices is expected to be 3 dual turbines for the site, which would a total of 6 turbines. However, in reality this will be restricted by the size of the site as turbines must be set at safe distances apart and with maximum potential for wind/energy capture and sufficient space for anchoring. Table 5-3 provides the maximum number of turbines calculated on the rule of thumb of spacing of approximately 8-12 times the diameter of the blades (D) in the dominant wind direction (Hou *et al*., 2019), with a spacing of 5 rotor diameters in the perpendicular direction (Patel and Beik, 2021). Our calculations therefore conclude that a maximum of 5 single Rotor FOW devices or 2 Dual Rotor FOW devices could be accommodated on Test Area A and 1 single or dual Rotor FOW on Test Area B. A total of 6 FOW devices is therefore considered as the worst-case scenario.

Table 5-3: Summary of maximum (worst-case) FOW devices on site

Technology	Site A (offshore)	Site B (nearshore)	Maximum no. FOW devices	Max no. FOW turbines	Total no. devices (max)
FOW device*(s)	5 Single Rotor FOW devices	1 Single Rotor device	6	6	6
	2 Dual Rotor FOW devices	1 Dual Rotor FOW device(s)	3	6	3

*Each FOW device can have 1-2 turbines.

5.3.1 Floating Wind Turbine Generators

There are currently over 50 different FOW substructure designs that are known to be under development, varying significantly in their design and specification. Most can be categorised into four substructure types: Spar, Semi-submersible, Barge and Tension Leg Platform (Figure 5-5). Given the purpose of AMETS as a test facility, all platform types will be included in this scoping report. Material used in the construction of these platforms is usually steel or concrete.

Figure 5-5: Summary of the varying floater platform types and mooring systems

Floating offshore wind (FOW) turbines consist of a turbine platform(s), turbine(s) (including blades and nacelle) and mooring system. Maximum specifications are shown in Table 5-4.

Table 5-4: Indicative design parameters for AFLOWT Test Site (maximum / worst-case)

Design Parameter	Indicative Value
Test Site	
Capacity	Up to 20 MW (Grid connection agreement exists for 10 MW)
Operational Life	[11] 35 Years
Approximate Test Area	8.4 km^2 (combined Test Areas A and B)
Distance of Test Areas from shore (closest point)	6 km
Water Depths	96-107 m Test Area A[12] 41-56 m Test Area B
Export Cable Corridor Length	16 km
Maximum Number of export cables	4
Export Cable Voltage	33 – 66 KV (expected but will be the most suitable cable on the market when being installed).
Floating Offshore Wind (FOW) Turbines including Floaters	
Power generation per FOW turbine	Up to 20 MW
Number of turbines	Up to 6 (totalling 20 MW)
Number of Floaters (See Table 5.3 above)	Up to 5 in Test Area A and 1 Test Site B (Single turbines) Up to 2 in Test Area A and 1 in Test Area B (Double turbines)
Maximum tip height	300 m
Smallest wind turbine size*	Not less than 3MW
Number of blades per turbine	2 or 3
Number of turbines per floater	Up to 2
Floater height, width, length	80 m deep, 90 m long x 80 m wide (approximate)[13]
Draft – varies by design, but spar design can touch seabed bottom.	100 m (full water depth)

[11] Clause 3.2 of the original Lease document says it is 35 years from the 'effective date' and that the lease will commence from the 'date of execution'. Deployment to the site – if 35 years from the date the lease was granted (25/11/2015

[12] Admiralty chart © British Crown and OceanWise, 2022.

[13] These are the largest likely dimensions considered suitable to fit on the site and have been gathered from responses to the industry questionnaire carried out in 2021. (The Hexicon and Spar designs are likely to be too large. The spar technology cited requires 120 m full water depth).

Design Parameter	Indicative Value
Colour of turbine	Likely grey[14]

*The smaller the turbine the faster the rotation speed and this affects the input for the bird strike modelling. Speed of the turbine would be modelled by demonstrator company(ies) and provided to regulator for approval.

5.3.1.1 Turbines

From the results of the industry questionnaire, early consensus within the industry is that as the FOW sector commercialises, the wind turbines deployed on floating substructures will be similar to those used on fixed offshore wind foundations, with some key distinctions. These being the turbine's control system which will require bespoke developments to manage the impact of platform motion on power production and fatigue life and to avoid negative damping effects on the FOW structure. Changes to the turbine tower stiffness may also be required (ORE Catapult, 2021).

Full scale commercial FOW deployment is targeted by 2030 and has recently strongly featured with the announcement of the Scotwind OWF auction results announced in January 2022. Installed capacity and current demonstration projects are in the 6-10 MW range. Capacity is expected to reach 12-20+ MW in the next decade.

The largest turbines that will likely occupy AMETS will have a maximum tip height of 300 m. Both horizontal and vertical turbine blades should be considered, with 2 or 3 blades on each turbine. Maximum turbine speeds will be assessed through modelling and submitted to the relevant regulator to assess the impact on birds prior to a developer occupying the site.

Navigation and aviation lighting will meet international requirements and the requirements of the Irish Aviation Authority. Further information is included in sections 9.1 and 9.2.

Table 5-5: Indicative turbine design parameters

Detail	Definition / Scope	Unit	6 MW	9.5 MW	12 MW	15 MW	20 MW
Hub height	Height from mean sea level to rotor hub	Metres	100	110	135	150	168
Rotor diameter	Full rotor diameter (i.e., including blades and hub)	Metres	154	164	220	240	277

[14] This is a recognised industry standard and other colours are likely to have more of an impact on Seascape, Landscape and Visual Impact. (Rialtas nah Eireann, 2019). International Civil Aviation Organisation (ICAO) guidance for the colour of onshore wind turbines deemed to be aviation obstacles is that the upper two-thirds of the structure should be 'white' and the CAA adheres to this guidance for onshore turbines. The typical wind turbine colour (RAL7035) is generally accepted as being appropriate for OWF devices.

Detail	Definition / Scope	Unit	6 MW	9.5 MW	12 MW	15 MW	20 MW
Deployment date	Actual and estimated installation dates		2017 (Hywind)	2021 (KOWL)	Mid 2020s	Early 2030s	Late 2030s

5.3.2 Anchoring

The floating platforms and their turbines will be fixed to the seabed by means of an anchoring and mooring system. This will provide the mechanical connection between the floating substructure and the seabed. FOW mooring systems are subject to ongoing research and development (Table 5-6), with further innovation required for FOW to become commercially competitive alongside fixed bottom wind (ORE Catapult, 2021). Given mooring and anchor systems for FOW are in such an early stage, both may be part of the technologies tested at the AMETS site. Early indications from the Sea Mammal Research Unit Consultancy at St Andrews who are supporting the Irish Whale and Dolphin Group on the project and who have been carrying out assessments for other FOW EIA projects have suggested underwater noise impact assessments should be based on the worst-case scenario of piled anchor systems.

The anchoring configuration for a given substructure/platform will depend on a number of factors including the design of the structure, water depth, and seabed conditions.

Mooring systems are of two main types, catenary or taut (tension), although a hybrid of these may also be used. The number of mooring lines deployed per FOW structure will vary depending on requirements, though typically they range between 3 - 6, the type of mooring depends on the type of anchor[15].

Table 5-6: Overview of catenary and taut mooring systems

	Catenary	Taut
Restoring force	Weight of mooring line	Mooring line tension
Seabed connection	Horizontal	Varies between vertical and 45 degrees, depending on design
Material	Chain, or chain-rope combination	Steel or synthetic tendon
Advantages	Offers anchor system cost savings: simpler installation process, and the anchor is not required to tolerate uplift.	Smaller mooring footprint. Less seabed disruption during operational phase.
Disadvantages	Larger mooring footprint. Greater environmental disruption at seabed touchdown point during operational phase (due to horizontal movement of chain).	Costly anchor systems required to withstand vertical loading. Installation process more costly and complex.

Source: ORE Catapult, 2021

[15] The option of up to 9 anchors suggested from the responses to the SEAI industry questionnaire has been removed as the response related to a double turbine device requiring a 100 MW connection which would be unrealistic for the AMETS site.

5.3.2.1 *Anchoring of the FOW devices at AFLOWT*

Mooring materials are likely to consist of chain, wire rope or synthetic rope. The industry appears to be tending towards the selection of mooring systems that comprise multiple materials e.g., Ideol's FloatGen demonstrator and Stiesdal's Tetraspar demonstrator both include a combination of chain and synthetic rope (ORE Catapult, 2021).

As with moorings, the type of anchor will vary depending on the technology, the moorings selected and the seabed substrate. The key anchor types that could be utilised at AMETS are outlined in the bullet points below (Figure 5-6): Anchoring specifications are included in

Table 5-7.

- gravity bases (gravity anchors) which use the weight of the structure to hold it in place
- pile driven anchors are piles (tubes of metal) which are piled (hammered) into the seabed using a piling hammer (large anvil). This can result in high levels of underwater noise. The use of such anchors is dependent on-site suitability. This will be further considered once the results of the site investigation surveys are available
- drilling pin piles which are connected with a long chain to the floater
- drag (or embedment) anchors which use a long chain with an anchor at the end, the weight of the chain keeps the floater in position, with only a small length of chain near the floater moving frequently. This category also includes rock anchors
- suction bucket (pile) anchors which are placed on soft sediment on the seabed and the water sucked out
- vertical load anchors. Similar in design and installation method to drag embedment anchors, though installed to a greater depth, vertical load anchors allow for rotation about the connection, which is known as a shank-fluke connection, in order to enable omnidirectional loading
- torpedo piles. These are anchors which are dropped from a vessel and designed to 'fall' into place and hold fast.

Given the potential for noise impacts and the installation investment in terms of cost and vessel time, it is possible that there will be preference once anchors have been installed, for them to remain for the duration of the project (35 years) assuming periodic inspection requirements. This could allow a clip-in-connection option for subsequent technology developers, which could make the site more favourable as a demonstration facility.

A safety zone for fishing and navigation may be requested for establishment 50 m outside of Test Area A and B, if authorised by the competent authorities (e.g. the harbour authorities), to prevent entanglement and ensure safety. If authorised, a safety zone would be put in place during construction and the testing of turbines, but not outside of these times. It is noted that this is not a statutory zone as for the UK.

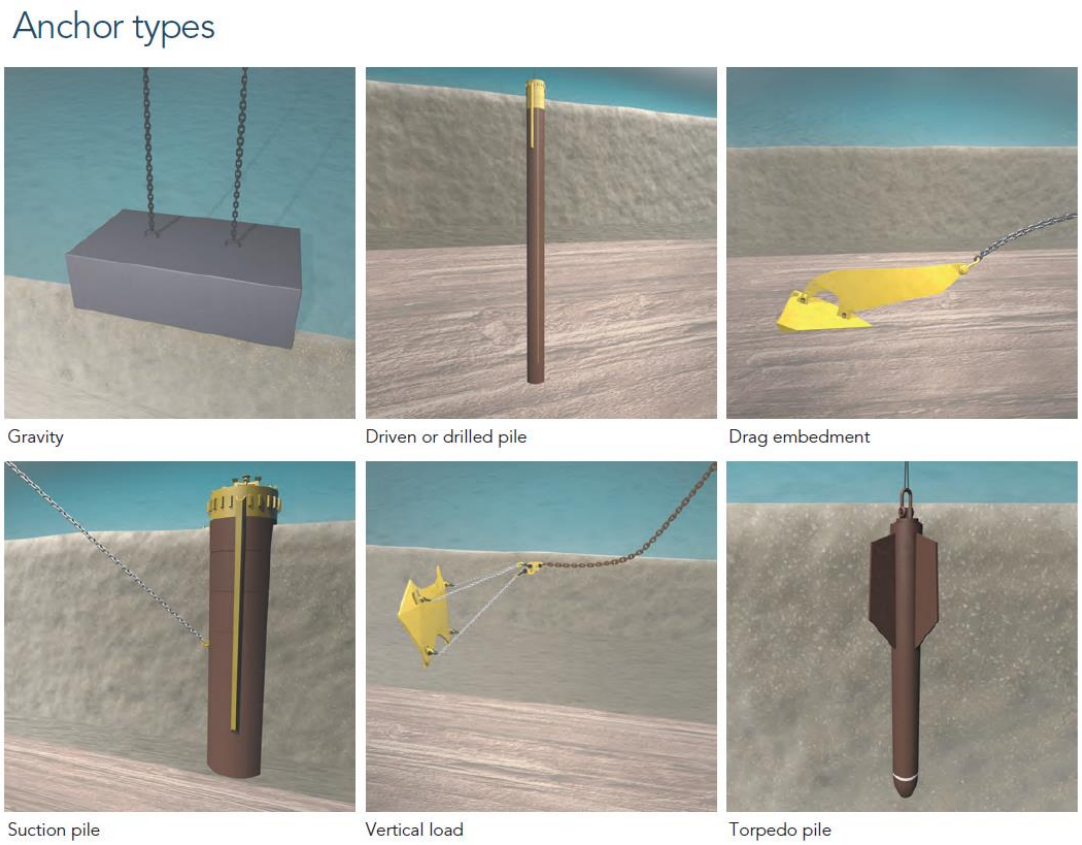

Figure 5-6:Anchor examples

Table 5-7: Anchoring specifications

Anchoring (per floater)	Details
Number of anchors per floater	6 (max)
Anchor size/weight	200 tons[16] (max)
Mooring system area (approx.) below floater	2.5 km^2 (max)
Chain on seabed, connected per anchor	50-300 m (approx.)[17]

[16] This excludes the spar suggested in the SEAI Industry questionnaire response which as a 2,000-tonne anchor.

[17] This would be per anchor – so an approximate 1.8km of anchor chains per floater for semi-taut or catenary systems.

Anchoring (per floater)	Details
Safety for floating facilities (if authorised by competent authorities)	50 m[18]

5.3.3 Meteorological Stations

Meteorological stations will be essential in order to provide meteorological and oceanographic data from the site. One meteorological mast and/or buoy or floating monitoring system e.g. lidar with 1-2 meteorological measuring devices will be installed as deemed appropriate.

In order to provide the most accurate wind velocity data the maximum height of the mast will be at or just below maximum hub height (167 m). However, a mast measuring not less than 75% of the hub height will still provide viable velocity data (DNV GL. (2018)).

5.4 Electrical Infrastructure

The site currently has a generating capacity of 10 MW, but 20 MW will be included in the AFLOWT application to allow for developing technologies to be tested. Current demonstration sites are testing devices of up to 10 MW e.g., FloatGen.

The required AMETS transmission infrastructure is likely to include:

- Up to 4 Static subsea electrical cables (33 or 66 kV), or others on market at time of installation)
- Array cabling
- Onshore substation and cable.

The Landfall and onshore Electrical infrastructure at AMETS are already consented under the 2016 Foreshore Licence and will not be considered further in this EIA.

For the purpose of this Scoping Report the subsea export cables from Test Area A and Site B will be considered, in addition to the connection between technologies looking to use the two Test Areas and this export cable.

The subsea electrical cables (static) will likely be either 33 or 66 kV (2015 Foreshore Licence consented 11 kV). The cable length is approximately 6 km to Test Area B and 16 km to Test Area A. It is envisaged that the originally consented cable corridor will remain the same, see Table 5-4. Further information is included in chapter 8, section 8.2.

The connections from deployed devices to the static export cable will likely be a dynamic design that can withstand the additional fatigue load caused by the platform motions.

Export and array cables will be AC and are likely to be installed using a combination of techniques including jetting, ploughing, trenching and cable injector. A detailed cable burial risk assessment and a burial assessment study will be carried out to determine burial depths and installation methodology. Standard trenching tools will be used where possible to bury/protect the cables. However, in areas of more challenging strata alternative cable protection measures such as rock placement, bags, mattresses, etc may

[18] The positioning of any demonstration device within the Test Area Areas would have to be considered in relation to the spread of the anchor chains. Thus, Test Area A is likely to be more favorable for FOWTs given its greater area compared with Test Area B.

be required to achieve adequate cable protection. Once determined, electrical infrastructure impacts will be assessed in the EIAR using a worst-case design scenario.

5.5 Deployment

Flexibility for timings and the potential need for phasing of deployment of the demonstration device/s is required for the project. An anticipated outline programme is provided in section 5.5.1 however this will be further refined during pre-application feasibility studies for each demonstration device. Each developer will be expected to carry out their own back-to-back impact assessment considering the range of installation options proposed.

SEAI are keen to progress AMETS to a working WEC and FOW Test Site as soon as possible. If left too late the industry will have moved on through the use of other sites outside Ireland, thus potentially adversely affecting Ireland's position in the developing ORE markets. Although it is not currently possible to provide a definitive programme for the future stages of individual projects, the envisaged key tasks are outlined in section 5.5.1. FOW developers will only be interested in deploying to the AMETS site with evidence of a general FOW site licence being awarded.

5.5.1 Anticipated Programme for individual technology deployment

The anticipated programme is listed below:

- Detailed design, within specifications how the project falls within the consented AFLOWT EIA Project Design Envelope
- Environmental assessment and consultation reponses received
- Pre-construction surveys
- Planning interest (MPDM[19])
- Submission of information to FLU/MARA/ ABP if required
- Approval received
- Submission of planning application if required (ABP)
- Commencement of phase 1 construction (as per 2015 Foreshore Licence)
    - Offshore cable installation
    - Landfall infrastructure
    - Anchoring system (If not already pre-deployed)
    - Placement of measurement equipment such as ADCPs to measure current speeds
- Commencement of phase 2 construction
    - Developers' installation of FOW devices, subject to individual assessment and consent.
    - Placement of measurement equipment such metocean buoys / mast to measure performance

[19] Marine Planning and Development Management Bill /Marine Area Planning Bill (MAP)

A high-level timeline for the AMETS project development is provided in Figure 5-7 below.

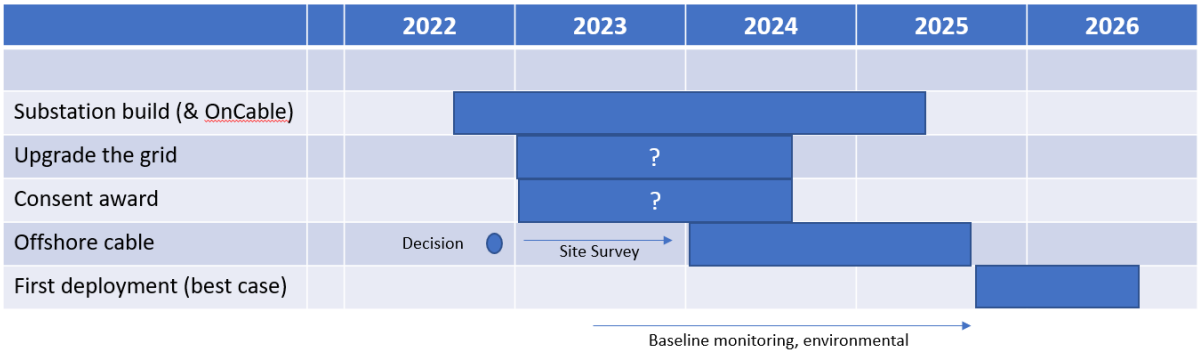

Figure 5-7: High-level project timeline

5.5.2 Ports and Supply Basis

In contrast to fixed wind, much of the assembly for FOW will take place onshore (at suitable port facilities) or remotely, and the structure towed to location. It is envisaged that all materials will be shipped to site rather than delivered by road, due to local road conditions.

During the construction phase FOW vessels may use deep water ports for placing FOW devices in the water and towing to site. There are a variety of harbours and ports with varying capabilities available at Blacksod, Ballyglass, Belmullet, Killybegs, Shannon Foynes, Galway Port and Belfast. The closest commercial ports are Sligo to the northeast and Galway to the southeast (see section 9.1). The ports are generally aware of the opportunities in this sector and in many cases are already actively marketing and engaging with developers and planning new and improved facilities to cater for this potential market[20].

Killbegs is one such suitable port, it is 70 nm from the AFLOWT site, has large deep-water berths, no beam restrictions and a high bearing capacity quayside.

Ports will also be used for loading FOW components (such as anchors/chains etc) and as a supply base. Where a local port is used, space will be required on the quayside for mobilisation and storage of equipment, mobile offices and associated infrastructure. Ports will require suitable mobile cranes for lifting pieces, including turbine blades, although this activity can also be carried out at sea using large crane vessels. The construction contractor will determine which ports are required for any local support. Support vessels will operate from established ports that will also be used as supply bases. Port facilities will also be required for maintenance of the FOW devices.

[20] The Department of Transport has published a Policy Statement setting out the strategy for commercial ports to facilitate offshore renewable energy activity in the seas around Ireland (DoT, 2021). Pending a review of overall National Ports Policy in 2022, the Department in conjunction with the Irish Maritime Development Office (IMDO), carried out an assessment of the options for Irish commercial State Ports to facilitate the ORE sector and assist in Ireland achieving its emission reduction targets. A Ports Co-ordination Group will be established to coordinate port responses and maintain policy alignment. (DoT, 2021).

5.6 Operation, Maintenance and Decommissioning

Deployment of a turbine will be for an anticipated minimum period of 12 months, although this figure could be less, with the Test Site envisaged to be operational for at least the duration of the consent award (~35 years).

During the operational lifetime of the Test Site and associated deployed devices, numerous operational and maintenance activities will be required. These are likely to include:

- Cable burial surveys and inspection of anchors
- Reburial of export and array cables as required
- Repair or replacement of export and array cables as required
- Inspection, maintenance and monitoring of deployed devices
- Minor repair and replacement of infrastructure including boat landings and aids to navigation
- Removal of marine growth and guano; and
- Use of additional cable and scour protection measures.

The number of monthly maintenance visits to deployed devices will be approximately 1 per month, using a single vessel. This is outside of any breakdowns. The expected number of helicopter visits will be once annually (most OWFs sites do not use helicopters unless they are far offshore, this would be a worst-case scenario and may not be necessary).

At the end of the trial period for each deployed device, the device will be decommissioned and recovered from the water as per the individual device's consent. Similarly, at the end of the AMETS operational life, the permanent site infrastructure will need to be decommissioned. The detail of the required decommissioning work is currently unknown; however, decommissioning will be determined and carried out in line with the relevant legislation and guidance available at the time. It is likely that this would include the removal of all structures above the seabed, including anchoring systems, and appropriate decommissioning of the cables which could include leaving in situ, removal of the entire cable runs or removal of sections of the marine cable. Prior to any decommissioning work, the feasible options will be assessed, and a final decommissioning plan agreed with the relevant stakeholders and authorities.

6 EIA METHODOLOGY

6.1 Guidance and Regulation

Scoping has been undertaken according to the Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Barnes, 2017). In addition to this, the following guidance will be taken into consideration in the full EIA:

- 'Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 1' (DCCAE, 2018 a)
- Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 2 (DCCAE, 2018 b)
- Revised Guidelines on the information to be contained in Environmental Impact Statements (EIA) Draft September 2015 (EPA, 2015)[21]
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) 2017 (EPA, 2017 (Draft));
- Revised guidelines on the information to be contained in environmental impact assessment reports (EPA, 2015 (Draft))
- Best Practice Guidelines for the Irish Wind Energy Industry (IWEA, 2012)
- A Strategic Framework for Scoping Cumulative Effects (MMO, 2014)
- Guidance Notes for Applying for a Licence to Generate Electricity (Commission for Regulation of Utilities, 2018)
- Offshore Electricity Generating Stations – Note for Intending Developers (DCENR, 2000)
- Development of a generic framework for informing Cumulative Impact Assessments (CIA) related to Marine Protected Areas through evaluation of best practice (NECR147) (Natural England, 2014)
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).

Also under the Irish Government's energy policy, guidance has been set out for the development of offshore renewable energy projects, to aid in the decarbonisation of the national energy system. The following guidance documents are available:

- the 'Offshore Renewable Energy Development Plan (OREDP) 2014' by the Department of Communications, Energy and Natural Resources (DCENR) (now Department of the Environment, Climate and Communications) (DCENR, 2014) and associated SEA Environmental Report and Natura Impact Statement
- OREDP 2 - Strategic Environmental Assessment (SEA) and Appropriate Assessment for Offshore Renewable Energy Development Plan 2.

As highlighted by Barnes (2017) 'it is recognised that offshore renewable energy technology is evolving, and that it may not be possible to fully describe the intricacies of

[21] Since updated to EPA's Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, May 2022 (EPA, 2022)

various technological elements, but any elements likely to have significant effects on the environment must be described, as suggested'….'The merits of the 'deploy and monitoring' approach for filling gaps and as part of scaling up of larger developments is recognised in the OREDP'.

Other, less recent, guidance documents that used in conjunction with the above include:

- Guidance on EIA – Scoping (European Commission (EC), 2001)
- Guidelines on the Information to be Contained in Environmental Impact Statements (EPA, 2002)
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003)
- Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities, DEHLG 2009 (NPWS, 2009)
- Guidance on the Application of the Environmental Impact Assessment Procedure for Large-Scale Transboundary Projects (EC, 2013)
- Guidelines for Ecological Impact Assessment in the UK (IEMA, 2006).

In addition these guidance documents have been prepared in accordance with the EIA Directive (2011/92/EU), the Habitats Directive (92/43/EEC) and Birds Directive (2009/147/EC). Additional EU Directives that may apply to certain projects are included in Table 3-1 within chapter 3.

As indicated above, guidance from Barnes (2017) sets out the requirement for projects developed under the OREDP to be subject to a national consenting process. A high-level goal of the OREDP is that offshore renewable energy development do not negatively impact the marine environment. Projects should refer to the OREDP Strategic Environment Assessment (SEA) and associated AA (SEAI, 2010). An interim review of the OREDP was carried out in 2017, with a full review carried out in conjunction with a full review of the associated SEA in 2020. The interim review concluded that the OREDP was fit for purpose and the new plan, OREDP II is also under development. This is expected to inform the identification and designation of candidate areas for future offshore renewable energy development under the regime established by the Maritime Area Planning (MAP) Bill, which was officially published on 16 August 2021, following Cabinet approval on 29 June 2021 and confirmation by Ireland's Prime Minister on 1 July 2021.[22]) SEAI launched a tender for the creation of a Strategic Environmental Assessment (SEA) and an Appropriate Assessment (AA) for OREDP II in September 2021. Relevant aspects from which will be factored into the EIA Methodology for AFLOWT as necessary[23].

Chapter 3 lists the directives and regulations under which an EIA is required. The guidance listed above has helped to inform the approach taken for the AFLOWT project. As indicated, it is expected that the project may be subject to a formal Environmental Impact Assessment (EIA) and Appropriate Assessment (AA), by the competent authority

[22] Sustainable Energy Authority of Ireland (SEAI) awarded a contract to ClearLead Consulting for the creation of a Strategic Environmental Assessment (SEA) and an Appropriate Assessment (AA) for the country's new Offshore Renewable Energy Development Plan (OREDP II) in December 2021. This is expected to be completed in 2023.

[23] The OREDP sets out project level mitigation measures which developers and competent authorities should have regard to when planning/assessing a project. These measures are listed in Table 4 of the Offshore Renewable Energy Development Plan.

which will be MARA. The project capacity is expected to be up to 20 MW and there could be up to 6 devices deployed at the Test Site based on the Project Design Envelope presented in chapter 5. For the EIA, an Environmental Impact Assessment Report (EIAR) must be produced. If there are any likely significant effects from the project on Natura 2000 sites and/or their qualifying species, then a Natura Impact Statement (NIS) will also be produced, for preparation of the AA by the competent authority.

The EIA process will be integrated into the project design throughout, from this scoping stage through to EIA, construction, operation, maintenance and decommissioning (Barnes, 2017). The EIAR and NIS will be completed by competent experts, with relevance, experience, independence and objectivity (based on the Irish law transposed Habitats Directive). Reliable data sources will also be used, and cooperation and communication with consultees conducted throughout, as per the Aarhus Convention (EC, n.d.a). The EIAR and NIS will be integrated and prepared alongside each other.

This Scoping Report has been prepared following the above guidance documents, and this chapter sets out how the subsequent EIAR will be prepared, also in line with the guidance.

6.2 Description of the project

As part of the full EIA process, and as per SEAI (Barnes, 2017) guidance, a full project description will be set out. This will be based upon the project design envelope description given in chapter 5 in this report.

6.3 Characterisation of the receiving environment (Baseline)

An environmental baseline is essential for effective environmental assessment. For this project, the baseline of the Scoping Report will be expanded for the EIA process. Marine environmental information will be collated from a wide range of existing available data sources. Significant gaps identified during this scoping stage, will be resolved through field surveys.

The EIA Directive requires:

“A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.” (EPA, 2017)

and:

“A description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.” (EPA, 2017).

This project will follow an approved methodology to collect and report on environmental baseline data, ensuring that the variable nature of the marine environment is considered, taking into account aspects such as seasonality. A 'do-nothing' scenario may be described to demonstrate how the baseline might change independently, if the project were not to take place.

Annex IV(3) of the amended EIA Directive describes the 'do-nothing' scenario as:

'A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge,' (Barnes, 2017).

As required above data collected for the AFOWT Project data collected is of a good quality and identifies receptors in the marine environment and indicators to help the analysis of project pressures and subsequent impacts. Data sources include previously published studies (such as those from the previous EIS, and for example from the NPWS database), as well as results from field surveys where secondary data is not available (DCCAE, 2017). The type of data collected is outlined in the subsequent chapters of this report based on the project specifics, with the scale and duration of the surveys also planned specific to the project and specific receptor studied. Contingencies for field surveys will be built in to planning, to allow for unexpected eventualities such as poor weather.

The following characteristics of the environment are identified through the baseline review:

- Character – relating to the distinguishing aspects of the environment
- Vulnerability to change – resilience of the environment to changes
- Significance/value – designated sites, quality of the environment
- Certainty – certainty of the quality and quantity of data on the environmental condition of the site.

The information will be broken down into the following sections, to ensure a systematic and accurate review of information:

- **Offshore physical environment:**
  - Coastal Erosion, Sedimentation Processes, Seabed Geology and Wind
  - Bathymetry and hydrography
  - Water and Sediment Quality
- **Offshore biodiversity:**
  - Protected sites and species
  - Benthic and pelagic ecology
  - Fish and shellfish ecology
  - Marine mammals
  - Offshore ornithology

- **Human environment:**
  - Ports, Shipping and Navigation
  - Socio-Economics, Recreation and Tourism
  - Commercial Fisheries, Shellfish and Aquaculture
  - Noise
  - Risk of Major Accidents and Disasters
  - Human Health
  - Cultural and Archaeological Heritage
  - Seascape, Landscape and Visual Impact
  - Material Assets and Activities
  - Climate Change.

6.4 Alternatives

No alternative locations are to be considered, as the site being developed already has a lease in place for WEC testing and the rationale for site selection was addressed in the previous EIS following rigorous analysis of technical geophysical/geotechnical, environmental and social selection criteria (Chapter 3). However, a project design envelope is being developed, in order to agree parameters which would allow for a range of different FOW demonstration technologies to be deployed to the site. The worst-case scenario for design parameters will be assessed in the EIA, to allow for all FOW device options to be considered.

6.5 Assessment of Potential Effects

6.5.1 Introduction

The EIA Directive requires an assessment of the likely and significant effects of a proposed project. The approach taken to assess the significance of potential effects of the project has been guided by available data, modelling, experience and expert judgement.

Impact significance will take into account the magnitude of the effect and receptor sensitivity. The assessment will consider impacts during installation, operation and decommissioning.

The impact assessment methodology throughout the EIA process will follow that recommended by the Chartered Institute of Ecology and Environmental Management (CIEEM) for marine and coastal developments (CIEEM, 2019) and SEAI (Barnes, 2017) guidance.

The assessment process will involve the following:

- Determining the baseline environment in the study area / zone of influence and identifying potential receptors
- Identifying activities within the project that may result in effects on the receptors

- Evaluating project effects on the receptors based on the magnitude of the impact and the sensitivity of the receptor
- Assessment of potential negative and positive impacts pre-mitigation[24] including an indication of certainty in the predictions made
- Provision of proposed mitigation measures (where applicable)
- Assessment of residual negative and positive impacts including an indication of certainty in the predictions made
- Assessment of any interrelated or cumulative effects.

6.5.2 Identification of potential impacts

This Scoping Report sets out the potential environmental impacts for each sub-topic and identifies those which are proposed to be scoped in or scoped out of the EIA process. The final list of issues to be considered in the EIA process will be confirmed following receipt of feedback on this Scoping Report from the relevant stakeholders, and through further discussions with relevant stakeholders.

6.5.3 Defining magnitude and sensitivity

The EIA will determine the significance of impacts for those effects scoped into the assessment. As stated above, the impact significance will take into account the magnitude of the effect and the sensitivity of the receptor.

The magnitude of the effect will take into account:

- the geographical extent of the impact (including any transboundary issues)
- the duration of the impact
- the reversibility of the impact
- the timing and frequency of impact.

For potential unplanned / accidental events associated with the project, magnitude will also incorporate the likelihood of the event taking place.

The evaluation of receptor sensitivity will take into account:

- its local, regional, national and international designations
- its importance to the local or wider community
- its economic value.

The ability of a receptor to adapt to change, tolerate, and/or recover from potential impacts will be key in assessing its sensitivity to the impact under consideration. The assessment of the sensitivity of human receptors, for example, a household, community or wider social group, takes into account their likely response to change and their ability to adapt to and manage the effects of the impact. Stakeholder concerns associated with the type of receptor will also be taken into consideration.

Definitions of magnitude and sensitivity will be tailored to each receptor and categorised as negligible, low, medium or high.

[24] Embedded mitigation which is part of the project design will be taken into account.

6.5.4 Evaluation of significance

The scoring of impact significance will be carried out using a matrix included in Figure 6-1, based on the magnitude of effect and sensitivity of the receptor.

Those residual negative and positive effects indicated as major or moderate are considered significant.

A detailed description of the approach to impact assessment and the interpretation of significance levels will be provided in the EIAR. This approach will ensure that the definition of impacts is transparent and relevant to each topic under consideration. Barnes (2017) refers to the scale set out in the EPA EIS Guidelines, (2002).

- Imperceptible - an effect which is capable of measurement but without noticeable consequences.
- Slight - an effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
- Moderate - an effect that alters the character of the environment in a manner that is consistent with emerging trends.
- Significant - an effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
- Profound-an effect which obliterates sensitive characteristics.

Effects can be classified as positive, neutral or negative. A range of assessment matrices are used in the assessment of significance. The following matrix is proposed for the project.

Value/sensitivity	Magnitude			
	High	Medium	Low	Negligible
High	Major significant impact	Major significant impact	Moderate significant impact	Insignificant impact
Medium	Major significant impact	Moderate significant impact	Minor significant impact	Insignificant impact
Low	Moderate significant impact	Minor significant impact	Insignificant impact	Insignificant impact
Negligible	Insignificant impact	Insignificant impact	Insignificant impact	Insignificant impact

Figure 6-1: Example impact matrix

6.5.5 Mitigation

Where the impact assessment identifies that an aspect of the development is likely to give rise to significant environmental effects, mitigation measures above and beyond any embedded mitigation will be proposed to avoid effects or reduce them to acceptable levels where possible.

Two types of mitigations have been defined and these will be identified within the EIAR:

- Embedded mitigation - measures that are identified and adopted as part of the evolution of the project design, or measures otherwise incorporated as controls (embedded mitigation measures have been identified in this Scoping Report)
- Additional mitigation - measures that are identified as a result of the EIA process to reduce or eliminate any effects that are predicted to be significant, which are subsequently adopted as project commitments.

The aim of the mitigation measures will be to 'avoid', 'prevent', 'reduce' and/or 'offset' any negative likely significant effects on the environment from the project's activities. The OREDP provides suggested mitigation measures for offshore renewable energy projects. Any additional mitigation measures proposed for the AFLOWT project will be developed in consultation with the competent authority and relevant stakeholders/consultees, OREDP guidance, and measures designed specifically for the unique interactions of this project's activities with its surrounding environment.

6.5.6 Assessing residual effects

Following the identification of any necessary additional mitigation measures, impacts will be reassessed, and any residual significance discussed. Where significant impacts remain, and no mitigation measures can be proposed, an explanation will be provided on why the significance cannot be reduced. Monitoring measures will be proposed as part of the EIAR where there is uncertainty regarding the significance of, or the predicted levels of residual effects.

6.6 Assessment of Cumulative and Inter-related Effects

During this scoping stage, cumulative effects of the AFLOWT project have been identified. These cumulative effects will then be evaluated at the EIA stage, following the Cumulative Impact Assessment (CIA) process. The CIA process will consider the following, as per the European guidance 'Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions' (EC, 1999):

- the assessment will be collaborative with consultees and stakeholders, with the process communicated clearly and transparently
- clear boundaries for cumulative impacts of project will be identified
- the clear project design envelope for the AFLOWT Project will followed
- other relevant plans or projects will be considered, with information shared between this project and others
- the assessment will consider the risk of impacts, relating to the sensitive receptors of the receiving environment
- cumulative impacts will be addressed as part of the implementation of mitigation and monitoring measures.

In accordance with the 'Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms' (Renewable UK, 2013) the following will be taken into account:

- only likely significant cumulative effects will be assessed
- the need for further assessments/field surveys is included in chapters 7 onwards
- stakeholder consultation will be undertaken on cumulative effects

- the impact of likely significant effects will be evaluated, as per the approach for other effects
- a precautionary 'worst case scenario' approach will be followed
- mitigation and monitoring measures will be applied where required and residual effects evaluated.

In addition to cumulative impacts (the effect of similar impacts from multiple schemes on the same receptor), in-combination or interrelated effects will also be considered at the EIA stage (where the same receptor is affected by the same scheme in different ways, such as a resident experiencing both noise and air pollution).

Cumulative effects identified during the EIA process will also be integrated into the NIS preparation, to ensure an aligned approach to the evaluation of effects, and to mitigation and monitoring measures.

EIA regulations (EU (Planning and Development) (EIA Regulations, 2018) and SEAI (2017) Guidance require that the likely potential impacts of a development are considered in combination with the significant impacts of other existing or consented projects nearby. A number of projects identified from the Irish Government's open consultations database (Irish Government, 2022) are listed below (these projects are in the planning stage and could, during construction or when operational, have cumulative effects when combined with the AFLOWT development):

1. ANIAR Offshore Array – offshore windfarm off the coast of Sligo, Leitrim and Donegal. Phase 1 – 500 MW static turbine development, Phase 1 – 500 MW floating turbine development. ANIAR has submitted a Foreshore Investigatory Licence Application and supporting document for the necessary survey work.
2. Inis Ealga Marine Energy Park (IEMEP) site investigations off County Cork – export cable corridor application to connect the Array Investigation Area with a landfall between Clonard and Ballymacoda, County Cork. A previous application for the Inis Ealga Marine Energy Park and export cable corridors is yet to be determined. Last licence update October 2021.
3. Oil and gas licencing option 16/26 held by Predator Oil and partner Theseus located in the South Corrib gas field (Predator Oil and Gas, 2022)
4. The Corrib Offshore gas field – ongoing maintenance works and surveys. The site is operated by Vermilion Energy and is situated in the region of the Slyne-Erris Trough west of the Mullet Peninsula. Next geophysical surveys are planned to start between March and December 2022. Figure 7-4 below shows the Corrib pipeline in proximity to the AMETS Test Areas.
5. Sceirde (Skerd) Rocks Offshore Wind Farm licence application by Fuinneamh Sceirde Teoranta May 2008[25] Galway, latitude of 53.263531° (FST acquired by Macquarie's Green Investment Group (GIG) 9th September 2021)
6. FS006889 America Europe Connect 2 trans-Atlantic subsea cable system linking Europe with the USA – travelling from a landfall location at Belderra Strand, Co. Mayo towards Clew Bay. Licence application submitted October 2018 and resubmitted more recently for reconsideration. (AMETS is 39 km to the north of

[25] FST completed its Environmental Impact Assessment and applied for a Foreshore Lease for a 100 MW project in May 2008. The company made a grid connection application to EirGrid for 392 MW in July 2011. The Skerd Rocks project was the first proposed offshore windfarm on the West Coast http://www.fsteo.com/Non-Technical%20Summary.pdf

proposed subsea fibre optic cable, proposed to be located to the south of Achill Island per foreshore reference number FS006889 (in consultation).

7. Galway Bay Marine and Renewable Energy Test Site, as shown in Figure 6-2 below. Currently, the SmartBay Underwater Observatory is operational under a 25 year lease. The Renewable Energy Test site has been decommissioned, and the Marine Institute is awaiting the award of a new lease, which is under consideration by the Department of Housing, Local Government and Heritage.
8. FS007246 Main lay and construction works for installation of the IRIS sub-sea fibre optic cable system, Co Galway. It is expected that the cable will be laid and operational by the end of 2022. (Last update July 2021).

The locations of these projects deemed close enough to the AMETS to be of potential significance are presented in Figure 6-2. The projects are also listed in Table 6-1, together with an indication of which of these will need to be included in the AFLOWT cumulative impact assessment for the physical environment, biodiversity or human environment sub-topics (sections 7.2 – 9.11).

Table 6-1: Other projects in the planning stage which could have cumulative impacts with the AFLOWT project

EIA Topic	Potential cumulative project							
	1	2	3	4	5	6	7	8
Coastal Erosion, Sedimentation Processes, Seabed Geology and Wind	✓				✓			
Bathymetry and Hydrography								
Water and Sediment Quality								
Protected sites and species	✓	✓	✓	✓	✓	✓	✓	✓
Benthic (Subtidal and Intertidal) Ecology						✓		
Fish and Shellfish Ecology			✓	✓	✓	✓		
Marine Mammals, Megafauna and Reptiles	✓	✓	✓	✓	✓	✓	✓	✓
Offshore Ornithology	✓	✓	✓	✓	✓	✓	✓	✓
Ports, Shipping and Navigation	✓		✓	✓	✓	✓		✓
Aviation Safety, Military Exercise and Telecommunications	✓				✓			
Socio-Economics, Recreation and Tourism	✓				✓			
Commercial Fisheries, Shellfish and Aquaculture	✓	✓	✓	✓	✓	✓		✓
Airborne Noise								
Risk of Major Accidents and Disasters	✓	✓	✓	✓	✓			✓
Human Health								
Cultural and Archaeological Heritage						✓		
Seascape, Landscape and Visual Impact	✓				✓			
Material Assets and Activities			✓	✓		✓		✓
Climate Change	✓	✓	✓	✓	✓	✓	✓	✓

There were also four other sites included in the Site Investigation Licence Application in January 2020 as follows:

- 3.5km to the south of the Mayo County Council Frenchport application per foreshore reference number FS006451 (determined 9th August 2016)
- 18.5 km to the south of the Shell E&P Ireland Ltd application per FS005190 (determined 22ndJune 2010)
- 18.5 km to the south of the Shell E&P Ireland Ltd application per FS005191 (determined 15thJanuary 2010)
- 40 km to the north of the MayoCounty Council Mulranny Pier application, proposed per foreshore reference number FS006798 (in consultation).

Other ongoing activities that may result in cumulative impacts with the project include:

- Climate change.

The cumulative impact process will be iterative throughout the project, as information on other future potential interacting activities becomes available.

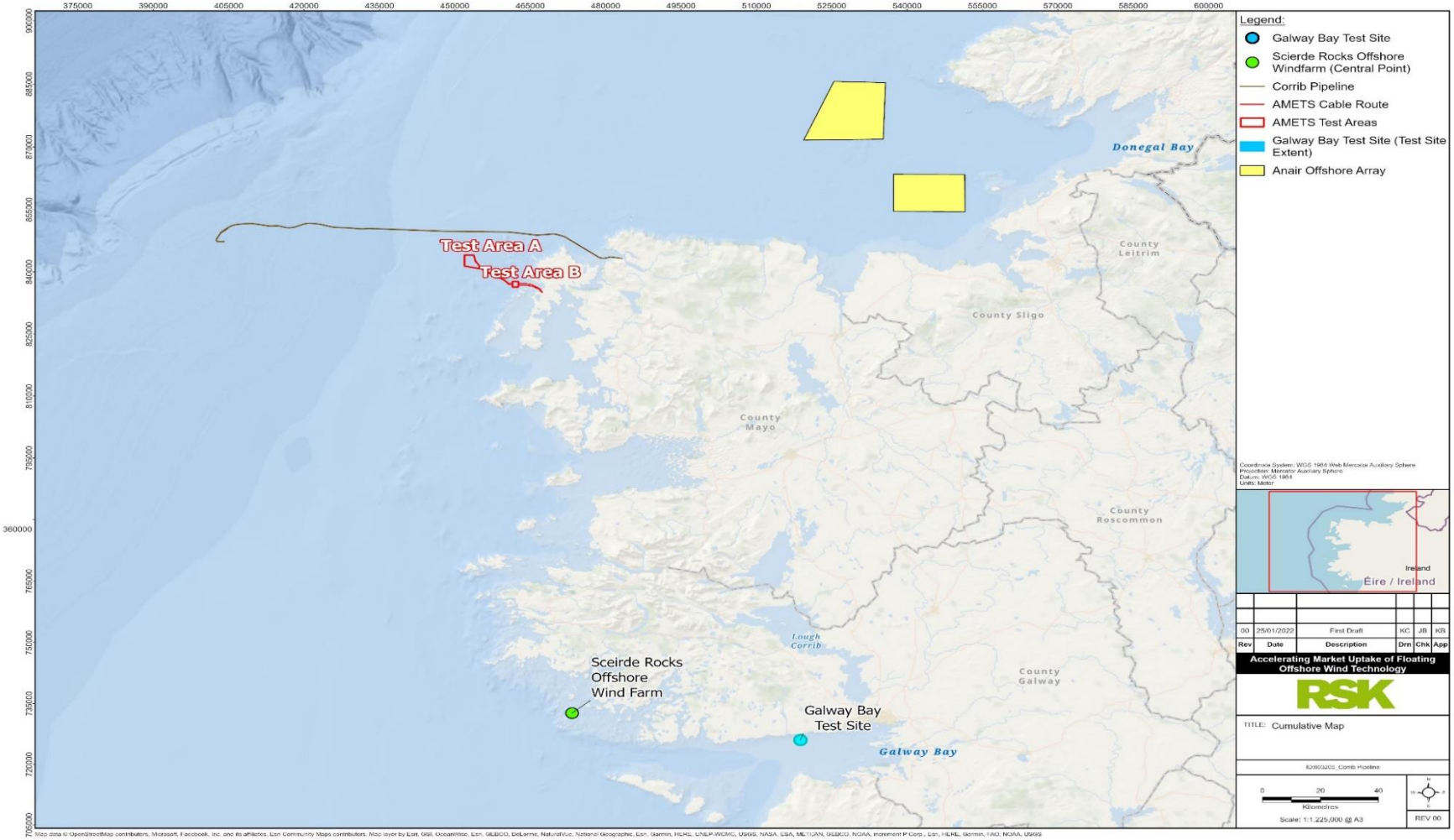

Figure 6-2: Cumulative projects Galway Bay Test Area, Anair Offshore Array, and Sceirde Rocks Offshore Wind Farm, and their proximity to the AMETS Test Areas and cable route

7 OFFSHORE PHYSICAL ENVIRONMENT

7.1 Coastal Erosion, Sedimentation Processes, Seabed Geology and Wind

7.1.1 Receiving Environment

The AMETS area, where Test Area A and B are located, is characterised by a large expanse of open water. The seabed comprises rock reefs extending westwards from the land, with soft sediment-filled areas between the reefs. Seabed sediments are described as fine to medium sand, gravel and sand with some gravelly areas close to the rock reefs. Sediments further offshore are generally areas of shelly sand, broken shell over sand, sandy firm clay, fine sand, sandy gravel and gravelly sand (INFOMAR, n.d.). The original EIS completed in 2015 stated that the AMETS Test Area has excellent wind resource (SEAI, 2021).

7.1.2 Data sources and Baseline

7.1.2.1 Data Sources

Information has been gathered from the following sources listed in Table 7-1.

Table 7-1: Data sources for coastal erosion, sedimentation process and seabed geology

Name of source	Date accessed	Data overview
SEAI (2011). 'Atlantic Marine Energy Test Area Environmental Impact Statement - Chapter 16 - Coastal-processes'.	12/10/2021	Desktop and survey data detailing many physical characteristics of the site.
SEAI (2021), 'Call for Expression of Interest from Marine Energy Technology Developers for deployment at the AMETS Test Area', Offshore Belmullet, Co Mayo, Ireland.	12/10/2021	Overview of current desktop and survey baseline data collected for the AMETS site
INFOMAR (Produced by GSI, OceanWise, Esri, GEBCO, DeLorme, and NaturalVue). (n.d.), 'INFOMAR Marine Data Download Portal – Beta'.	13/10/2021	Data portal comprising of sub bottom profile data (SBP), multibeam bathymetry (MBES) and some side scan sonar (SSS).
Geological survey of Ireland - Data and maps (DECC, 2022)	14/01/2022	Data and maps on geological features of Ireland.

7.1.2.2 *Existing Baseline*

It was decided that combined hydrodynamic, wave and sediment transport models would not be necessary based on a fundamental assumption that given the magnitude of the waves at the site, the sea bed material has high mobility (SEAI, 2011). The sediment transport mechanism is only present in a state of quasi-equilibrium, this is indicative to the concept of sediment being able to move freely but within its defined coastal system. As a result, due to the external forcing present at the site the threshold of motion is often exceeded meaning that sediment transport occurs frequently, this transport will be exemplified during storms (SEAI, 2011). At the 100m depth sediment movement will occur when surface waves reach heights of 0.52m or greater. Considering data presented in section 7.2.2 this occurs quite frequently which suggests that sediment transport is a frequent occurrence (SEAI, 2011). However, no further research has been carried out concerning the magnitude of sediment transport and suspension.

Previous INFOMAR geophysical campaigns have surveyed the AMETS site (SEAI 2021).

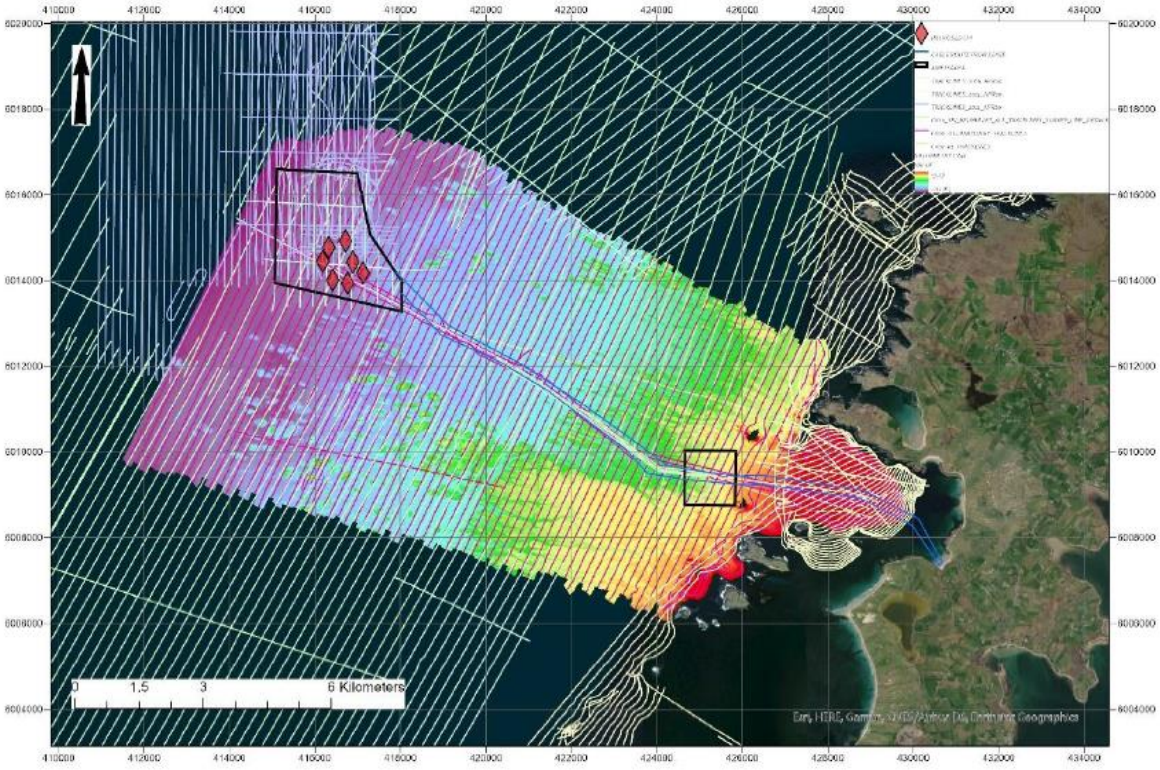

Figure 7-1: Existing INFOMAR Geophysical Data

Source SEAI (May 2022)

The seabed area past the 10m depth mark has been extensively surveyed using multibeam surveys, these surveys have located and identified the different rocky outcrops show in Figure 7-1. The rocky outcrop are likely Pre-Cambrian quartzo-feldspathic gneiss which is has a high probability of being from the Annagh Division (Marine Institute 2008). Vibrocore surveys have shown that when the bedrock is close to or protrudes the seabed

the facies is gravel, meanwhile the facies containing sand were located further away from the bedrock.

In addition, surveying was carried out over the proposed cable route which designated the seafloor composition as follows (Berrow et al., 2014):

- seabed with localised relief (bedforms) comprising sands and gravels with localised development of bedforms
- seabed of low relief with gentle slopes comprising sands and glacial tills
- seabed of moderate relief with moderate to steep slopes comprising bedrock outcrop

The seabed sediment classification is presented in Figure 7-2. The site is characterized by sand in the nearshore area and at Test Area B, coarse and mixed sediment including sand along the cable route and sand in Test Area A. The rock outcrops are also well defined surrounding the AMETS site and can be viewed clearly on the bathymetry data.

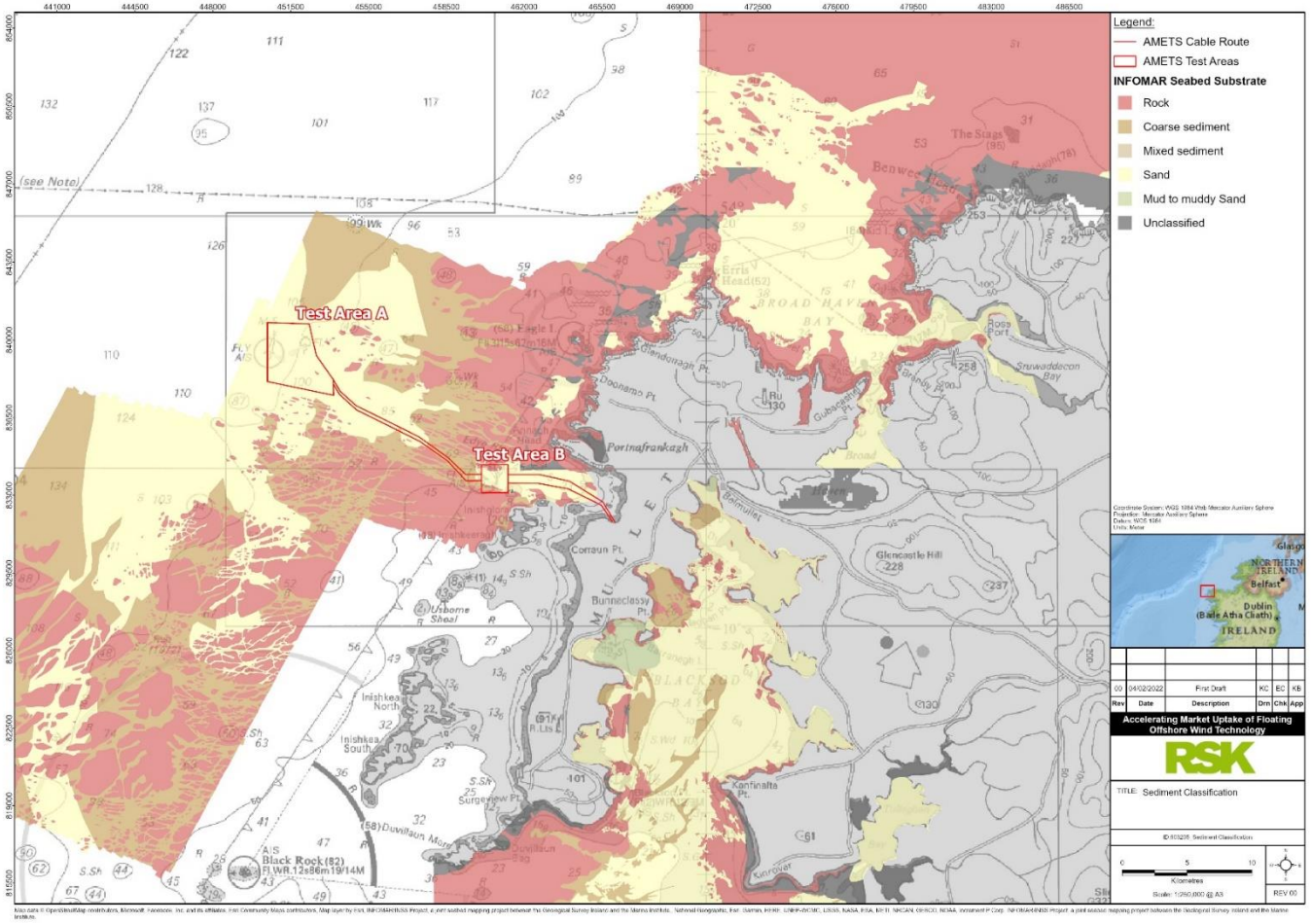

Figure 7-2: INFOMAR sediment classification Map

(Image courtesy of INFOMAR. INFOMAR is the Department of the Environment, Climate and Communications (DECC) funded national seabed mapping programme, jointly managed and delivered by Geological Survey Ireland and Marine Institute) Contains Irish Public Sector Data (Geological Survey Ireland) licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence

Work completed for the previous EIS (SEAI, 2011) included an analysis of ordnance survey maps and aerial photographs in order to assess the extent of coastal erosion that occurs using past vegetation lines. This work concluded that there has been very little significant change in the coastline position. As a result, is assumed that the coastline is resistant to the majority of coastal erosion processes and that a small amount of sediment is being added to the system overtime. Furthermore, the beaches close to the site are swash aligned which, in conjunction to the sediment movement occurring in a cross-shore direction, means that the beaches repair over time. Analysis of topographic survey data of Belderra beach (SEAI, 2011), that was carried out in September 2009 and August 2012, backed up this assumption as it concluded that the coastline was stable. It should be noted that storms of a certain magnitude will likely cause a short increase in erosion.

7.1.2.3 Wind Resource

Average wind speed at the Test Site is 8.8 m/s at 1 m above sea level with maximum wind speed is 35.1 m/s. Mean wind speed is approximately 13 m/s at 100 m as presented in Figure 7-3 and taken from the New European Wind Atlas. A wind rose for the AMETS test site can be shown in Figure 7-4, data covers the whole of 2006 and is measured at 50m

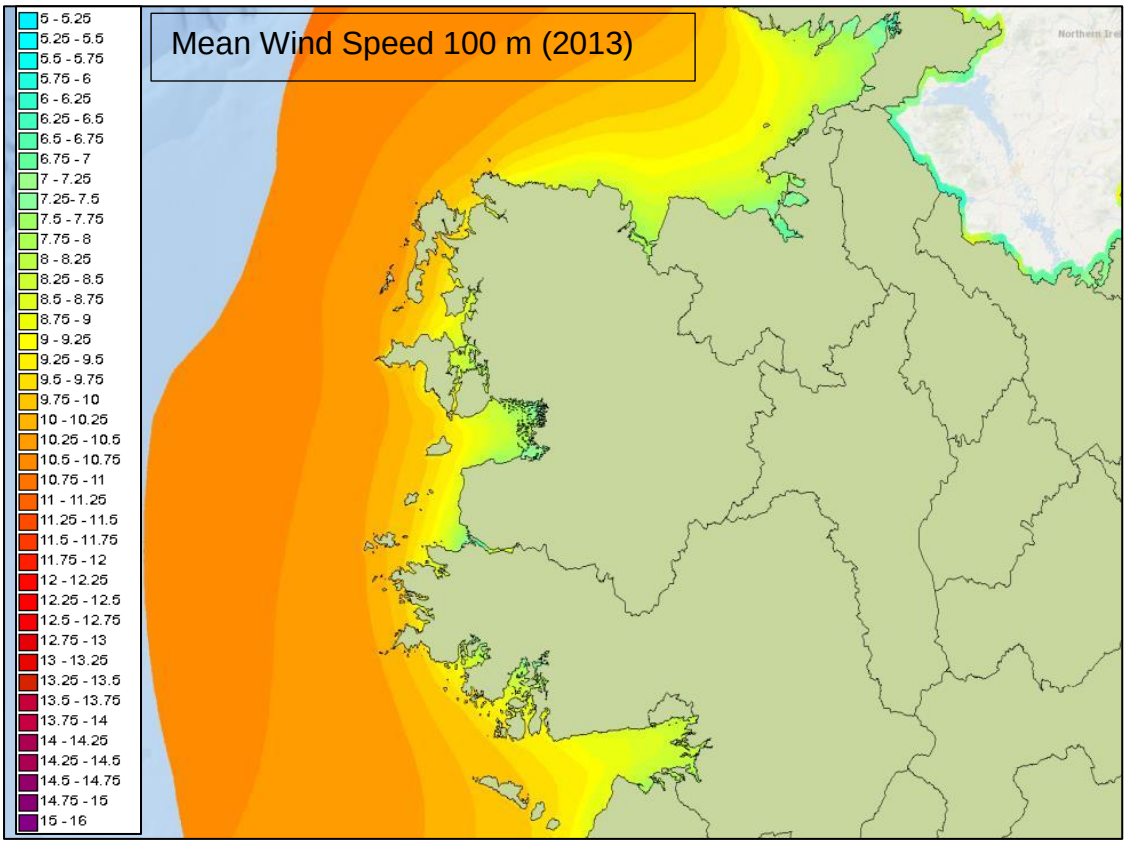

Figure 7-3: Mean Wind Speed 100m above MSL for Mayo area (m/s)

Source: Marine Institute, 2022, (SEAI May 2022)

(Image courtesy of INFOMAR. INFOMAR is the Department of the Environment, Climate and Communications (DECC) funded national seabed mapping programme, jointly managed and delivered by Geological Survey Ireland and Marine Institute).

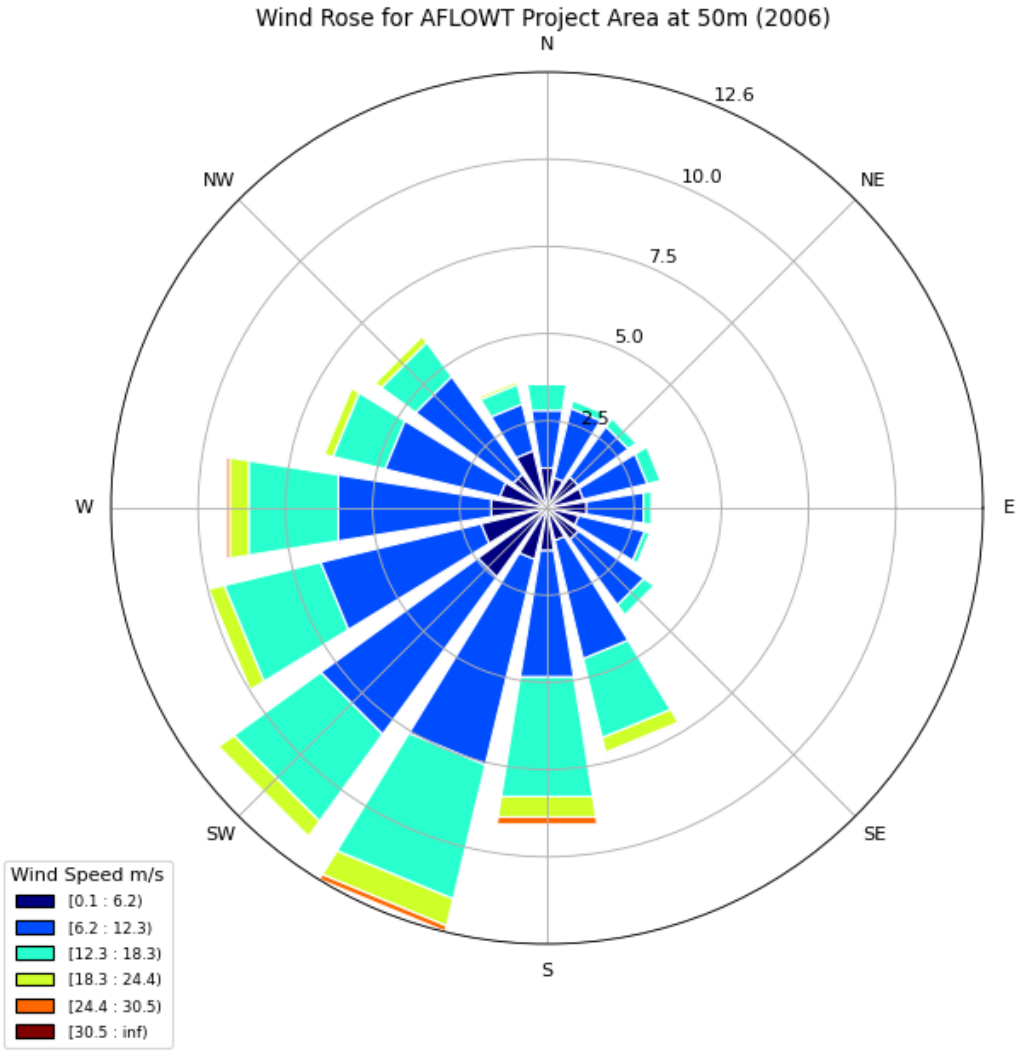

Figure 7-4: Wind Rise showing wind speed and direction collected at a height of 50m over the year 2006.

Source: SEAI 2022

7.1.3 Relevant Guidance

Scoping for the offshore physical environment chapter has been undertaken according to the Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Barnes, 2017). In addition to this, the following guidance will be taken into consideration in the full EIA:

- Geological Survey of Ireland Data and Maps (Geological Survey Ireland, 2022)
- Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment' (Marine Institute, 2000)
- Potential Effects of Offshore Wind Developments on Coastal Processes (Beiboer and Copper, 2002)
- Offshore Wind Farms: Guidance Note for EIA in Respect to Food and Environmental Protection Act (FEPA) and Coastal Protection Act (CPA) Requirements (CEFAS, 2004)

- Best Practice Guidelines for the Irish Wind Energy Industry (IWEA/SEI, 2008)
- review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry - Technical Report (BERR, 2008)
- Coastal Process Modelling for Offshore Wind Farm Environmental Impact Assessment: Best Practice Guide (Lambkin *et al*., 2009)
- Assessment of the environmental impacts of cables (The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR, 2009)
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (CEFAS, 2012)
- Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects. (Brooks *et al*., 2018)
- Irish Coastal Protection Strategy Study (OPW, 2020) International Cable Protection Committee Ltd ("ICPC") Recommendations (ICPC, 2021)
- Potential environmental effects of deep-water floating offshore wind energy facilities (Farr *et al*., 2021).

7.1.4 Design Parameters

The design parameters presented in chapter 5 which are relevant to coastal erosion, sedimentation processes and seabed geology are listed in Table 7-2. A worst-case scenario is considered.

Table 7-2: Design parameters and their relevance to coastal erosion, sedimentation process and seabed geology for AFLOWT scoping

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B	Each FOW device will have anchors associated with it which will have physical impacts on seabed and will disturb sediment
Separation distance between FOW devices	Maximum anchoring area is about 2.5 km^2 radius for the turbines	Provides context on distance between FOW devices
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor	Anchor installation will result in physical disturbance of anchor chain on the seabed cant can move around resulting in ongoing sediment disturbance and potentially lead to localised scouring
Minimum deployment period FOW devices	12 months minimum Anchors may remain for the lifetime of the demonstration site	Length of deployment will determine duration of impacts

Design parameter	Technical details – worst case scenario	Relevance
	(~35 year) for use by subsequent technology developers.	
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will result in physical disturbance of seabed and will suspend sediment in fine sediment bed substrate. Installation on hard substate may require cable protection leading to destruction of certain sections of the bedrock.

7.1.5 Embedded Mitigation

Due to the likelihood of sediment transport occurring (SEAI, 2011) any works that are required should ensure they have a level of mitigation to protect the equipment from such processes. The following designed-in measures are proposed:

- the electrical cables should be buried to a depth such that they are not exposed by extreme storm events. Cable burial surveys will be carried out regularly. Ensuring that cables remain buried will reduce any localised scour effects. Such a design will ensure that sediment movement is not affected
- during the operational phase, surveys should be carried out to confirm that the moorings are not impaired by scouring. This would help identify the early stages and prevent scouring, which causes amplifying the seabed erosion in a localised area.

7.1.6 Scoping of EIA

Table 7-3 presents project activities and resulting potential impacts that could arise during installation, operation and decommissioning phases of the proposed AFLOWT project at AMETS, identifying which are considered to require further study in the EIA process and which can be scoped out.

Table 7-3: Activities and potential impacts scoped in or out - coastal erosion, sedimentation process and seabed geology

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Physical disturbance to seabed during installation of FOW devices / infrastructure leading to increased suspended sediment levels and deposition	In	Anchoring of the FOW devices and installation of the export cables will lead to physical disturbance of the seabed, possibly leading to localised increases in suspended sediment which is likely to redeposit close to the site of disturbance.
Operation		
Loss of seabed from deployment of FOW devices	In	Loss of seabed and/or change to large sedimentary bedforms, from presence of FOW

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
/ infrastructure. Potential requirement for cable protection		device anchor blocks and export cable protection, with potential for longer term impact if anchors are left for use by subsequent demonstration devices
Scouring around FOW devices / infrastructure	In	Scour around installed structures and associated sediment transportation and deposition can lead to changes in seabed morphology
Decommissioning		
Physical disturbance to seabed during removal of FOW devices / infrastructure	In	Same rationale as for installation

7.1.7 Approach to EIA

The assessment will encompass the following:

- a desktop-based literature review of available data has been completed to help characterise the baseline conditions in the study area. This has included survey data from the original site EIS (SEAI, 2011). Information from the delayed Site Investigation geotechnical and geophysical surveys is now expected in 2023. Details of the proposed surveys are included in the Foreshore Licence application submitted in January 2020
- identification of potential effects that the project may have on coastal erosion, sedimentation processes and seabed geology (incorporating embedded mitigation) during the installation, operation and decommissioning phases
- identification of mitigation measures that may be required
- setting out residual effects following mitigation, by magnitude and significance.

The assessment within the EIAR will consider the magnitude and significance of each effect, as per the guidance in CEFAS (2004), regarding the following factors:

- sediment composition and particle size
- sedimentation patterns, e.g. resuspension of sediments, deposition etc
- large sedimentary structures, e.g. bedforms and channels
- suspension of sediments.

7.1.8 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below and in the corresponding sections of each subject section.

- Do you consider that the baseline data gathering meet the requirements for scoping ?
- Given the extremely localised nature of likely impact and sediment movement of the substrate in Test Area A and B are you content that numerical modelling is not required at scoping stage?

7.2 Bathymetry and Hydrography

7.2.1 Receiving Environment

The bathymetry of the AMETS project site ranges from the Mean Low Water Spring mark at Belderra Strand where the cables landfall, to the deepest isobath of 100 m in Test Area A. Test Area B is located at 50 m water depth. The site experiences a highly energetic wave climate with the significant wave height (Hs) being 16.7 m. These conditions can be attributed to the large fetch with waves being transported from as far away as the East cost of the USA.

The local currents have been measured and were found to be stronger offshore (0.44m/s max current recorded) than closer to shore (0.175m/s max current speed recorded), this is due to the indented coastline past Annagh Head and the current deviating away from the main tidal flow, which has a residual flow in the NW direction. The current directions at Site B are mainly to the Northeast and Southwest, while the low velocities found nearshore mean that the coastal current flows are not in any distinguishable direction (SEAI, 2011).

7.2.2 Data sources and Baseline

The following sources were used to gather data on bathymetry and hydrography:

Table 7-4: Data sources on the bathymetry and hydrography for AFLOWT scoping

Name of Source	Date accessed	Data overview
SEAI (2011), 'Atlantic Marine Energy Test Site Environmental Impact Statement - Chapter 16 - Coastal-processes.	12/10/2021	Desktop and survey data, including ADCP survey data for site A.
SEAI (2021), 'Call for Expression of Interest from Marine Energy Technology Developers for deployment at the AMETS Test Area', Offshore Belmullet, Co Mayo, Ireland.	12/10/2021	Desktop researched bathymetry and hydrography baseline data relevant to the AMETS site.
Marine Institute (n.d.), 'Irish Data Buoy Network', From http://vis.marine.ie/dashboards/#/dashboards/wave_spectral?buoy=AMETS%20Berth%20A%20Wave%20Buoyandmeasurement=MeanWavePeriod_Tm01	13/10/2021	Wave buoy data for the AMETS Test Area A and Test Area B with data going back to 2012 and 2009 respectively.
Marine Institute, and Geological Survey of Ireland (n.d.), 'INFOMAR Bathymetry Viewer', From https://maps.marine.ie/infomarbathymetry/	14/10/2021	Online maps containing past survey data on seabed bathymetry.
NEWA (n.d.), 'New European Wind Atlas', From https://map.neweuropeanwindatlas.eu/	14/10/2021	Online data atlas detailing Mean and max wind speeds for all of Europe.

7.2.2.1 *Existing Baseline*

Seabed physical conditions at the AMETS has been previously surveyed by INFOMAR using sub bottom profiler data, multibeam bathymetry and side scan sonar. The bathymetry data is presented in Figure 7-5 which includes Test Area A and Test Area B (SEAI, 2021).

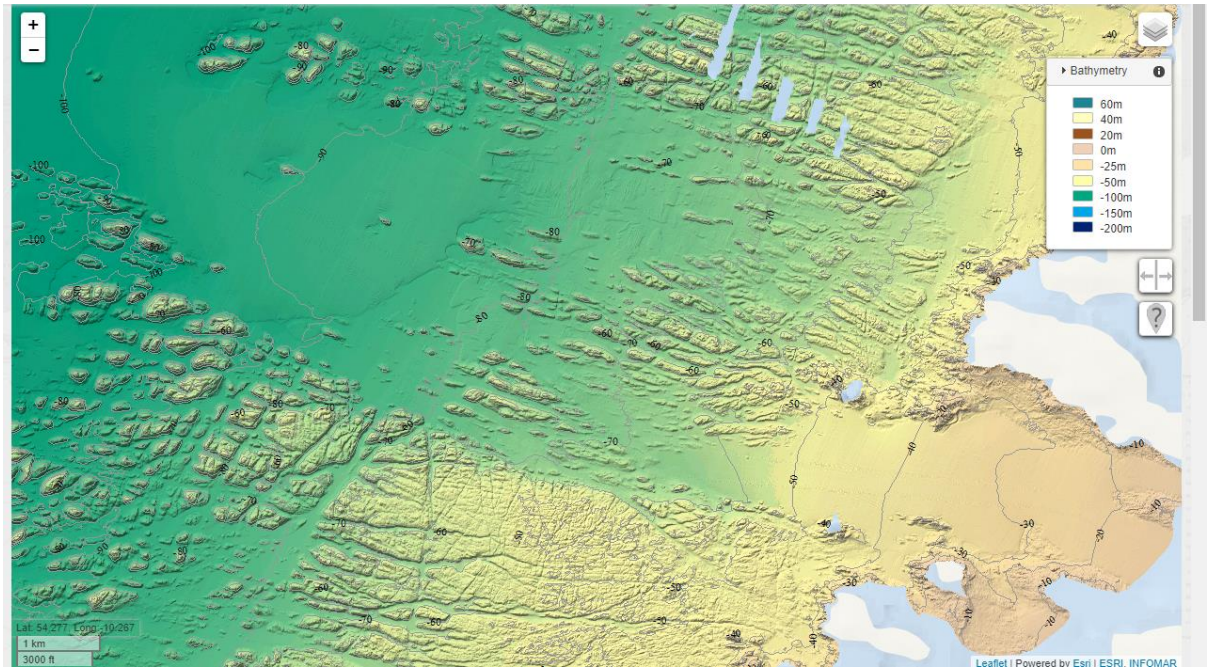

Figure 7-5: INFOMAR bathymetry data

Source: (SEAI, 2021).

Image courtesy of INFOMAR. INFOMAR is the Department of the Environment, Climate and Communications (DECC) funded national seabed mapping programme, jointly managed and delivered by Geological Survey Ireland and Marine Institute.

Acoustic doppler current profilers (ADCPs) to measure current speed and direction have been periodically deployed at the AMETS site at various depths.

- June July 2011 – ADCP Data from 28m and 52m (Test Area B)
- July - September 2016 – ADCP Data from Test Area A and Test Area B
- October 2019 - April 2020- ADCP Data from Test Area A
- April - August 2019 ADCP Data from Test Area A and Test Area B.

The Marine Institute are doing some work at the moment on ADCP data for the site– which might be available for the EIAR. Maximum current recorded over this 10-year period was 2.46 m/s while the current speed at the seabed was recorded as 0.26 m/s. Recent current speed measurements from April through August 2019 measured at Test Area A ranged between 0.002 to 0.8 m/s (Figure 7-6) with a mean current speed of 0.27 m/s. At Test Area B, current speeds were similar ranging from 0.002 to 1.023 m/s (Figure 7-7) with a mean of 0.22 m/s.

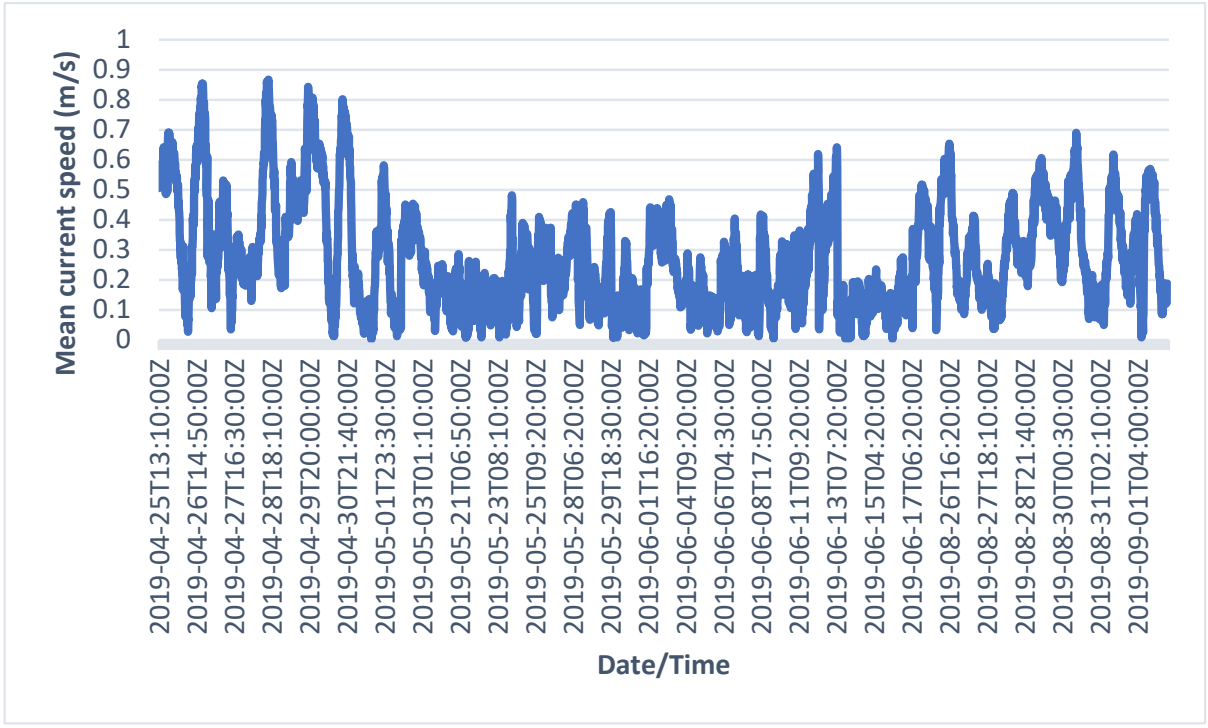

Figure 7-6: Current speed measured at Test Area A from April – August 2019

Source: Marine Institute (2022)

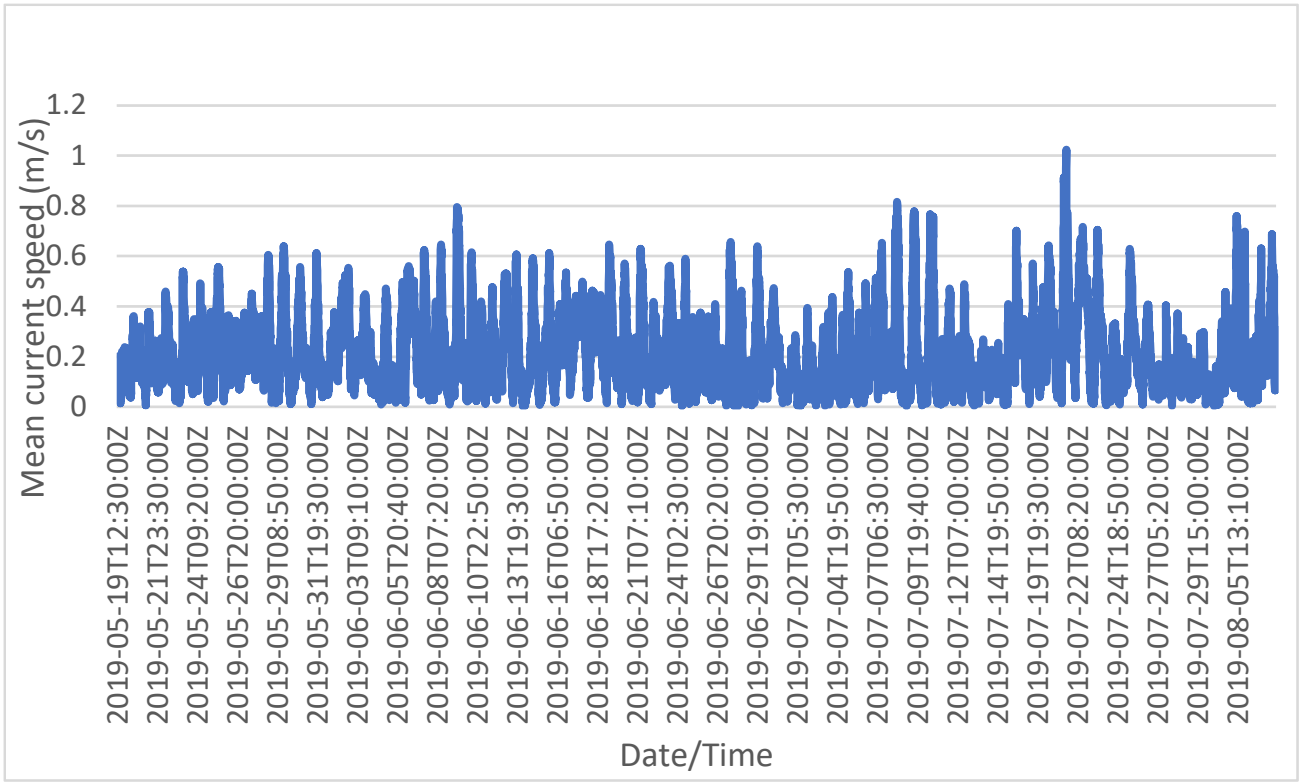

Figure 7-7 Current speed measured at Test Area B from April – August 2019

Source: Marine Institute (2022)

A wave rider buoy has been stationed at AMETS Test Area A since 2012 and Test Area B since 2009. The buoys are collecting hydrographical data on peak period, peak wave direction, significant wave height, max wave height and sea temperature. The data collected since deployment of each of the buoys has been summarised and presented in the Table 7-5. It should be noted there are gaps in the data as the buoys were not operational all the time within these periods.

Table 7-5: Mean wave data calculated from AMETS Test Area A wave buoy from 16/05/2012 to 31/12/2021 and Test Area B from 04/12/2009 to 31/12/2021

Wave Parameter	Test Area A	Test Area B
Annual Mean Peak Period (s)	11.02	11.05
Annual Mean Peak Wave Direction (degrees true)	262.86	277.08
Annual Mean Significant Wave Height (H_s) (cm)	314.84	283.39
Annual Mean Max Wave Height (cm)	411.8	272.0
Annual Mean Sea Temperature (°C)	11.94	11.64

The data shows a similar wave regime of peak wave period and direction at both locations. The predominant wave directions can be established as coming from WNW to WS. The significant wave height was greater at Test Area A which is further offshore than Test Area B.

7.2.3 Relevant Guidance

The following guidance documents have been identified that are applicable for bathymetry and hydrography in addition to those listed in section 7.1.3 above:

- Effects of Offshore Wind Turbines on Ocean Waves (Wimer *et al*., 2014)
- The effects of offshore wind farms on hydrodynamics and implications for fishes. (Van Berkel *et al*., 2020).
- 'Estuarine and Coastal Hydrography and Sediment Transport. Uncles and Mitchell (2017)'
- International Hydrographic Organization (IHO) standards (S44 and S57) for hydrographic surveys (IHO, 2008)
- The Manual on Hydrography (IHO Publication M-13) (IHO, 2011).

7.2.4 Design Parameters

Table 7-6 sets out the design parameters which are relevant to bathymetry and hydrography. A worst-case scenario is considered.

Table 7-6: Design parameters and their Relevance to Bathymetry and Hydrography (with non-relevant parameters excluded)

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices and floater size.	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B.	Due to the likelihood of a 2.5 km^2 buffer between each FOW, the impact felt on the tidal and wave regime will be negligible.
Minimum depth of water for anchoring system.	96-107 m Test Area A 41-56 m Test Area B	Depths required dictate that devices will be installed in areas of more energetic wave regime and stronger currents. (See also table 5-4 in chapter 5.)
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor.	Differing anchor designs will have a larger impact on the surrounding bathymetry as more seabed may have to be altered/removed for the larger anchor types. In addition, the mooring system connector will cause drag in the surrounding hydrodynamic system. This will cause a reduction in current velocity in the immediate area. The larger the chain the more energy will be removed from the system.
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will result in disturbance to the seabed.

7.2.5 Embedded Mitigation

Due to the environment being so energetic, works that are required to spend time offshore in any capacity should ensure they have a level of mitigation to reduce impacts on the surrounding hydrodynamic and bathymetric environment. Such as:

- The floaters and moorings should be designed to reduce hydrodynamic impacts from drag on the devices deployed, which also reduces effects on the hydrodynamic system.

7.2.6 Scoping of EIA

Table 7-7 presents project activities and resulting potential impacts that could arise during installation, operation and decommissioning phases of the proposed AFLOWT project at AMETS, identifying which are considered to require further study in the EIA process and which can be scoped out.

Table 7-7: Activities and potential impacts scoped in or out - bathymetry and hydrography

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Localised alteration to hydrodynamic and wave conditions around the turbines	Out	Effects will be minimal
Operation		
Localised alteration to hydrodynamic and wave conditions around the turbines	In	Localised alteration likely, but further afield unlikely. Waves in the immediate vicinity may also be affected from the FOW or floating mooring systems but this is not expected to be significant based on previous studies (SEAI, 2011)
Alteration to local bathymetry from anchors	In	The anchor design may require degradation/increasing of the local bathymetry as well as the cable rock protection. This is particularly important nearshore where navigable depths can be reduced.
Scouring around FOW devices / infrastructure	Out	Effects to bathymetry will be minimal
Decommissioning		
Localised alteration to hydrodynamic and wave conditions after removal of the turbines	Out	Effects will be minimal

7.2.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-1 in chapter 6 identifies those projects which may have cumulative impacts with Bathymetry and Hydrography impacts from the AFLOWT project and will be considered in the EIAR.

7.2.8 Approach to EIA

The following assessment will be carried out in order to determine the impacts that the development could have on Bathymetry and Hydrography:

- a desktop-based literature review of available data has been completed to help characterise the baseline conditions in the study area Identifying the potential effects that the proposed development will have on the Bathymetry and Hydrography environment by project phase; the installation, operation and decommissioning phases. This has included survey data from the original site EIS (SEAI, 2011). Information from the delayed Site Investigation geotechnical

and geophysical surveys is now expected in 2023. Details of the proposed surveys are included in the Foreshore Licence application submitted in January 2020

- identifying any additional mitigation that may be required to ensure the scoping report follows the correct guidelines
- writing up and describing the residual effects, their magnitude and significance.

7.2.9 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions.

7.3 Water and Sediment Quality

7.3.1 Receiving Environment

AMETS Test Area A is located outside of specific water bodies that are under jurisdictional control through the European Communities Water Framework Directive. Test Area B however, is located within the Western Atlantic Seaboard, as defined by the EPA. The EPA has not assigned a status to the Western Atlantic Seaboard coastal water body due the lack of significant data in the area.

7.3.2 Data sources and Baseline

The following sources were used to gather data on water and sediment quality:

Table 7-8: Data sources on Water and Sediment Quality

Name of Source	Date accessed	Data overview
SEAI (2011), 'Atlantic Marine Energy Test Site Environmental Impact Statement - Chapter 7 – Water'.	15/10/2021	Previous Environmental Impact into AMETS site. 25 sites were sampled at the test locations and along the proposed cable route Macrofaunal communities of the study area were delineated and characterised into standard biotopes. The ecological status of the sampling stations was assessed using the IQI. The ecological status of the stations sampled was generally High or Good. Lower diversity in shallower water likely to physical distance from wave action.
Environmental Protection Agency. (n.d.), 'EPA Maps', From https://gis.epa.ie/EPAMaps/default?easting=andnorthing=andlid=EPA:WFD_CoastalWaterQuality_20102012	15/10/2021	Environmental Protection Agency data maps showing designated water bodies and water quality status.

The macrofaunal communities within AMETS Test Area A and the proposed cable route were sampled, delineated, and characterised as particular communities, which in turn led to them being classified in terms of standard Biotopes. Using the Infaunal Quality Index (IQI), the ecological status of these biotopes was assessed in order to give a representation of the water quality present in the tests site. The results of this survey concluded that the water quality was generally High or Good.

7.3.3 Relevant Guidance

The following guidance documents have been identified in addition to those already included within section 7.1.3 that are applicable for water and sediment quality which have been referenced and which will inform the EIA process:

- Potential environmental effects of deep water floating offshore wind energy facilities (Farr, H *et al*., (2021)
- Water quality in 2020, an indicators report. (EPA, 2021)
- Irish Coastal Protection Strategy Study (OPW, 2020)
- Report on the implementation of the Marine Strategy Framework Directive. (EC, 2020)
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (CEFAS, 2012)
- Assessment of the environmental impacts of cables (The Convention for the Protection of the Marine Environment of the North-East Atlantic - (OSPAR, 2009)
- Offshore Wind Farms: Guidance Note for EIA in Respect to Food and Environmental Protection Act (FEPA) and Coastal Protection Act (CPA) Requirements (CEFAS, 2004)
- The Water Framework Directive (WFD) (2000/60/EC) transposed into Irish law by S.I. No. 722/2003 - European Communities (Water Policy) Regulations 2003 (Government of Ireland, 2003).
- Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment'. Marine Institute, 2000
- The EU Water Framework Directive - integrated river basin management for Europe. (EC, 2000)

7.3.4 Design Parameters

Table 7-9 sets out the design parameters which are relevant to sediment and water quality. A worst-case scenario is considered.

Table 7-9: Design parameters and their Relevance to Sediment and Water Quality

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Higher MW may lead to more than one FOW device in each Test Area, leading to increased chance of hydrocarbon contamination from vessels, antifoulant and lubricating oils.

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B	More FOW Devices lead to increased chance of hydrocarbon contamination from vessels, antifoulant and lubricating oils. Extent of sediment disturbance, sediment resuspension and increased threat of oil contamination will be determined by size of the FOW device.
Mooring system	Anchor types include drag, pile driven, suction bucket, vertical load, gravity bases and drilling pin piles. 2-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor Anchors may remain for the lifetime of the demonstration site (35 years) for use by subsequent technology developers.	Type of anchoring system will affect sediment disturbance and resuspension. A greater number of anchors will cause sediment disturbance and resuspension. Installation operations run the risk of contaminating water column. The area covered by the spread of anchors/anchor system will affect extent of sediment disturbance and resuspension.
Export cabling	It is likely that there is only room on the current corridor for a maximum of 1 subsea export cables from Test Area A and 1 from Test Area B. Worst case scenario would be 2 from each Test Area. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will result in physical disturbance of seabed, and potentially resulting in sediment disturbance and resuspension.

7.3.5 Embedded Mitigation

The project design will include measures such as:

- during the Installation and decommissioning phases as the vessels involved should have an oil pollution emergency response plan, carry emergency response equipment, appropriate trained staff to prevent of oil pollution into the water column
- all hydrocarbons used on maintenance and installation vessels should be correctly contained to ensure they are not released into the water column
- all floating devices should be designed such that if oil leaks from the machinery it is contained within the body of the device. In addition, only oils that are identified as having a low environmental impact should be used as lubricants
- the level of antifoulant used on the hull and any submerged part of the device, should be kept to a minimal to prevent the accumulation of antifoulant sediments in the water column.

7.3.6 Scoping of EIA

The potential impacts and the factors significantly affected that will occur during the installation, operation and decommissioning phases of the proposed development that should be scoped for an EIA are presented in Table 7-10.

Table 7-10: Activities and potential impacts scoped in or out – water and sediment quality

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Installation activities that will cause disturbance to seabed	In	This may lead to suspension of contaminated sediments on the seabed. Given that deployment will be limited to 1-2 FOW devices impacts are expected to be minimal[1].
Accidental events, e.g., oil or fuel spill (also applicable to operation and decommissioning)	Out	Potential impacts of non-planned events (where sufficient good practice measures are in place to render the chance of such events occurring minimal) are proposed to be scoped out. As such possible spills and pollution incidents are scoped out. Each site developer will prepare a CEMP which will include a Pollution Management Plan.
Operation		
Contamination of water column from antifoulants present on turbine structures	In	Contamination of the water column could impact localised water quality
Short term disturbance of seabed from anchoring activities	In	Disturbance can release contaminants from the seabed sediments, affecting water quality. Resuspension of sediment can also impact upon water quality.
Decommissioning		
If cables need to be removed the removal process will cause a temporary suspension of seabed sediment / contaminated sediment.	In	Suspension of seabed sediment / contaminated sediment could impact water and sediment quality

7.3.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-1 within chapter 6 identifies those projects which may have cumulative impacts with Water and Sediment Quality impacts from the AFLOWT project and will be considered in the EIAR.

7.3.8 Approach to EIA

The following assessment will be carried out in order to determine the impact the development will have on Water and Sediment Quality:

- a desktop-based literature review of all previous data to ensure that the breadth of previous data that has been collected, is sufficient enough to inform the assessment without further survey work being required
- identifying the potential effects that the proposed development will have on the water and sediment quality during the installation, operation and decommissioning phases
- identifying any additional mitigation that may be required not already included in section 7.3.5 above
- writing up and describing the residual effects, their magnitude and significance.

The potential impacts to transitional and coastal waters, to one nautical mile, will be considered in line with the requirements set out in the Water Framework Directive (WFD). This will include consideration of protected areas nearby that are known to have sensitivity to reduced water quality or have water quality objectives included in their programme of measures. As the majority of the site and area of potential effect is located outside the area covered by the WFD, the assessment will also cover the requirements set out by the Marine Strategy Framework Directive (MSFD) (European Commission, 2020).

7.3.9 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below and in the corresponding sections of each subject section.

- Are there any other guidance documents covering how to address water quality impacts, including how to consider WFD and MSFD requirements you would wish us to apply?

8 OFFSHORE BIODIVERSITY

8.1 Protected sites and species

8.1.1 Receiving Environment

Within the study area or the vicinity of the AMETS site there are a number of protected sites, including Special Areas of Conservation (SAC) (designated under the EU Habitats Directive (EU, 1992)) (see Table 8-1), Natural Heritage Areas (NHA) (see Table 8-2) and Special Protection Areas (SPA) for birds (designated under the Birds Directive (EU, 2009)) (see Table 8-3). Only those sites that have the potential to be impacted by the proposed project are included in these tables, i.e., fully marine sites, estuarine, bog or river sites. These areas are considered important for habitats or species present. Figure 8-1 shows the protected sites in proximity to the AMETS Test Area.

Table 8-1: Designated Special Areas of Conservation (SAC) sites within a radius of 20 km of the study area (at the closest point of Test Area A or B)

Site name	Site code	Qualifying interest(s)
West Connacht (NPWS, 2021 a)	002998	Bottlenose dolphin (*Tursiops truncatus*)
Mullet/Blacksod Bay Complex (NPWS, 2021 b)	000470	Mudflats and sandflats not covered by seawater at low tide, large shallow inlets and bays, reefs, *Salicornia* and other annuals colonising mud and sand, shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), fixed coastal dunes with herbaceous vegetation (grey dunes), Atlantic decalcified fixed dunes (*Calluno-Ulicetea*), Machairs (* in Ireland), natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation, alkaline fens, otter (*Lutra lutra*) and petalwort *(Petalophyllum ralfsii*).
Erris Head (NPWS, 2021 c)	001501	Vegetated sea cliffs of the Atlantic and Baltic coasts and Alpine and Boreal heaths.
Broadhaven Bay (NPWS, 2021 d)	000472	Mudflats and sandflats not covered by seawater at low tide, Large shallow inlets and bays, reefs, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and submerged or partially submerged sea caves.
Duvillaun Islands (NPWS, 2021 e)	000495	Bottlenose dolphin (*Tursiops truncatus*) and grey seal (*Halichoerus grypus*).
Inishkea Islands (NPWS, 2021 f)	000507	Machairs, grey seal and petalwort.

Table 8-2: Natural Heritage Areas (NHA) within 20 km of Test Area A or B

Site name	Site Code	Qualifying features
Tullaghan Bay and Bog (NPWS, 2021 g)	001567	Peatlands
Tristia Bog (NPWS, 2021 h)	001566	Peatlands

Table 8-3: Special Protection Areas (SPA) within 75 km of Test Area A or B

Site name	Site code	Qualifying interest	Population (date of estimate)	Season	Distance from turbine site (Test Area A)	Distance from closest part of proposal, including cable route to landfall (Test Area B)	Foraging habitat / range
Inishglora and Inishkeeragh (NPWS, 2021 i)	004084	Storm petrel *(Hydrobates pelagicus)*	3,423 pairs (2000)	Breeding	9.34 km south-east of the edge	583 m south of the outer perimeter	Highly maritime / pelagic with an extensive feeding range extending hundreds of km while breeding.
		Cormorant *(Phalacrocorax carbo)*	57 Pairs (1987)	Breeding			Largely coastal feeder / shallow water feeder – foraging range can exceed 30 km
		Shag *(Phalacrocorax aristotelis)*	61 pairs (2001)	Breeding			Largely coastal shallow water feeder – foraging range can exceed 40 km
		Barnacle goose *(Branta leucopsis)*	136 (1993 – 2003)	Non-breeding			Feeds and roost in terrestrial habitats – foraging range generally less than 5 km –long distance migrant which can move significant distances if required
		Lesser black backed gull *(Larus fuscus)*	66 pairs (2001)	Breeding			Adaptable feeder and can exploit a range of resources in both terrestrial and marine habitats – foraging range can exceed 50 km
		Herring gull *(Larus argentatus)*	78 pairs (2001)	Breeding			Adaptable feeder and can exploit a range of resources in both terrestrial and marine habitats – foraging range can exceed 50 km
		Arctic tern *(Sterna paradisaea)*	105 pairs (1995)	Breeding			Typically, maritime feeder targeting small fish prey such as sandeel - foraging range of up to 30 km
Termoncarragh Lake and	004093	Barnacle goose	394 (2020)	Non-breeding		1.3 km north of the proposed	Feeds and roost in terrestrial habitats– foraging range generally

Site name	Site code	Qualifying interest	Population (date of estimate)	Season	Distance from turbine site (Test Area A)	Distance from closest part of proposal, including cable route to landfall (Test Area B)	Foraging habitat / range
Annagh Machair (NPWS, 2021 j)					11.65 km east of the edge of Test Area A	cable route traversing the bay.	less than 5 km – long distance migrant which can move significant distances if required
		Whooper swan *(Cygnus cygnus)*	35 (2020)	Non-breeding			Feeds and roost in terrestrial habitats such as freshwater sites or cultivated land - long distance migrant which can move significant distances if required
		Greenland white fronted goose *(Anser albifrons flavirostris)*	11 (2020)	Non-breeding			Terrestrial species
		Corncrake *(Crex crex)*	Low	Breeding			Terrestrial species associated with croft landscapes
		Chough *(Pyrrhocorax pyrrhocorax)*	30 (2015)	Breeding			Terrestrial species associated with Machair vegetated sea cliffs and slopes
		Lapwing *(Vanellus vanellus)*	22 pairs (1996)	Breeding			Largely estuarine and terrestrial feeder
		Dunlin (*Calidris alpina schinzii*)	14 Pairs (1996)	Breeding			Terrestrial species breeding in machair / wetland habitats
Blacksod Bay/ Broadhaven (NPWS, 2021 k)	004037	Great Northern diver *(Gavia immer)*	308 (2015/16-2016/17)	Non-breeding	13.1 km south-east of Test Area A	860 m south-west of the proposed cable landfall site	During non- breeding period - feeds in open water marine environment
		Light-bellied brent goose *(Branta bernicla hrota)*	279 (1999/00-2003/04)	Non-breeding			Largely estuarine species typically feeding on marine grasses
		Common scoter *(Melanitta nigra)*	3,772 (2015/16-2016/17)	Non-breeding			During non- breeding period - feeds in open water marine environment – typically associated with shallower water

Site name	Site code	Qualifying interest	Population (date of estimate)	Season	Distance from turbine site (Test Area A)	Distance from closest part of proposal, including cable route to landfall (Test Area B)	Foraging habitat / range
		Red-breasted merganser *(Mergus serrator)*	138 (2015/16-2016/17)	Non-breeding			Feeds in freshwater and coastal / estuarine habitat
		Ringed plover *(Charadrius hiaticula)*	590 (1999/00-2003/04)	Non-breeding			Largely estuarine feeder
		Sanderling *(Calidris alba)*	171(1999/00-2003/04)	Non-breeding			Largely estuarine feeder
		Dunlin	1,255 (1999/00-2003/04)	Non-breeding			Terrestrial species intertidal feeder
		Bar-tailed godwit *(Limosa lapponica)*	664 (1999/00-2003/04)	Non-breeding			Largely estuarine feeder
		Curlew *(Numenius arquata)*	567 (1999/00-2003/04)	Non-breeding			Largely estuarine feeder
		Sandwich tern *(Sterna sandvicensis)*	114 (1994) 81 (1995)	Breeding			Typically maritime feeder targeting small fish prey such as sandeel - foraging range of up to 30 km
		Dunlin	24 pairs (1985-2009)	Breeding			Terrestrial species breeding in machair / wetland habitats
Inishkea Islands (NPWS, 2021l)	004004	Shag	90 pairs (2000)	Breeding	11.7 km south-east of Test Area A	6.7 km south south-west of Test Area B	Largely coastal feeder
		Barnacle goose	2,481 (1993-2003)	Non-breeding			Feeds and roosts in terrestrial habitats
		Ringed plover	225 (1996/97-1999/00)	Non-breeding			Largely estuarine feeder
		Sanderling	140 (1996/97-1999/00)	Non-breeding			Largely estuarine feeder

Site name	Site code	Qualifying interest	Population (date of estimate)	Season	Distance from turbine site (Test Area A)	Distance from closest part of proposal, including cable route to landfall (Test Area B)	Foraging habitat / range
		Purple sandpiper *(Calidris maritima)*	50 (1996/97 - 1999/00)	Non-breeding			Largely estuarine feeder
		Turnstone *(Arenaria interpres)*	275 (1996/97 -1999/00)	Non-breeding			Largely estuarine feeder
		Common gull *(Larus canus)*	47 pairs (2000)	Breeding			Can exploit a range of terrestrial and marine habitats
		Herring gull*)*	81 pairs (2000)	Breeding			Adaptable feeder and can exploit a range of resources in both terrestrial and marine habitats – foraging range can exceed 50 km.
		Arctic tern	182 pairs (2000)	Breeding			Typically, maritime feeder targeting small fish prey such as sandeel. Foraging range of up to 30 km.
		Little tern *(Sternula albifrons)*	63 pairs (2007)	Breeding			Typically, maritime feeder targeting small fish prey such as sandeel . Foraging range of up to 11 km.
		Dunlin	17 pairs (1985-2009)	Breeding			Terrestrial species; intertidal feeder.
Duvillaun Islands (NPWS, 2021 m)	004111	Fulmar *(Fulmarus glacialis)*	638 pairs (2000)	Breeding	20.4 km south-east of Test Area A	13.7 km south south-west of the proposed cable landfall site	Highly maritime / pelagic
		Storm petrel	1,050 - 1,150 pairs (2001and 2002)	Breeding			Highly maritime / pelagic with an extensive feeding range extending hundreds of km while breeding.
		Barnacle goose	221 (2008)	Non-breeding			Feeds and roost in terrestrial habitats
Carrowmore Lake (NPWS, 2021 n)	004052	Sandwich tern	164 pairs (1984)	Breeding	28.85 km east of Test Area A	15.6 km east of the proposed cable landfall site	Typically, maritime feeder targeting small fish prey such as sandeel or other items. Foraging range of up to 54 km.

Site name	Site code	Qualifying interest	Population (date of estimate)	Season	Distance from turbine site (Test Area A)	Distance from closest part of proposal, including cable route to landfall (Test Area B)	Foraging habitat / range
Stags of Broadhaven (NPWS, 2021 o)	004072	Storm petrel	1,912 pairs (2001)	Breeding	32 km east north-east of Test Area A	24 km north-east of the proposed cable route traversing the bay	Highly maritime / pelagic with an extensive feeding range extending hundreds of km while breeding.
		Leach's storm petrel *(Hydrobates leucorhous)*	310 pairs (2001)	Breeding			Highly maritime / pelagic with an extensive feeding range extending hundreds of km while breeding.
Illanmaster (NPWS, 2021 p)	004074	Storm petrel	7,500 pairs (1980)	Breeding	40 km east of Test Area A	29.75 km north-east of the proposed cable landfall	Highly maritime / pelagic with an extensive feeding range extending hundreds of KM while breeding.
Bill Rocks (NPWS, 2021 q)	004177	Storm petrel	500 – 1,000 pairs	Breeding	42.7 km south of Test Area A	38 km south south-west of the proposed cable landfall	Highly maritime / pelagic with an extensive feeding range extending hundreds of km while breeding.
		Puffin *(Fratercula arctica)*	1,500 pairs (2001)	Breeding			Highly maritime / pelagic
Clare Island (NPWS, 2021 r)	004136	Fulmar	4,029 pairs (1999)	Breeding	51 km southeast of Test Area A	42.3 km south of the proposed cable landfall	Highly maritime / pelagic
		Shag	89 pairs (1999)	Breeding			Largely coastal feeder
		Common gull	39 pairs (1999)	Breeding			Can exploit a range of terrestrial and marine habitats
		Kittiwake *(Rissa tridactyla)*	1,785 pairs (1999)	Breeding			Highly maritime / pelagic gull species
		Guillemot *(Uria aalge)*	1,528 pairs (1999)	Breeding			Highly maritime / pelagic
		Razorbill *(Alca torda)*	354 pairs (1999)	Breeding			Highly maritime / pelagic
		Chough	16 pairs (2002/03)	Breeding			Terrestrial species
Killala Bay / Moy Estuary	004036	Ringed plover	245 (1995/96 – 1999/00)	Non-breeding	64.6 km east of Test Area A		Largely estuarine and coastal feeder

Site name	Site code	Qualifying interest	Population (date of estimate)	Season	Distance from turbine site (Test Area A)	Distance from closest part of proposal, including cable route to landfall (Test Area B)	Foraging habitat / range
(NPWS, 2021 s)		Golden plover *(Pluvialis apricaria)*	2,361 (1995/96 – 1999/00)	Non-breeding		51.8 km east of the proposed cable landfall	Largely estuarine and coastal feeder
		Grey plover *(Pluvialis squatarola)*	221 (1995/96 – 1999/00)	Non-breeding			Largely estuarine and coastal feeder
		Sanderling	123 (1995/96 – 1999/00)	Non-breeding			Largely estuarine and coastal feeder
		Dunlin	2,073 (1995/96 – 1999/00)	Non-breeding			Largely estuarine and coastal feeder
		Bar-tailed godwit	366 (1995/96 – 1999/00)	Non-breeding			Largely estuarine and coastal feeder
		Curlew	731 (1995/96 – 1999/00)	Non-breeding			Largely estuarine and coastal feeder
		Redshank *(Tringa totanus)*	372 (1995/96 – 1999/00)	Non-breeding			Largely estuarine and coastal feeder
Lough Conn and Lough Cullin (NPWS, 2021 t)	004228	Tufted duck *(Aythya fuligula)*	428 (1995/96 – 1999/00)	Non-breeding	65 km southeast of Test Area A	51.2 km southeast of the proposed cable landfall	Largely wetlands, estuarine and coastal feeder
		Common scoter*)*	30 birds, 5 pairs, 18 unpaired males and 2 unpaired females (1999)	Breeding			Nests on the ground around the lakes; foraging is typically associated with shallower water
		Common gull	40 pairs (2000)	Breeding			Can exploit a range of terrestrial and marine habitats
		Greenland white-fronted goose	123 (1994/95 – 1998/99)	Non-breeding			Terrestrial species

Site name	Site code	Qualifying interest	Population (date of estimate)	Season	Distance from turbine site (Test Area A)	Distance from closest part of proposal, including cable route to landfall (Test Area B)	Foraging habitat / range
High Island, Inishshark and Davillaun (NPWS, 2021 u)	004144	Fulmar	830 pairs (1999)	Breeding	71.2 km to Test Area A	64.6 km south of the proposed cable landfall	Highly maritime / pelagic
		Barnacle goose	371 birds (1993- 2003)	Non-breeding			Feeds and roost in terrestrial habitats
		arctic tern	64 pairs (1995)	Breeding			Highly maritime feeding habits typically breeds on coastlines and offshore islands

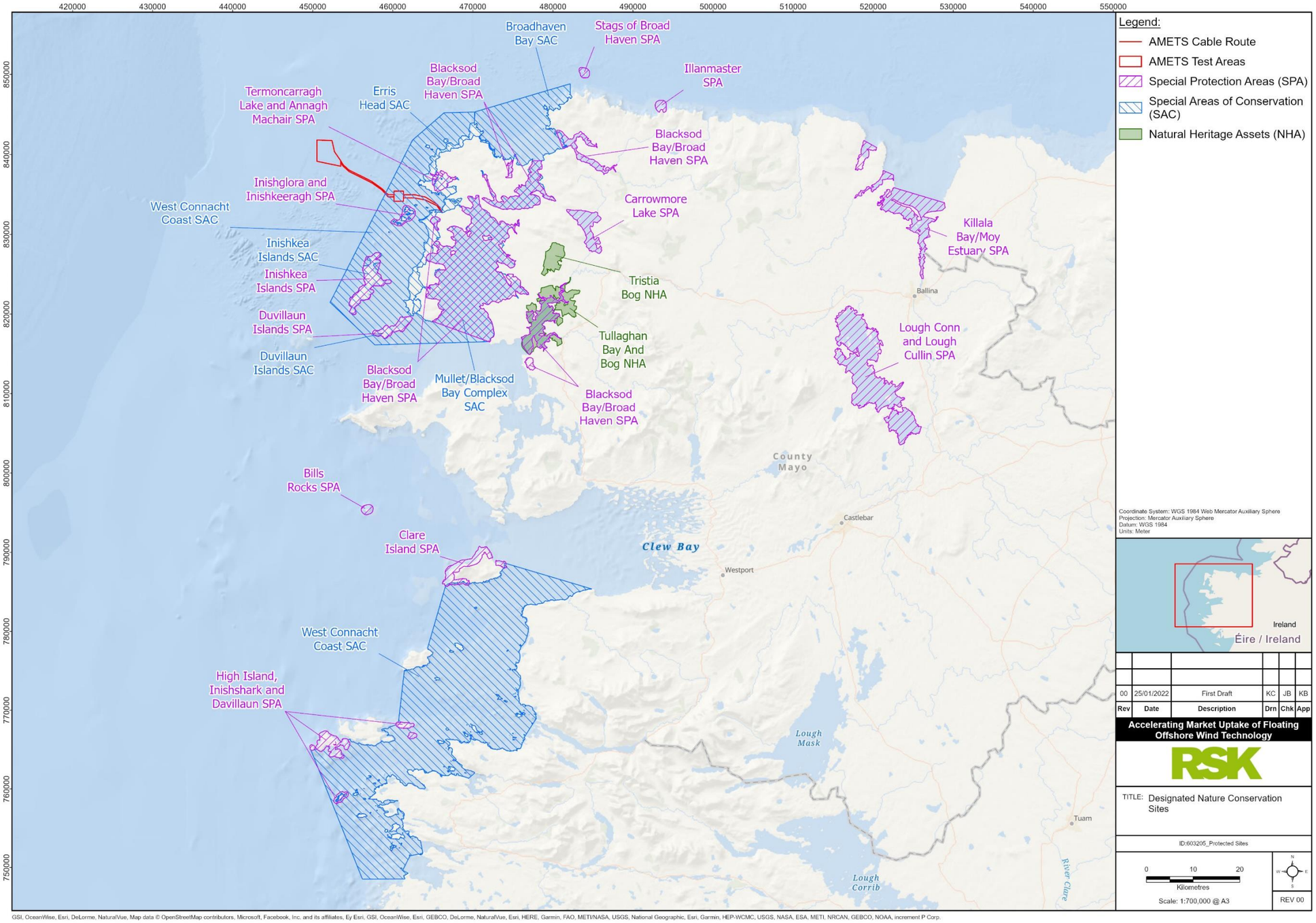

Figure 8-1: Designated Sites and their proximity to the AMETS Test Area and cables

Within the SACs no benthic species are identified as qualifying species; however, otters are included, migratory fish (salmon) and several marine mammals (grey seals, bottlenose dolphin and harbour seals). Within the SPAs qualifying features include coastal waterbird populations and breeding seabird colonies.

At the time of site selection, the marine area of the AMETS was not within any area designated under the Natura 2000 Network of sites. However, the West Connacht Coast SAC (site code: 002998) was subsequently proposed and designated in 2012, following the original selection of the Test Areas, preparation of the Environmental Impact Statement (EIS) and the subsequent gathering of an additional two years of baseline ecological data. The inshore marine site of the AMETS and some of the cabling now falls within the West Connacht Coast SAC, which was designated as a SAC under the EU Habitats Directive with bottlenose dolphin as the sole qualifying interest. The SAC is split into two spatial components in western Connemara and Mayo respectively and covers an area of 660 km^2. The northern component of the site extends from coastal waters off Erris Head westwards beyond Eagle Island and the Mullet Peninsula in County Mayo. From there it extends southwards immediately off the Coast as far as the entrance to Blacksod Bay. The southern component of the site the site extends from Clare Island and the outer reaches of Clew Bay at Old Head and continues southwards from the Mayo Coast to the Connemara coast near Clifden and Ballyconneely, County Galway (Figure 8-2).

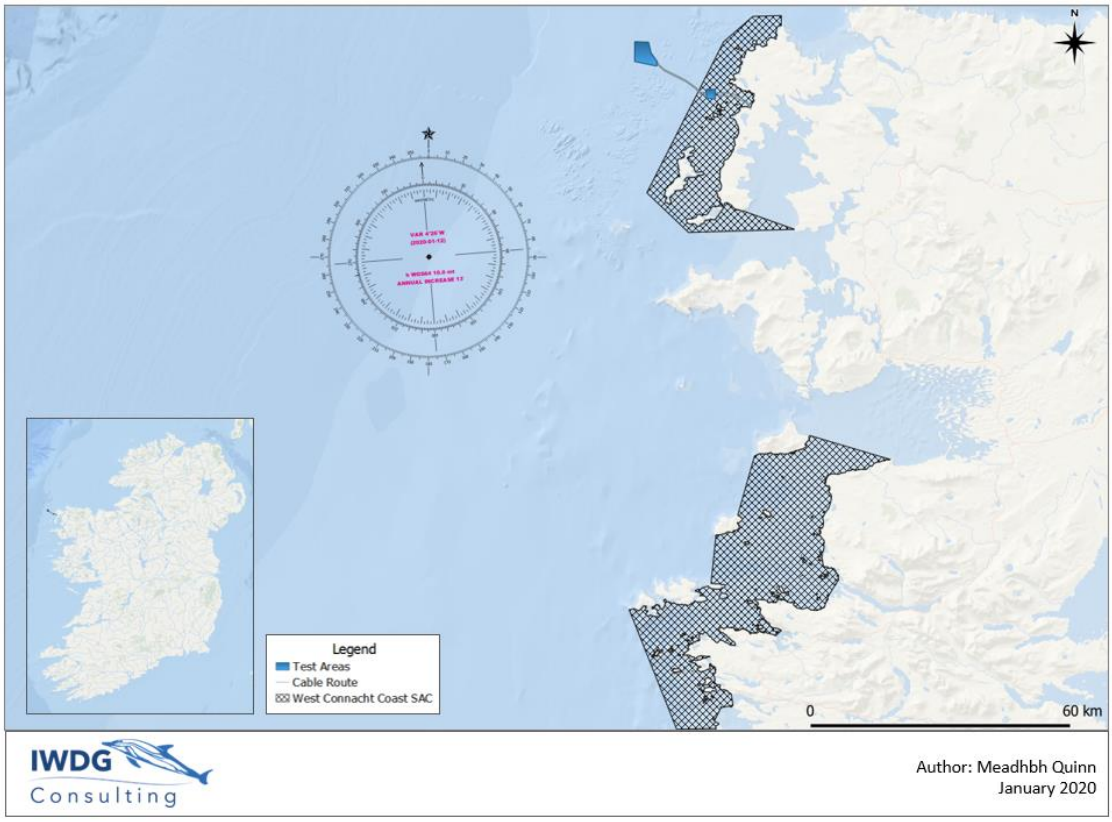

Figure 8-2: Location of West Connacht Coast SAC areas and Test Area A and B of AMETS.

Source: Adapted from IWDG Consulting (2021)

The landfall location is also within Mullet/Blacksod Bay Complex SAC (site code: 000470). This SAC was designated under the Natura 2000 Network of sites due to the presence of the Annex I priority habitats: fixed dune, machair and decalcified dune heath habitats. Other qualifying features include reefs, marram dunes, large shallow inlet and bay, tidal mud- and sandflats and *Salicornia* mudflats, as well as otters.

8.1.2 Data sources and Baseline

Information on the protected sites and species for the study area has been gathered from the following sources:

Table 8-4: Data sources utilised for protected sites and species

Source	Date Accessed
National Parks and Wildlife Service (NPWS) (2021), 'Protected Sites in Ireland', Available at: https://www.npws.ie/protected-sites.	20/12/2021
Irish Protected Sites Viewer, Available at: https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=8f7060450de3485fa1c1085536d477ba.	20/12/2021
SAC datasheets, Available at: https://www.npws.ie/sites/default/files/general/sac-datasheets-may-2020.xlsx.	20/12/2021
SPA datasheets, Available at: https://www.npws.ie/sites/default/files/general/spa-datasheets-june-2020.xlsx	20/12/2021

8.1.3 Relevant Guidance

The following guidance documents, which align with that which are available for the offshore renewables industry, will be used for the assessment of impacts on protected sites and species:

- Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (Environment Heritage and Local Government, 2010)
- Screening for Appropriate Assessment (AA) Determination under the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended) CONCERNING OUR RURAL FUTURE – RURAL DEVELOPMENT POLICY 2021 – 2025 (Department of Rural and Community Development, 2021)
- Protected Sites (NPWS, n.d.)
- Natural England and JNCC advice on key sensitivities of habitats and Marine Protected Areas in English Waters to offshore wind farm cabling within Proposed Round 4 leasing areas (Natural England and JNCC, 2019)
- Nature Conservation Guidance on Offshore Windfarm Development (DEFRA, 2005)
- UK Offshore Wind Expansion, Meeting the challenges of Article 6(4) of the Habitats Directive (ABPmer, 2020 a)

- Guidance document on wind energy developments and EU nature legislation (EC, 2020)
- The Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones (EC, 2011)
- Wind Energy Development and Natura 2000 (EC, 2011).

8.1.4 Design Parameters

The following table sets out the design parameters, and their relevance to protected sites and species. A worst-case scenario is considered.

Table 8-5: Design parameters and their Relevance to Protected Sites and Species

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Higher MW may lead to more turbines, and great electromagnetic field (EMF) effects on sensitive protected species, e.g., migratory fish.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B	More turbines lead to increased noise and disturbance, affecting protected species within protected sites, e.g., marine mammals.
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor	Type of anchoring system will affect benthic prey species for protected species, e.g., birds, and marine mammals The extent of disturbance is dependent on the mooring system utilised, the number and size of anchors.
Minimum deployment period FOW devices	12 months minimum Anchors may remain for the lifetime of the demonstration site (~35 years) for use by subsequent technology developers.	Length of deployment will determine duration of impacts to protected sites and species
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will result in physical disturbance of seabed, potentially resulting in disturbance to benthic prey species of protected species.

8.1.5 Embedded Mitigation

Mitigation measures relevant for protected benthic habitats are set out in section 8.2.5 below, for fish and shellfish (including salmon) in section 8.3.5 below, for marine

mammals (including grey seal, bottlenose dolphin and harbour seal) in section 8.4.5 and for offshore ornithology in section 8.5.5.

8.1.6 Scoping of EIA

According to the *Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 1* (DCCAE, 2018 a), accurate and reliable ecological data and information is a key element to ensure an accurate baseline of a proposed project site and identifies indicators necessary to predict potential impacts/pressures to assess potential changes in the receiving environment resulting from the proposed development. The type and range of the data will depend on multiple factors including the complexity of the receiving environment as well as the anthropogenic pressures; the scale and type of proposed project; and whether an EIAR or Natura Impact Statement (NIS) (or both) are required to support a consent application. It also states that the Scoping stage should identify the issues that are likely to be significant during the preparation of the Environmental Impact Assessment Report (EIAR) and/or NIS and acknowledge and eliminate those that are not.

Potential impacts to benthic species and habitats specifically are set out in section 8.2.6, to fish and shellfish in section 8.3.6, to marine mammals in section 8.4.6 and to offshore ornithology in section 8.5.6. Data from these sections will be used to scope and assess the project activities on protected sites, subject to the Appropriate Assessment (AA) process (set out in section 2.5).

8.1.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-1 and Figure 6-2 identifies those projects, which may have cumulative impacts with Protected Sites and Species impacts from the AFLOWT project and will be considered in the EIAR.

8.1.8 Scope of Appropriate Assessment

Under Article 6 (3) of the Habitats Directive (COUNCIL DIRECTIVE 92/43/EEC) Member States are required to consider the potential effects of any project or plan on the conservation objectives of an SAC or SPA before a decision can be made to allow that project or plan to proceed.

The Test Areas are not within any Natura 2000 sites, but the proposed cable route will pass through the West Connacht Coast SAC (002998) (with qualifying species bottlenose dolphin) and the landfall location is also within Mullet/Blacksod Bay Complex SAC (000470). At the landfall site, the EU Annex I habitat “Mudflats and sandflats not covered by sea water at low tide” (1140) is present and characterised by Mobile sand with *Bathyporeia guilliamsoniana* community. The EU Annex I habitat “Reef” (1170) is also present approximately 250 m to the north of the landfall site, where it is characterised by an intertidal reef community complex.

The zone of influence (ZoI) of a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This has the potential to extend far beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries. To establish the likely ZoI of the proposed project, the potential for impacts related to the proposed project

activities was assessed relative to the ecology of the receiving environment. Based on the known ecology of the receiving environment, taken in conjunction with the potential project related impacts and possibility for cumulative impacts, it is considered that the proposed project has the potential to impact the receiving environment within a maximum radius of 1 km of the proposed project site in the subtidal zone and 500 m in the case of the intertidal zone.

From these identified habitats, the screening process (as discussed in section 2.5) will then assess whether the project activities are likely to have an effect on any qualifying marine community types in the Natura 2000 sites, either singularly or in combination with other projects. If any effects are identified, then these will be assessed as being significant or not significant, and whether the effect is probable or not probable. The magnitude, reversibility, nature and duration of any effects will also be determined. If any effects are deemed significant and probable, a full AA assessment will be required, and necessary information will be provided to the competent authority for its' completion in the form of a Natura Impact Statement (NIS).

8.1.9 Approach to EIA

The approach to the EIAR for protected habitats and species will follow the general guidance set out in section 6.1 and more specific information set out in section 8.1.3:

- a desk-based literature review will be undertaken to determine if more information is available on those protected species and habitats present within and in the vicinity of the study area, identified in the Scoping Report. This will be developed in parallel with the NIS, utilising the same determination of impacts
- The desk-based study will include furthering the review of cumulative impacts, and also include a review of stakeholder consultations for other relevant offshore biodiversity chapters.

8.1.10 Scoping questions

The following questions have been identified for the competent authority, in regard to the scoping of this project's effects on protected sites and species:

- Have all relevant protected sites and species been identified, or are there any additional protected sites and species that you would like to see considered?
- Is the proposed approach to Appropriate Assessment satisfactory?

8.2 Benthic (Subtidal and Intertidal) Ecology

8.2.1 Receiving Environment

The study area for benthic habitats and associated species encompasses a Zone of Influence (ZoI) of 1 km radius around Test Areas A and B and the export cables. A 500 m ZoI has been defined at the landfall at Belderra Strand (detailed in Section 5.2.1). The overall extent of the ZoI has been designed to account for the potential influence the proposed project may have over the benthic habitats.

The benthic ecology in the vicinity of the AMETS ZoI is described from a combination of site-specific surveys as well as published and unpublished data. The data indicates an exposed benthic community in, and adjacent to, the AMETS site. In previous surveys (Scally *et al*., 2011; 2013), the subtidal habitats were largely classified as sand and

muddy sand under the European Nature Information System (EUNIS) Marine Habitat Classification scheme (European Environment Agency (2021). The ecological status of the area was classed as ‘high’ or ‘good’.

Subtidal reef habitat is present at several locations within the ZoI along the proposed cable route, and within or adjacent to the Test Areas ZoI, with kelp dominated infralittoral communities present in the shallower areas adjacent to Annagh Head. Intertidal reef habitat is present at the northern and southern ends of Belderra Strand and along the southern side of Annagh Head.

In previous surveys (Scally *et al*., 2011; 2013), intertidal habitats at Belderra Strand were generally comprised of fine and medium sands, with a shingle and gravel bank backing this area.

Recent monitoring of Mullet/Blacksod Bay SAC, in which the cable landfall is located, has demonstrated some damage to the benthic community. Bivalve dredging has caused the *Serpula vermicularis*-dominated community to be lost, whilst damage to maerl has also been observed (Scally *et al*., 2020). The following sediment community types were recorded within the SAC: Mobile sand with *Bathyporeia guilliamsoniana* community; Sand with *Angulus tenuis* (now *Macomangulus teneis*) and *Pygospio elegans* community complex; Sand with *Gastrosaccus spinifer* community complex; and Fine sand with *Angulus fabula* community complex (Scally *et al*., 2020). The following reef community types were recorded: Intertidal reef community complex; Sheltered subtidal reef community complex; and *Laminaria*-dominated community complex.

Figure 8-3 below illustrates the seabed biotope types of the wider study area, as recorded in 2010, and the location of subtidal and intertidal reef habitat.

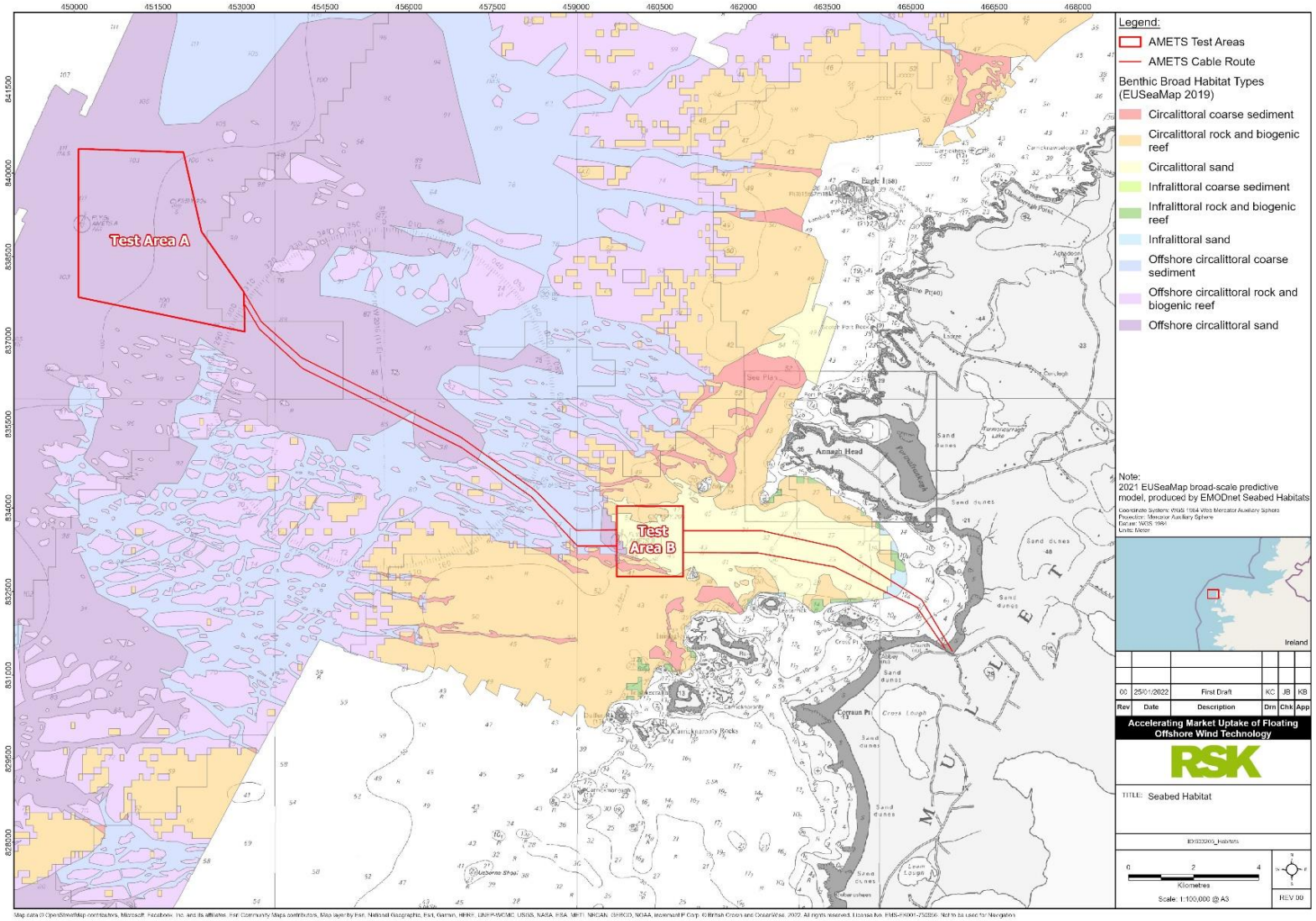

Figure 8-3: Seabed Benthic Broad Habitat Types within the AMETS Test Area and surrounding area

Source: EMODnet, 2021

8.2.2 Data sources and Baseline

Information on the benthic ecology of the study area has been gathered from the sources shown in Table 8-6.

Table 8-6: Data sources for benthic ecology

Source	Date Accessed	Relevant Data Overview
Atlantic Marine Energy Test Site Environmental Impact Statement – Chapter 6 Flora and Fauna (MERC and IWDG, 2011)	18/11/2021	Desktop and survey data overview detailing the ecological characteristics of the site, including benthic ecology.
Ecological Assessment for the Proposed Atlantic Marine Energy Test Site. Report prepared by MERC Consultants Ltd. (Scally *et al*., 2011)	18/11/2021	Baseline data on the AMETS site, including the benthic ecology component.
Nature Impact Statement, Appropriate Assessment, Site Investigations at the Atlantic Marine Energy Test Site (AMETS) (MERC, 2020).	18/11/2021	Desktop and survey data overview detailing the protected sites (Natura 2000) and potential impacts on qualifying features including benthic ecology.
Benthic site surveys (subtidal and intertidal reef) (MERC, 2020)	19/11/2021	Dropdown video, diver ground truthing, kelp height and density measurements and intertidal reef surveys of AFLOWT Test Areas, cable corridor and environs.
Ecological assessment of a proposed inshore Berth at the Atlantic Marine Energy Test Site (AMETS) (Scally *et al*., 2013)	19/11/2021	Dropdown video and diver ground truthing of Test Area B of the AMETS site to the south of Annagh Head.
INFOMAR (2020), 'INFOMAR Bathymetry and Lidar Shaded Relief - INSS/INFOMAR (INFOMAR, 2020)	19/11/2021	Bathymetry and sediment profiling of the AMETS site and its environment.
Irelands Marine Atlas Broad benthic habitat types (Marine Institute, 2016)	16/11/2021	Broad benthic habitat types translated as EUNIS classification.
The Marine Habitat Classification for Britain and Ireland Version 04.05 (Connor *et al*., 2004)	2021	Marine habitat classification guide.
Marine Data Centre (Marine Institute, 2020)	2021	Baseline data on seabed habitats.
Seabed Habitat (EMODnet Seabed Habitats, 2021)	2021	Baseline data on seabed habitats.

8.2.2.1 *Existing baseline*

The AMETS and its environs are characterised by a highly exposed area of open aspect marine waters to the northwest of the Mullet Peninsula, Co Mayo. Limited shelter is provided in the area to the south of Annagh Head where the proposed cable route leading from the Test Areas landfalls at Belderra Strand. Depths at the site range from Mean Low

Source	Date Accessed	Relevant Data Overview
Atlantic Marine Energy Test Site Environmental Impact Statement – Chapter 6 Flora and Fauna (MERC and IWDG, 2011)	18/11/2021	Desktop and survey data overview detailing the ecological characteristics of the site, including benthic ecology.
Ecological Assessment for the Proposed Atlantic Marine Energy Test Site. Report prepared by MERC Consultants Ltd. (Scally *et al*., 2011)	18/11/2021	Baseline data on the AMETS site, including the benthic ecology component.
Nature Impact Statement, Appropriate Assessment, Site Investigations at the Atlantic Marine Energy Test Site (AMETS) (MERC, 2020).	18/11/2021	Desktop and survey data overview detailing the protected sites (Natura 2000) and potential impacts on qualifying features including benthic ecology.
Benthic site surveys (subtidal and intertidal reef) (MERC, 2020)	19/11/2021	Dropdown video, diver ground truthing, kelp height and density measurements and intertidal reef surveys of AFLOWT Test Areas, cable corridor and environs.
Ecological assessment of a proposed inshore Berth at the Atlantic Marine Energy Test Site (AMETS) (Scally *et al*., 2013)	19/11/2021	Dropdown video and diver ground truthing of Test Area B of the AMETS site to the south of Annagh Head.
INFOMAR (2020), 'INFOMAR Bathymetry and Lidar Shaded Relief - INSS/INFOMAR (INFOMAR, 2020)	19/11/2021	Bathymetry and sediment profiling of the AMETS site and its environment.
Irelands Marine Atlas Broad benthic habitat types (Marine Institute, 2016)	16/11/2021	Broad benthic habitat types translated as EUNIS classification.
The Marine Habitat Classification for Britain and Ireland Version 04.05 (Connor *et al*., 2004)	2021	Marine habitat classification guide.
Marine Data Centre (Marine Institute, 2020)	2021	Baseline data on seabed habitats.
Seabed Habitat (EMODnet Seabed Habitats, 2021)	2021	Baseline data on seabed habitats.

Water Springs (MLWS) at the landfall at Belderra Strand to approximately 100 m Below Chart Datum (BCD) at Test Area A, approximately 16 km offshore from the proposed landfall location.

The general characteristics of the benthic environment are known from surveys carried out between 2010 and 2021 in support of previous and current baseline assessments and monitoring of the AMETS site and its environs. These surveys have indicated that

the benthic habitats are dominated by an exposed sand dominated seabed habitat with occasional outcrops of subtidal reef.

The subtidal sediments are dominated by fine sand but in some areas medium and coarse sand are also present. Organic carbon is recorded as low from sediment samples taken throughout the site. Surveys carried out in 2010 recorded benthic infauna comprising 5,268 individuals distributed amongst 172 species from 72 grab samples. The distribution of species and individuals recorded in the major taxonomic groups from the 2010 survey was considered typical of infralittoral and circalittoral sand communities for the area. The ecological status of macrofaunal stations *sensu* the Water Framework Directive (WFD) were assessed using the Infaunal Quality Index (IQI). The IQI was developed by the UK's Environment Agency to illustrate the ecological health of macrobenthic community assemblage, using normative definitions of the WFD, presenting an Ecological Quality Ratio (EQR) (Environment Agency, 2014). Classification boundaries for IQI values are presented in Table 8-7.

Table 8-7: Classification boundaries and corresponding Infaunal Quality Index (IQI)

Classification boundary (Ecological Quality Status)	IQI	Classification boundary (Ecological Quality Status)	IQI
Good-High	0.75	Poor-Moderate	0.44
Moderate-Good	0.64	Bad-Poor	0.24

Ecological Quality Status and subtidal reef communities identified, for the stations surveyed in 2010, are presented in Table 8-8and illustrated in Figure 8-4.

Table 8-8: Classification of ecological status of macrofaunal stations sensu the Water Framework Directive, using the Infaunal Quality Index (IQI)

Station	Ecological Quality Status	Biotope
NP08-1	GOOD	*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (NCirBat)
NP08-2	GOOD	NCirBat
NP08-3	MODERATE	NCirBat
NP08-4	MODERATE	NCirBat
NP08-5	GOOD	NCirBat
NP08-6	HIGH	Circalittoral fine sand (CFiSa)
NP08-7	HIGH	CFiSa
NP08-8	HIGH	CFiSa
NP08-9	HIGH	CFiSa
NP08-10	HIGH	CFiSa
NP08-11	HIGH	CFiSa
NP08-12	HIGH	CFiSa
NP08-13	HIGH	CFiSa

Station	Ecological Quality Status	Biotope
NP08-14	HIGH	*Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* (EpusOborApri)
NP08-15	n/a	Circalittoral coarse sediment (CCS)
NP08-16	HIGH	EpusOborApri
NP08-17	HIGH	EpusOborApri
NP08-18	HIGH	EpusOborApri
NP08-19	HIGH	EpusOborApri
NP08-20	HIGH	EpusOborApri
NP08-21	HIGH	EpusOborApri
NP08-22	HIGH	EpusOborApri
NP08-23	HIGH	EpusOborApri
NP08-24	HIGH	EpusOborApri
NP08-25	HIGH	EpusOborApri

Source: MERC Consultants Original EIAR (SEAI, 2011)

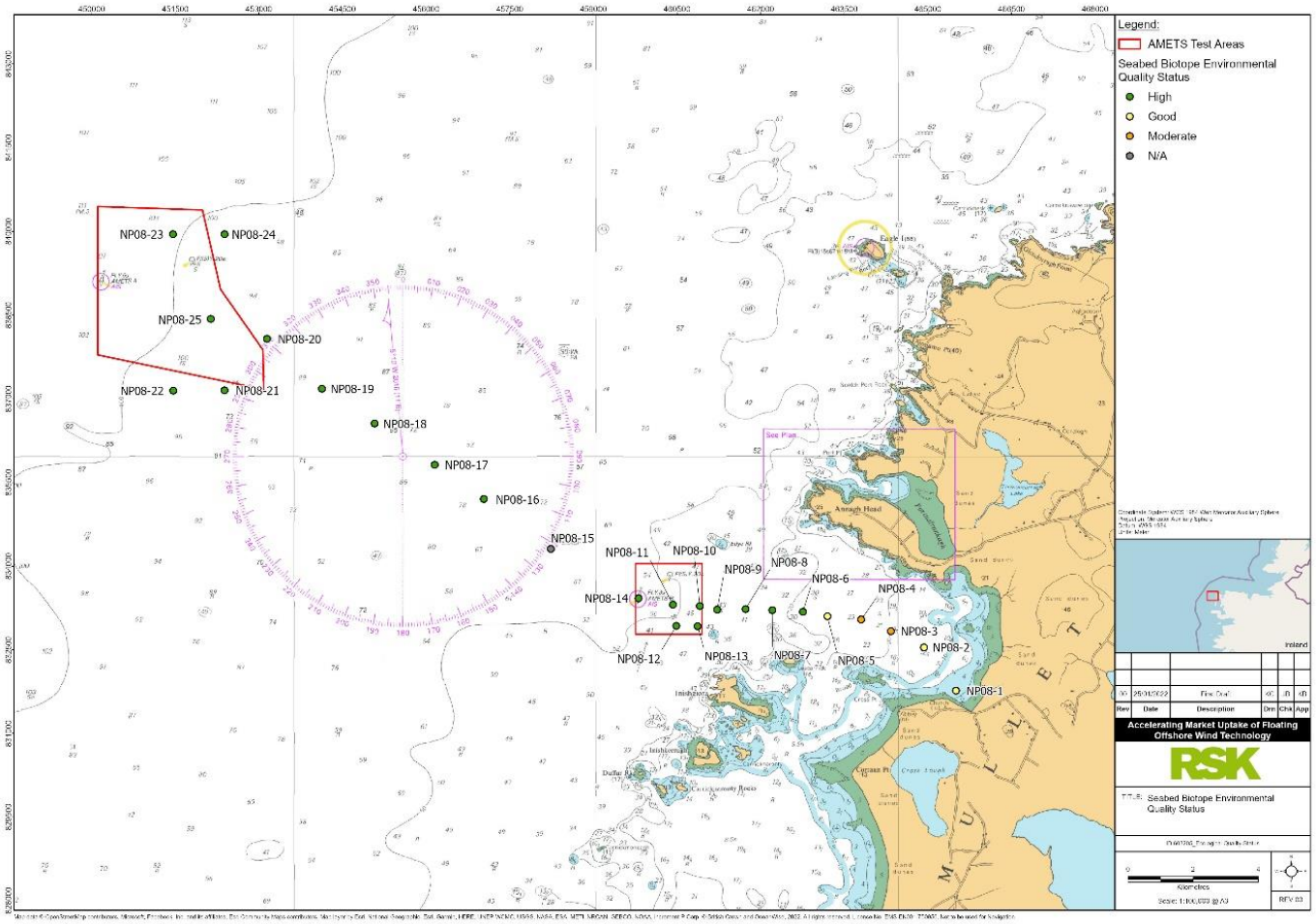

Figure 8-4: Ecological Quality Status and subtidal reef communities identified, for the stations surveyed in 2010

Subtidal reef habitat is present at a number of discrete locations along the proposed cable route, the northern and southern perimeter of Test Area B and the southern perimeter of Test Area A (Table 8-9). In these areas the reef habitat is dominated by either cobble or bedrock substrate. Depending on the depth and reef morphotype at these locations, the reef is characterised by either circalittoral sponge and echinoderm dominated biological communities or erect bryozoan communities. In some areas, brittlestar beds, associated with the reef margins, are present.

Table 8-9: Characterising reef biotopes of subtidal reef habitats

Area	Characterising reef biotope	Biotope code
South side of Annagh Head and southwest of proposed cable route	*Laminaria hyperborea* and red seaweeds on exposed vertical rock	IR.HIR.KFaR.LhypRVt

Area	Characterising reef biotope	Biotope code
Cable route. South of Annagh Head	*Caryophyllia smithii*, sponges and crustose communities on wave-exposed circalittoral rock	CR.MCR.EcCr.CarSp
Southern perimeter of Test Area B	*Caryophyllia smithii*, sponges and crustose communities on wave-exposed circalittoral rock and *Caryophyllia smithii* and sponges with *Pentapora foliacea*, *Porella compressa* and crustose communities on wave-exposed circalittoral rock	CR.MCR.EcCr.CarSp and CR.MCR.EcCr.CarSp.PenPcom
Northern perimeter of Test Area B	*Caryophyllia smithii* and sponges with *Pentapora foliacea*, *Porella compressa* and crustose communities on wave-exposed circalittoral rock and Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed circalittoral rock	CR.MCR.EcCr.CarSp.PenPcom and CR.MCR.EcCr.FaAlCr.Bri
Northeast of Test Area A	*Caryophyllia smithii* and sponges with *Pentapora foliacea*, *Porella compressa* and crustose communities on wave-exposed circalittoral rock	CR.MCR.EcCr.CarSp.PenPcom

Source: MERC Consultants Original EIAR (SEAI, 2011) and MERC Consultants unpublished data from surveys (Scally *et al*. 2011; 2013).

On the southern side of Annagh Head and at a small unnamed island between Inishglora and the proposed cable route, extensive kelp dominated infralittoral communities are present.

Intertidal reef is present at the northern and southern ends of Belderra Strand and along the southern edge of Annagh Head. Here the reef is characterised by an exposed intertidal reef community characteristic of either mussel and/or barnacle communities (Biotope complex: LR.HLR.MusB) or robust fucoids and/or red seaweed communities (Biotope complex: LR.HLR.FR).

The area is fairly stable in terms of degradation as it is offshore and exposed, thus is unlikely to have been subject to high impact from anthropogenic sources since surveys began in 2010 (Scally *et al*., 2020).

8.2.3 Relevant Guidance

The following guidance documents, which align with that which is available for the offshore renewables industry, will be used for the assessment of impacts on benthic ecology:

- Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects (DCCAE, 2018)
- Guidance on wind energy development in accordance with the European Union nature legislation (EU, 2010)
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2019)
- Guidelines for data acquisition to support marine environmental assessment of offshore renewable energy projects (CEFAS, 2011)
- Handbook for marine Intertidal Phase 1 biotope mapping survey (Wyn *et al*., 2006)
- The Marine Habitat Classification for Britain and Ireland Version 04.05 (Connor *et al*., 2004)
- Guidance on Survey and Monitoring in Relation to Marine Renewables Deployments in Scotland Volume 5: Benthic Habitats (SNH, 2011).

8.2.4 Design Parameters

Relevant project design parameters are set out in Table 8-10 together with their potential effects on benthic ecology. As the design is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 8-10: Design parameters and relevance to benthic ecology

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B	Potential impacts related to shading will be dependent on the number of floaters and their size. If multiple floaters are installed within either Test Area at one time, impacts on benthic ecology will be greater in terms of shading.
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicate 50-300 m chain on seabed for each anchor	Type of anchoring system will affect benthic environment. The extent of disturbance is dependent on the mooring system utilised and the number and size of anchors. Potential impacts related to sediment disturbance, damage to benthic species and fouling of anchors.
Minimum deployment period FOW devices	12 months minimum Anchors may remain for the lifetime of the demonstration site (35 years) for use by subsequent technology developers.	Length of deployment will determine duration of impacts to benthic species and habitats.

Design parameter	Technical details – worst case scenario	Relevance
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will result in physical disturbance to benthos.
Inter-array cables	Potential use of dynamic cables	Over the life of the project there is potential for ongoing benthic impacts as they would routinely disturb the benthic environment as they rise and fall, however if as a consequence they then have to close off the area to trawling then that would be beneficial to the benthic environment.
Vessel access for deployment and operation	Vessel access will be required during the construction approximately once per month during operation of the project.	Potential impacts on benthic ecology related to the spread of Invasive Alien Species (IAS) and accidental spillage of hydrocarbons.

8.2.5 Embedded Mitigation

Mitigation measures will be incorporated into the project design and may include the following:

Spatial considerations for anchoring and route selection for cable laying to avoid sensitive benthic habitat areas, e.g., subtidal reefs.

Pre-construction surveys will be undertaken to ensure cable routes avoid sensitive benthic habitats.

If ploughing is undertaken for cable laying, surface sediments will be reinstated to protect the cable – this will limit changes to morphology of the seabed and allow benthic communities to re-establish.

The use of vessels in compliance with MARPOL regulations, to mitigate the risk of pollution from vessels.

Ballast water management plans followed onboard vessels, to mitigate the risk of Invasive Alien Species (IAS).

Inclusion of a Construction Environmental Management Plan (CEMP) that will cover aspects such as any accidental spills of environmentally harmful substances.

8.2.6 Scoping of EIA

Table 8-11 lists potential impacts from project activities on benthic ecology, together with proposals on whether they should be scoped in or out of the EIA phase dependent on their likelihood of having a significant effect.

Table 8-11: Activities and potential impacts scoped in or out

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Direct habitat loss of benthic habitats from installation of cables and other infrastructure.	In	Potential for loss of reef habitat.
Habitat change from installation of cables and other infrastructure.	In	Potential for change to sediment and reef habitat as a result of shading, fouling, scour to the seabed, resuspension of sediments, cable protection, pollution and the introduction of IAS.
Temporary damage to benthic habitats and associated species through increased vessel activity at the site.	In	Potential for damage to benthic habitats and associated species due to scour of the seabed, and / or the introduction of IAS.
Accidental events, e.g., oil or fuel spill (also applicable to operation and decommissioning)	Out	Potential impacts of non-planned events (where sufficient good practice measures are in place to render the chance of such events occurring minimal) are proposed to be scoped out, including possible spills and pollution incidents. Each site developer will prepare their own impact assessment and Environmental Management Plan which will include a Pollution Management Plan.
Operation		
Colonisation of hard artificial substrates	In	Introduction of artificial substrates to the seabed, e.g., mooring, may lead to colonisation by macrobenthic communities, and possible enhancement of biodiversity. However, there is also the risk of introduction of IAS.
Decommissioning		
Decommissioning impacts – as above for installation works.	In	As during installation works, similar impacts are expected.

8.2.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-1 and Figure 6-2 identifies those projects which may have cumulative impacts with Protected Sites and Species impacts from the AFLOWT project and will be considered in the EIAR.

8.2.8 Scope of Appropriate Assessment

Benthic ecology aspects will be addressed in Appropriate Assessment - see section 2.5 and 8.1.8 – as the cable landfall is within Mullet/Blacksod Bay Complex SAC, which is designated for benthic habitats: “Reefs” and “Mudflats and sandflats not covered by sea water at low tide”.

8.2.9 Approach to EIA

The approach to the EIAR chapter for benthic ecology will follow the general guidance set out in section 6.1 and more specific information set out in section 8.2.3:

- A desk-based literature review will be undertaken to confirm and expand on the benthic species and confirm habitat types identified within the project area in the Scoping Report. Seabed imagery and other relevant data collected during other environmental surveys for the project will be reviewed for any information applicable to benthic ecology. The desk-based study will include furthering the review of cumulative impacts, and include a review of stakeholder consultations for other relevant offshore biodiversity chapters.
- Surveys will be completed for benthic ecology, (subject to award of foreshore licence) to confirm descriptions of the seabed biotopes identified in previous surveys. Drop-down video will be used to characterise sites, followed by grab sampling of the macrobenthos, sediment particle size and organic content analysis. It is noted that the commencement of grab sampling has been delayed whilst a Site Investigation licence (application submitted on 27/01/2020) is awaited from the Foreshore Unit. The extent of the *Laminaria*-dominated communities will also be characterised, and the epifaunal reef communities surveyed.
- Potential habitat loss and disturbance footprints from project activities will be calculated as the starting basis of the impact assessment. The key receptor groups will be assessed for the impact of the project activities on each group, based on sensitivity of receptor, magnitude, duration, frequency of impact etc. The significance of impacts will be determined, and appropriate mitigation and monitoring measures set out if any significant impacts are identified.

8.2.10 Scoping questions

The following questions have been identified for the competent authority, with regards to the scoping of this project's effects on benthic ecology: A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below and in the corresponding sections of each subject section. A list of stakeholders is included at Appendix A1.

- Are there any further habitats or species that should be considered?
- Under the heading "Biodiversity" at the EIAR Screening stage: The proposed project has the potential to impact the biodiversity of subtidal reef habitat which is present along the cable corridor and within Test Areas A and B. The reef habitat is of high quality and contains features (circalittoral stable cobble reef) and notable marine communities (Celtic feather star: Leptometra celtica communities). This needs to be addressed at the EIA stage. Do you agree with this?
- Under the heading "soils and geology" at the EIA screening stage: Temporary disturbance of sediment in the subtidal area will occur. In the subtidal area, reef habitat (rock/cobble) may be impacted. Do you agree with this?

- The delay to the gathering of the benthic samples from the Site investigation surveys will delay the finalisation of the EIAR. Are you happy that an addendum to the EIAR is submitted following application for a MAC?

8.3 Fish and Shellfish Ecology

8.3.1 Receiving Environment

The study area for fish and shellfish encompasses a 100 km Zone of Influence (ZoI) radius around Test Areas A and B. This ZoI has been designed to encompass the maximum predicted range at which an impact from the FOW is likely to occur to fish or shellfish.

There are no freshwater inputs directly into the area, however there are likely freshwater inputs from Glenamoy Bog Complex SAC, encompassing the Sruwaddacon estuary, to the northeast (RSK Environment, 2021), which may act as a migratory corridor for anadromous fish.

The study area is located within The International Council for Exploration of the Sea (ICES) rectangle 37D9, division 27.7b.

8.3.2 Data sources and Baseline

Information on the fish and shellfish ecology of the study area has been gathered from the following sources:

Table 8-12: Data sources on fish and shellfish ecology for AFLOWT scoping

Name of Source	Date accessed	Data overview
Agri-Food and Biosciences Institute (2021)	22/09/2021	Factsheets on various species present in the study area.
Updating Fisheries Sensitivity Maps in British Waters (Aires *et al*., 2014)	22/09/2021	Update on spawning and nursery grounds, and adult fish presence taken for the study area.
Fisheries Sensitivity Maps in British Waters (Coull *et al*., 1998)	22/09/2021	Distribution maps for certain species in the study area.
Ecological assessment of a proposed inshore Berth at Test AreaAMETS (Scally *et al*., 2013)	22/09/2021	Previous survey data for the study area.
Spawning and nursery grounds of selected fish species in UK waters (Ellis *et al*., 2012)	22/09/2021	Spawning and nursery grounds, and adult fish presence taken for the study area.

Name of Source	Date accessed	Data overview
Environmental Aspects of Developing Ireland's Test AreaAMETS (Fielding *et al*., 2011)	30/09/2021	Environmental impacts of similar offshore wind projects on fish and shellfish.
International Council for the Exploration of the Sea (ICES) (2021)	30/09/2021	Various data and catch statistics on fisheries, and specific fish and shellfish, across many member organisations, including Ireland.
Ireland's Marine Atlas (Marine Institute, 2016)	22/09/2021	Distribution maps for species present in the study area.
The Marine Life Information Network (MarLIN) (MBA, 2021)	22/09/2021	Detailed species information for sand eel and herring.
NBN Atlas (NBN, 2021)	23/09/2021	Literature and distribution maps for species present in the study area.
National Parks and Wildlife Service (2021)	23/09/2021	Literature on species present in the study area.
Recent drop-down video footage and diver stills from the AMETS site, gathered by Merc consultants August 2021 (MERC, 2021).	22/09/2021	Drop-down video footage and diver stills of the study area.

8.3.2.1 Existing baseline

Table 8-13 identifies species known to have spawning and/or nursery grounds in the study area, according to the literature sources above. However, as most data is not current and focuses on spawning and nursery grounds only rather than adult presence, additional species are likely to be present, and some species may have changed their distribution. In addition, locations of spawning and nursery grounds, and time periods, may vary over time (RSK Environment, 2021).

Table 8-13: Data on fish and shellfish species present in the AFLOWT study area and ZoI

Species	Description	Spawning grounds	Nursery grounds	Conservation importance (Designations: IUCN, 2021; OSPAR, 2021 and EU Habitats Directive, EU, 1992)
Spurdog (*Squalus acanthias*)	A marine species sometimes present in estuaries. Not normally present in waters of less than 10 m depth.	No known spawning grounds present (Ellis *et al*., 2012).	Low intensity nursery grounds recorded in/near to the study area in 2010 (Ellis *et al*., 2012).	IUCN Red List Vulnerable, OSPAR species Vulnerable to EMF impacts, as they use ampullae of Lorenzini (sensory organs) to detect electric fields. They are also slow-growing and have low numbers of offspring, thus would have slow recovery rates to impacts.
Common skate (*Dipturus batis*-complex)	A marine species. Doesn't occur in waters of less than 30 m depth. Irish Red List of endangered cartilaginous fish.	No known spawning grounds present, but likely to overlap with nursery grounds (Ellis *et al*. 2012). Unknown spawning times.	Low intensity nursery grounds recorded in/near to the study area in 2010 (Ellis *et al*., 2012). Eggs laid in spring and summer.	IUCN Red List Critically Endangered, OSPAR species Vulnerable to EMF impacts, as they use ampullae of Lorenzini (sensory organs) to detect electric fields. They are also slow-growing and have low numbers of offspring, thus would have slow recovery rates to impacts.
Atlantic herring *(Clupea harengus)*	Marine species but nursery grounds in estuarine habitats. Pelagic species and occurs from surface waters down to 200 m deep.	Spawning grounds in study area recorded in 1998, with more dense areas to the west and north. Spawning season in Autumn in County Mayo (Enterprise Energy Ireland Ltd., n.d.). Spawning takes place at depths of 15 to 40 m, over sand/gravel substrates (UK, Government, 2009).	Nursery grounds to the east of the study area, with a low intensity (recorded 2010) (Ellis *et al*., 2012). Ireland's Marine Atlas records show herring nursery grounds probability of more than 0.69 of occurring in study area (Marine Institute, 2022).	IUCN Least Concern.

Species	Description	Spawning grounds	Nursery grounds	Conservation importance (Designations: IUCN, 2021; OSPAR, 2021 and EU Habitats Directive, EU, 1992)
Atlantic cod (*Gadus morhua*)	Marine species using estuarine habitats as nursery grounds. Generally, a demersal species, but occasionally pelagic when feeding or spawning. Occurs from shoreline coastal habitats to continental shelf, up to 600 m deep.	No known spawning grounds present (Ellis *et al*., 2012; Marine Institute, 2022).	Low intensity nursery grounds present (Ellis *et al*., 2012; Marine Institute, 2022).	IUCN Red List Vulnerable, OSPAR species
Whiting (*Merlangius merlangus*)	Marine species that uses estuarine habitats for nursery grounds. Occurs mostly between 30 and 100 m deep across gravel, mud, sand and rock.	No known spawning grounds present (Ellis *et al*., 2012).	Low intensity nursery grounds recorded in 2010 (Ellis *et al*., 2012).	IUCN Least Concern.
Blue whiting (*Micro-mesistius poutassou*)	Marine species that uses estuarine habitats. Offshore species, normally occurring waters more than 50 m deep.	Spawning season April to July, with peak April to May. Spawning grounds are not present in study area (Ellis *et al*., 2012; Marine Institute, 2022).	Low intensity nursery grounds recorded (Ellis *et al*., 2012).	N/A
Ling (*Molva molva*)	Marine species that uses estuarine habitats. Offshore species, normally occurring waters more than 50 m deep.	No known spawning grounds present (Ellis *et al*., 2012).	Low intensity nursery grounds recorded in study area 2010 (Ellis *et al*., 2012).	N/A
European hake (*Merluccius merluccius*)	Marine species that uses estuarine habitats. Offshore species, normally occurring waters more than 50 m deep.	Spawning grounds present further offshore (Ellis *et al*., 2012). Spawning season February to July, with peak February to March.	Low intensity nursery grounds recorded in study area (2010 records) (Ellis *et al*., 2012).	IUCN Least Concern

Species	Description	Spawning grounds	Nursery grounds	Conservation importance (Designations: IUCN, 2021; OSPAR, 2021 and EU Habitats Directive, EU, 1992)
Anglerfish (also monkfish) *(Lophius piscatorius)*	Anglerfish is a fully marine species that is recorded only very occasionally in estuaries. Juveniles may occur in coastal waters, although adults tend to occur further offshore.	No known spawning grounds present (Ellis *et al*., 2012).	High intensity nursery grounds (2010 records) (Ellis *et al*., 2012).	IUCN Least Concern
Horse mackerel (*Trachurus trachurus*)	Marine species occasionally recorded in estuaries.	Spawning grounds present slightly more offshore (Marine institute, 2022).	Nursery grounds present (Marine institute, 2022).	IUCN Red List Decreasing
Sandeels (*Ammodytidae*): Greater sand eel (*Hyperoplus lanceolatus*), lesser sand eel (*Ammodytes tobianus*)	Lesser sand eel common in estuaries. Both species found in coastal waters. Habitats consist of sandbanks and sandy sediment areas, up to 30 m deep. Bury themselves in the sand during winter.	No known spawning grounds present, however, habitat is suitable. Spawning January to February and November to December. Spawning takes place in spring and summer over sandy grounds (MBA, 2021).	No known nursery grounds present. However, habitat is suitable (MBA, 2021).	IUCN Data Deficient. Though no sand eels and/or their nesting/spawning grounds have been confidently recorded within the study area (according to MarLIN, the NBN Atlas and Ellis *et al*. 2012 – see section 8.3.2), the sandy seabed sediments observed represent a suitable habitat for the species. Thus, efforts should be made to minimise disturbance to potential sand eel habitats. Sand eels are a vital component of the marine ecosystem, supporting various other species such as larger fish and seabirds, thus avoiding disturbance of their habitats is essential (The Wildlife Trusts, n.d.).

Species	Description	Spawning grounds	Nursery grounds	Conservation importance (Designations: IUCN, 2021; OSPAR, 2021 and EU Habitats Directive, EU, 1992)
Mackerel (*Scomber scombrus*)	Marine species very occasionally recorded in estuaries. There is a "Biologically Sensitive Area" for mackerel recorded slightly offshore from the study area (RSK Environment, 2021).	High intensity spawning grounds recorded 2010. Spawning pelagic with season March to August, with peak spawning May to June (Ellis *et al*., 2012).	High intensity nursery grounds 2010 record (Ellis *et al*., 2012; Marine institute, 2022).	IUCN Least Concern
Lemon sole (*Microstomus kitt*)	Demersal found on sandy bottoms 20 to 200 m deep.	Spawning area present, spawning season April to September (Coull *et al*., 1998).	No known nursery area present (Coull *et al*., 1998).	IUCN Least Concern
Sprat (*Sprattus sprattus*)	Herring family, marine pelagic species.	Spawning area present (depths 10 to 20 m) spawning season May to August (EcoServe, 2011; UK Government, 2009).	Nursery areas not present (Coull *et al*., 1998).	IUCN Least Concern
Shellfish species				
Pacific oysters *(Crassostrea gigas)*, native oysters *(Ostrea edulis)*, brown crab *(Cancer pagarus)*, European lobster *(Homarus gammarus)*,	There are inshore oyster farms in the area, with inshore fishing for crab and lobster also taking place in the area, and surveys identifying species (Scally *et al*., 2013). Native oysters are also present in Clew Bay to the south of the study area (ZSL, n.d.). Whelk, mussel and razor clam are also known to be present (Christiansen, 2020).	N/A	N/A	The native oyster is protected under OSPAR Annex V). Native oyster populations have drastically declined in recent years, and various conservation efforts are being made to restore them. The native oyster is particularly sensitive to habitat changes, disturbance and sedimentation (Perry *et al*., 2017). European lobster – IUCN Least Concern.

Species	Description	Spawning grounds	Nursery grounds	Conservation importance (Designations: IUCN, 2021; OSPAR, 2021 and EU Habitats Directive, EU, 1992)
whelk, mussel, razor clam.				
Migratory anadromous species				
Atlantic salmon *(Salmo salar)*	Adults are marine, whilst spawn in freshwater. Juveniles molt in freshwater and migrate to marine waters (MBA, 2021). Migrating salmon may be present in the study area, due to the several known designated freshwater sites for salmon close by. These include the Glenamoy Bog Complex SAC (including the Glenamoy River salmonid fishery within Sruwaddacon Bay and Rossport Bay); Owenduff / Nephin Complex SAC (the Owenduff River System); the River Moy SAC; Newport River, the Erriff River system, the Lough Gill system and the Lough Corrib system. The downstream migration of salmon smolts generally takes place between April and early May, with adults migrating upstream from late July (RSK Environment, 2021).	N/A – freshwater spawning sites nearby.	N/A – freshwater nursery sites nearby.	IUCN Red List Vulnerable, OSPAR species, Annex II species of the Habitats Directive.
Sea trout (*Salmo trutta*)	Sea trout is also an anadromous species, present in sites such as the Lough Corrib SAC, Lough Gill	N/A – freshwater spawning sites nearby.	N/A – freshwater nursery sites nearby.	IUCN Red List Least Concern

Species	Description	Spawning grounds	Nursery grounds	Conservation importance (Designations: IUCN, 2021; OSPAR, 2021 and EU Habitats Directive, EU, 1992)
	system and the Connemara Bog Complex. As sea trout may migrate up to 300 km from their natal river, there is a possibility of presence in the study area (RSK Environment, 2021).			
Sea lamprey (*Petromyzon marinus*)	Sea lamprey is also an anadromous species, present in the lower stretches of the river Moy near to Ballina, and also present in sites such as the Lough Corrib SAC, Lough Gill system and the Connemara Bog Complex. Adult sea lamprey may be present in the study area (Inland Fisheries Ireland, 2016; RSK Environment, 2021).	N/A – freshwater spawning sites nearby.	N/A – freshwater nursery sites nearby.	IUCN Red List Least Concern, OSPAR species, Annex II Habitats Directive species
European eel (*Anguilla anguilla*)	The European eel has been shown to be present close to the study area (MarLIN and NBN Atlas) and may move through the area during their migration, from European freshwater habitats to the Sargasso Sea for spawning (Avant, 2007).	N/A - freshwater spawning sites nearby.	N/A - freshwater nursery sites nearby.	IUCN Red List Critically Endangered, OSPAR species, Annex II Habitats Directive species

Additional species may be caught in the wider area (ICES rectangle 37D9), such as megrim (*Lepidorhombus whiffiagonis*) and haddock (*Melanogrammus aeglefinus*).

The following species were also identified during the analysis of drop-down video footage and diver stills from a recent survey undertaken at the AMETS site in 2010 (see Appendix B for images of fish and shellfish identified):

- Pollachius. Species, possible (*Pollachius pollachius*)
- Gurnard (*Triglidae*), possible Grey gurnard (*Eutrigla gurnardus*)
- Hooknose (*Agonus cataphractus*)
- Flatfish *(possibly Pleuronectiforme)*
- Dragonet (*Callionymidae*)
- Blenny (*Blennidae*)
- Gadoids, possible Pollack *(Pollachius pollachius)*
- Wrasse *(Labridae)*, possible Ballan wrasse *(Labrus bergylta)*.

The species were difficult to fully determine due to low images and video quality.

8.3.3 Relevant Guidance

Scoping has been undertaken according to the Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Barnes, 2017). In addition to this guidance, the following guidance will be taken into consideration in the full EIA for the assessment of impacts on fish and shellfish ecology:

- Marine Biological Association (MBA) (2014), 'Fish behaviour in the vicinity of renewable energy devices - Completed Project', Department of Energy and Climate Change.
- Byrne Ó Cléirigh Ltd. Ecological Consultancy Services Ltd (EcoServe) (2000), 'Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment', Prepared for The Marine Institute.
- OSPAR Commission (2008), 'Assessment of the environmental impact of offshore wind-farms', Biodiversity Series.
- Government of Ireland (2018 b), 'Offshore Renewable Energy Development Plan (OREDP) Interim Review May 2018', Prepared by RPS and REMTec Consulting on behalf of The Department of Communications, Climate Action and Environment.
- Chartered Institute of Ecology and Environmental Management (CIEEM) (2019), 'Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater, Coastal and Marine', Version 1.1.
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (CEFAS, 2012).
- Guidelines for EIA in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018).
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).

- Guidance Note for EIA in respect of FEPA and CPA requirements (CEFAS *et al*., 2004).
- Floating Offshore Wind and Fishing Interaction Map, Floating Offshore Wind Centre of Excellence, Delivered by Catapult Offshore Renewable Energy (Eatough, 2021)
- Collision Risks Between Marine Renewable Energy Devices and Mammals, Fish and Diving birds (SAMS, 2007)
- Fish Behaviour in the Vicinity of Renewable Energy Devices - Completed Project (DECC, 2014).
- Renewable energy and migratory species (CMS, 2014).

8.3.4 Design Parameters

The project design parameters relevant to fish and shellfish ecology are listed in Table 8-14. As development of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 8-14: Project design parameters and their relevance to fish and shellfish ecology

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Higher MW would have a greater impact on electromagnetic sensitive fish species, e.g., elasmobranchs. Thus, cable protection and burial are important if the voltage is increased, to dampen the associated field. Increase in power output may also result in increased operational noise.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B	The impact will be greater where more FOW devices are located at a greater density.
Separation distance between FOW devices	Minimum anchoring area is about 2.5 km radius for the turbines	The distance between FOW devices will affect the extent of the disturbance to fisheries. If a navigational safety zone is introduced (if authorised by the competent authorities), then this will be beneficial for fish and shellfish species directly within the area.
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device.	Type of anchoring system will affect bottom dwelling fish species and shellfish. The extent of disturbance is dependent on the mooring system utilised, likely movement of anchor chains and the number and size of anchors. Sediment disturbance and resuspension is likely to affect bottom

Design parameter	Technical details – worst case scenario	Relevance
	Indicative 50-300 m chain on seabed for each anchor	dwelling fish species and shellfish by smothering and interference with gills. Spawning and feeding habitats may be affected, as well as important habitats for vulnerable species, e.g., sandeel. Depth of anchoring system will affect fish and shellfish ecology, with different habitats affected based on depth.
Minimum deployment period FOW devices	12 months minimum, Anchors may remain for the lifetime of the demonstration site (~35 years) for use by subsequent technology developers.	Length of deployment will determine duration of impacts to fish and shellfish species and habitats.
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will result in physical disturbance of seabed, and potentially resulting in disturbance to bottom dwelling fish species, shellfish and important fish and shellfish habitats.

8.3.5 Embedded Mitigation

Mitigation measures will be incorporated into the project design, and may include the following:

- Timing of operations to avoid key spawning and migration times, especially in relation to more impactful operations.
- Spatial considerations, e.g., avoiding disturbance to key spawning and nursery grounds.
- Discussions with stakeholders to minimise the risk of ghost gear entanglement with moorings and cables. In the case of ghost fishing gear, ensure the FOW operators are aware and organise for the retrieval of gear if possible.
- Routine inspections of infrastructure and cable to ensure that any entanglement potential is minimised, and no debris enters the surrounding ocean.
- If piling is being considered, mitigation measures may include use of bubble curtains, screening and/or ramp-up/start-up procedures (Boyle *et al*., 2018).
- Inclusion of a Construction Environmental Management Plan (CEMP) that will cover aspects such as any accidental spills of environmentally harmful substances.

8.3.6 Scoping of EIA

Table 8-15 lists potential impacts from project activities on fish and/or shellfish, together with proposals on whether they should be scoped in or out of the EIA phase dependent on their likelihood of having a significant effect.

Table 8-15: Activities and potential impacts scoped in or out

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / Installation		
Underwater noise from construction activities resulting in harm or disturbance to sensitive species.	In	High likelihood of temporary disturbance to fish through underwater noise created by deployment/ installation works. Fish with swim bladders are more likely to be affected, e.g., herring (Popper *et al*., 2009; Boyle *et al*., 2018), which are present in the study area. Gadoid species are also known to use drumming noises, produced by the swim bladder, in mating (UK Government, 2009), anthropogenic noise could therefore affect breeding activity.
Indirect habitat loss of spawning and nursery grounds from disturbance through installation of cables and other infrastructure.	Out	As the nature of the installation/construction works is temporary and localised, and fish are highly mobile, it is unlikely that spawning/nursery grounds not in the direct project footprint will be affected.
Sedimentation from sediment disturbance leading to smothering of shellfish and/or fish – blocking feeding and breathing apparatus.	In	Sediment disturbance may lead to increased turbidity in the water, affecting habitats and species. However, as the study area is already turbid, species are likely to have a degree of natural tolerance, and the dynamic nature of ocean will mean turbidity will return to normal levels quickly. Due to the dynamic nature of the area, the generally sandy nature of sediments present and the temporary nature of the works, any sedimentation is likely to be very localised.
Migratory fish barrier effects from introduced infrastructure.	Out	As there a few observations of migratory species in the study area or nearby, and the fact that the installations will be small and not inshore, this impact is scoped out.
Accidental events, e.g., oil or fuel spill (also applicable to operation and decommissioning)	Out	Potential impacts of non-planned events (where sufficient good practice measures are in place to render the chance of such events occurring minimal) are proposed to be scoped out. As such possible spills and pollution incidents are scoped out. Each individual site developer will prepare an impact assessment and Environmental Management Plan which will include a Pollution Management Plan.
Operation		
Direct habitat loss / disturbance of spawning and nursery grounds from installation of cables and other infrastructure.	In	Though the anchors for the FOW technology will only cover a small area, there is potential for more than one device to be tested at one time, gravity-base type moorings could cover a larger area. This could result in permanent loss of fish/shellfish

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
		sensitive habitat. Some species will be particularly vulnerable to disturbance of spawning and nursery grounds. For instance, herring is reliant on sandy/gravelly sediments, and sandeels on sandy sediments (UK Government, 2009). Some species, such as sandeels, are essential for higher trophic level organisms. Sandeel declines have been linked to declines in some seabirds and possible starvation in harbour porpoise, thus minimisation of disturbance to sandeel habitats is essential (UK Government, 2009).
Underwater noise from operation of FOW devices.	Out	As some fish use sounds for navigation, behaviour, spawning and communications etc.an increase in ambient noise could mask noise signals and alter fish behaviour (Duncan *et al*., 2016). However, given the low ambient noise of FOW devices during operation only, underwater noise impacts from operation are unlikely.
Lost fishing gear entanglement in infrastructure – leading to ghost fishing.	In	Ghost gear entanglement with offshore infrastructure is possible, which would have an impact on many fish species.
Aggregation of fish around floating structure.	In	Introduced FOW devices have the potential to act as Fish Aggregating Devices (FAD) providing food and shelter, which could change community structure and distribution (Duncan *et al*., 2016; Mayraki *et al*., 2021).
Electromagnetic Field effects from subsea cables on sensitive species.	In	There is potential for EMF to have negative effects on some sensitive species. These include elasmobranchs and migratory species. Effects can include behaviour and migratory changes (Duncan *et al*., 2016). Cables will be designed to minimise this impact through protection to industry standards, and burial in the sediment where possible.
Decommissioning		
Decommissioning impacts – as above for installation works.	In	As during installation works, similar impacts are expected.

8.3.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-1 and Figure 6-2 identifies those projects which may have cumulative impacts with Protected Sites and Species impacts from the AFLOWT project and will be considered in the EIAR.

Other ongoing activities that may result in cumulative impacts specifically relating to fish and shellfish include:

- Climate change: As for all marine species, fish and shellfish are under severe pressure from climate change. Possible impacts include changes in distribution, growth rates, behaviour, spawning, survival and migratory routes for some species. Though these changes are difficult to predict, they will be interacting with the project impacts (UK Government, 2009).

The cumulative impact process will be iterative throughout the project, as information on some future potential interacting activities may not yet be known or available.

8.3.8 Scope to Appropriate Assessment

Fish and shellfish ecology impacts will be addressed in Appropriate Assessment - see section 2.5 and 8.1.8.

8.3.9 Approach to EIA

The approach to the EIAR chapter for fish and shellfish ecology will follow the general guidance set out in section 6.1 and more specific information set out in section 8.3.3:

- A desk-based literature review will be undertaken to expand on the fish and shellfish species identified within the project area in the Scoping Report, and to identify further information on spawning and nursery grounds, and potential habitat areas, e.g., for sand eels. Seabed imagery and other relevant data collected during other environmental surveys for the project will be reviewed for any information applicable to fish/shellfish. The desk-based study will include furthering the review of cumulative impacts.
- No surveys are required specifically for fish and shellfish ecology.
- The commercial fisheries chapter will be reviewed on completion, to identify any synergies and missed information, with other information obtained directly from consulting with fishermen.
- The physical impacts chapter will be reviewed on completion, to identify any missed information on potential sedimentation impacts.
- Fish and shellfish key receptor groups will be identified, with the sensitivities of each group identified, e.g., bony fish, elasmobranchs, migratory fish, hearing specialists and shellfish.
- Potential habitat loss and disturbance footprints from individual project activities will be calculated as the starting basis of the impact assessment. The key receptor groups will be assessed for the impact of the project activities on each group, based on sensitivity of receptor, magnitude, duration, frequency of impact etc. The significance of impacts will be determined, and appropriate mitigation and monitoring measures set out if any significant impacts are identified.

8.3.10 Scoping questions

The following questions have been identified for the competent authority, in regard to the scoping of this project's effects on fish and shellfish ecology. (A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below

and in the corresponding sections of each subject section.) A list of Stakeholders is included in Appendix A1.

- Are there any unidentified projects that may result in cumulative impacts, and need to be included assessed?
- Do you agree that no specific fish / shellfish surveys are required?

8.4 Marine Mammals, Megafauna and Reptiles

8.4.1 Receiving Environment

The study area for marine mammals encompasses a 100 km Zone of Influence (ZoI) radius around Test Areas A and B off the Mullet peninsula, the export cables and the landfall at Belderra sand. This ZoI has been designed to encompass the large ranges of mobile marine mammals and reptiles.

The marine mammal community around the AMETS ZoI is described from a combination of visual and acoustic surveys as well as published, unpublished and historic data. The data indicates a rich marine mammal community in, and adjacent to, the AMETS with grey seal (*Halichoerus grypus*), short-beaked common (*Delphinus delphis*) and bottlenose dolphins (*Tursiops truncatus*) being the most frequently reported species. Marine turtles are rarely seen in the study area (King and Berrow, 2009).

Cetaceans and seals can be seen in the study area year-round, although species composition depends on the season. Short-beaked common dolphins are observed year-round, while bottlenose dolphins are more ephemeral and may use the site for shorter periods throughout the year. Harbour porpoise (*Phocoena phocoena*) are also regularly observed and detected acoustically throughout the year, while other reported species are seasonal or infrequent to rare visitors; the minke whale (*Balaenoptera acutorostrata*) is usually only seen during the summer. Historically large baleen whales, such as blue (*Balaenoptera musculus*), fin (*Balaenoptera physalus*) and sei (*Balaenoptera borealis*) whales, migrated annually along the shelf edge, approximately 60 nautical miles (nm) from the AMETS site and are only occasionally reported closer to shore.

In 1997, the EU Directive on the Conservation of Habitats, Flora and Fauna (92/43/ECC), commonly known as “the Habitats Directive”, was transposed into Irish law with the aim to contribute into the conservation of biodiversity by maintaining or restoring natural habitats and wild species listed on the Annexes of the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) that are considered threated within the EU. All cetaceans are listed under Annex IV of the Habitats Directive as European Protected Species (EPS) of Community Interest and in need of strict protection. In addition, the Habitats Directive also legislates to protect important habitats and requires the establishment of a network of important ecological sites known as Natura 2000. Marine mammals are protected within Special Areas of Conservation (SAC) as Annex II species, including bottlenose dolphin, harbour porpoise, grey seal and common seal (*Phoca vitulina*) in Ireland.

At the time of site selection, the marine area of the AMETS was not within any area designated under the Natura 2000 Network of sites. However, the West Connacht Coast SAC (site code: 002998) was subsequently proposed and designated in 2012, following the original selection of the Test Area, preparation of the Environmental Impact Statement

(EIS) and the subsequent gathering of an additional two years of baseline ecological data (see section 8.1). The inshore marine site of the AMETS and some of the cabling now falls within the West Connacht Coast SAC, which was designated as a SAC under the EU Habitats Directive with bottlenose dolphin as the sole qualifying interest.

There are two SACs designated for a second Annex II species, namely the grey seal, just south of the AMETS; the Inishkea Islands SAC (site code: 000507) and the Duvillaun Islands SAC (site code: 000495) (see section 8.1). The Inishkea Islands SAC lies just south of the AMETS and is designated for two plant species along with the grey seal. The area of the site is 12.3 km^2, of which 65.3% is marine. The Duvillaun Islands SAC is located just south of the Inishkea Islands SAC and within the open marine area of the West Connacht Coast SAC, and is designated for the bottlenose dolphin, as well as the grey seal. As with the Inishkea Islands SAC, grey seals occupy both aquatic and terrestrial habitats in the Duvillaun Islands SAC, including intertidal shorelines and skerries that become exposed during the tidal cycle. They are present at both sites year-round including breeding and moulting phases as well as non-breeding, foraging and resting phases.

8.4.2 Data sources and Baseline

To understand how marine mammals use the AMETS and surrounding areas, a desk-based overview of marine mammal data has been undertaken, using the data sources listed in Table 8-16. The selection of data sources includes several publications related to the ecological characterisation of the marine mammal community and its potential impacts in the AMETS as well as site-specific data.

Table 8-16: Data sources for marine mammal and reptile ecology

Source	Date Accessed	Relevant Data Overview
An extensive survey of bottlenose dolphins *(Tursiops truncatus)* on the west coast of Ireland (Ingram *et al*., 2001)	05/10/2021	Data on the bottlenose dolphin population off Mullet peninsula and West Connacht Coast SAC.
Bottlenose dolphins *(Tursiops truncatus)* in the Shannon estuary and selected areas of the west coast of Ireland (Ingram *et al*., 2003)	05/10/2021	Data on the bottlenose dolphin population off Mullet peninsula and West Connacht Coast SAC.
Site assessment of the waters of northwest Connemara. A survey of bottlenose dolphins *(Tursiops truncatus)* (Ingram *et al*., 2009)	05/10/2021	Data on the bottlenose dolphin population off Mullet peninsula and West Connacht Coast SAC.
Test Site AMETS Environmental Impact Statement – Chapter 6 Flora and Fauna (MERC and IWDG, 2011)	05/10/2021	Desktop and survey data overview detailing the ecological characteristics of the site, including marine mammals.
Ecological Assessment for the Proposed AMETS (Scally *et al*., 2011)	05/10/2021	Baseline data on the AMETS site, including the marine mammal component.

Source	Date Accessed	Relevant Data Overview
Evidence for Distinct Coastal and Offshore Communities of bottlenose Dolphins in the North East Atlantic (Oudejans *et al*., 2015)	05/10/2021	Data on the bottlenose dolphin population off Mullet peninsula and West Connacht Coast SAC.
Abundance, distribution and habitat use of bottlenose dolphins in the west and north-west of Ireland (Nykänen *et al*., 2015)	05/10/2021	Data on the bottlenose dolphin population off Mullet peninsula and West Connacht Coast SAC.
Phylogeography, population structure, abundance and habitat use of bottlenose dolphins, *Tursiops truncatus*, on the west coast of Ireland (Nykänen, 2016)	05/10/2021	Data on the bottlenose dolphin population off Mullet peninsula and West Connacht Coast SAC.
Aerial thermal-imaging survey of seals in Ireland, 2017 to 2018. Irish Wildlife Manuals (Morris and Duck, 2019)	05/10/2021	Survey data on seal surveys around the site.
Natura Impact Statement, Appropriate Assessment, Site Investigations at the Atlantic Marine Energy (AMETS) (MERC, 2020)	05/10/2021	Desktop and survey data overview detailing the protected sites (Natura 2000) and potential impacts on qualifying features including marine mammals.
AFLOWT: Review of Marine Mammal Baseline Data and Gap Analysis from the Atlantic Marine Energy Test Site (AMETS) (Quinn and Berrow, 2020)	05/10/2021	Review of Marine mammal data from the site and gap analysis.
AFLOWT Marine Mammal Survey – progress report to SEAI (IWDG, 2021)	05/10/2021	Survey data progress report on marine mammal surveys around the site.
Boat-based visual surveys for bottlenose dolphin in the West Connacht Coast SAC in 2021 (Berrow *et al*., 2021)	30/10/2021	Updated abundance estimates and use of site by bottlenose dolphins.
Site assessment of the waters of northwest Connemara. A survey of bottlenose dolphins *(Tursiops truncatus)* (Ingram *et al*., 2009)	30/10/2021	Updated abundance estimates and use of site by bottlenose dolphins.

The marine mammal community at the AMETS and surrounding areas has been further established through a combination of site-specific land and boat-based surveys, static and passive acoustic surveys, published and historic data. The data sources reviewed in this report were used to assess the marine mammal abundance, density, and seasonal trends, as well as the potential impacts of the development of FOW devices in the proposed development area and adjacent waters.

8.4.2.1 Baseline

Marine mammal surveys were carried out at the AMETS site using land-based and at-sea surveys between October 2009 and April 2013. This study comprised of a total of 32 monthly land-based watches from Annagh Head in Co. Mayo, 12 dedicated vessel-based line transects, towed hydrophones surveys and and 31 months of static acoustic monitoring. In addition, some sighting data was obtained from the Irish Whale and

Dolphin Group (IWDG) sighting database, which stores data collected by All-Ireland cetacean sighting schemes and can be assessed on-line through www.iwdg.ie. In October 2010 there were 15,752 sightings from around the Irish coast.

The site survey was updated between May 2020 and July 2021 to fill data gaps identified by Quinn and Berrow (2020): 10 dedicated RIB based surveys were carried out to locate and photograph bottlenose dolphins, with 12 months static acoustic monitoring at two sites (Berth A and Berth B; one within each Test Area). Bottlenose dolphins were located on 4 RIB surveys and a catalogue of individually identifiable individuals created to explore site fidelity and connectivity. Figure 8-5 illustrates the sightings from the RIB based surveys.

Incidental sightings of marine mammals were recorded during the bird surveys described in Section 8.5.2. Seventy five percent of the sightings were of short-beaked common dolphins, with the four sightings of unidentified dolphins likely to be this species too; these sightings were recorded throughout the survey campaign. Single sightings of Risso's dolphins in December and harbour porpoise in August were also recorded, while minke whales were recorded on two occasions in August. Two to three large whales were reported offshore in August 2020, spotted by their blows they are likely to have been humpback whales as this species was known to be in the area at the time. Seals were also seen throughout the survey campaign, and those that were identified to species level were grey seals.

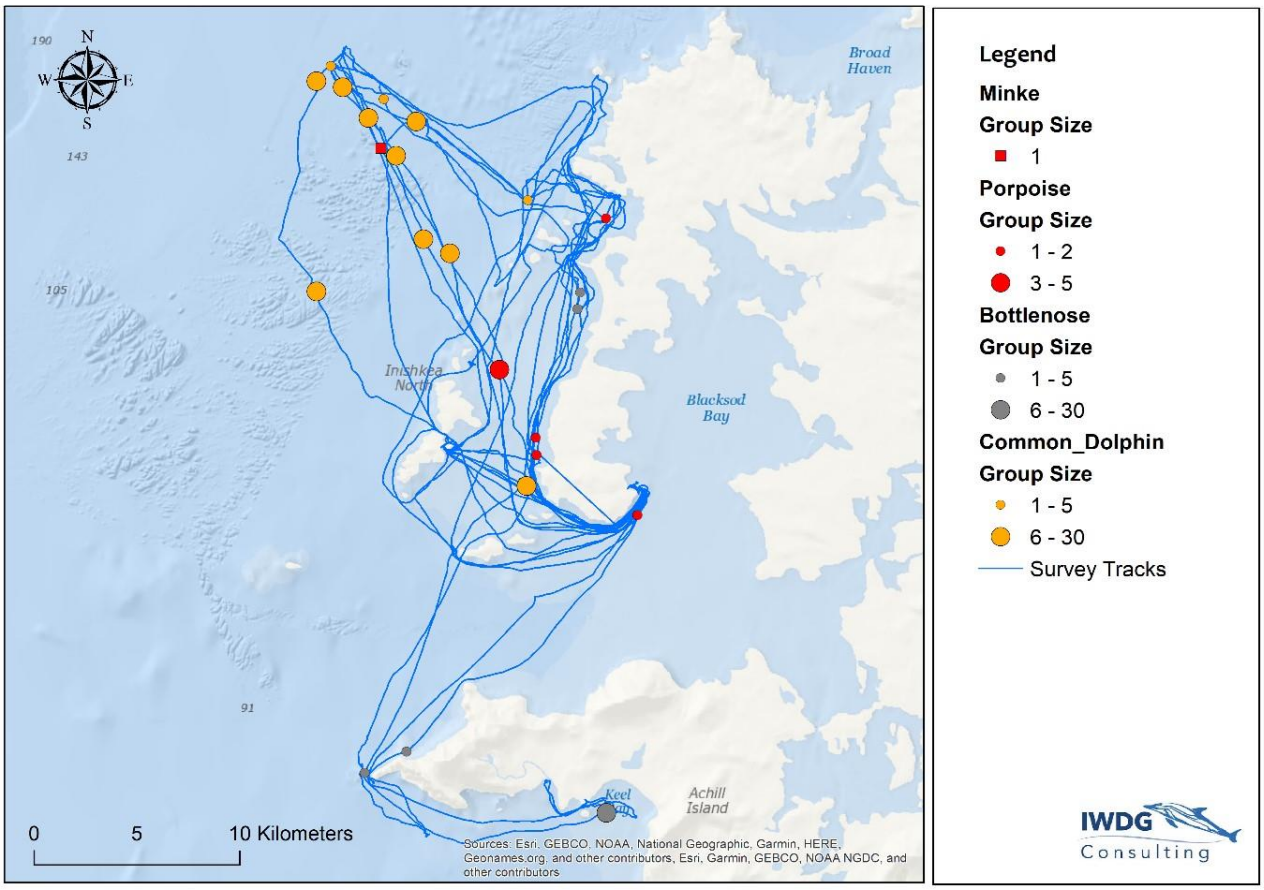

Figure 8-5: Marine mammal sightings around the AMETS Test Areas

The list of cetaceans and other marine species recorded can be found in Table 8-17. Throughout the year harbour porpoise and common dolphin are the most abundant species in all seasons, and bottlenose dolphin classified as seasonally resident occurring mainly during summer and autumn months. Minke whales were also seen during the summer and autumn. Grey seals occurred all year long and were classified as resident/abundant. In total, seven cetacean species, two seal species and two other marine megafaunas (sunfish and basking shark) were recorded within or adjacent to the AMETS.

Table 8-17: Summary of marine mammal and megafauna occurrence at or adjacent to the proposed AMETS area

Species	Spring	Summer	Autumn	Winter	Notes
Harbour porpoise (*Phocoena phocoena*)					Regular
Short-beaked common dolphin (*Delphinus delphis*)					Regular / abundant
Bottlenose dolphin (*Tursiops truncatus*)					Seasonally resident

Species	Spring	Summer	Autumn	Winter	Notes
Risso's dolphin (*Grampus griseus*)					Vagrant
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)					Rare
White-beaked dolphin (*Lagenorhynchus albirostris*)					Rare
Striped dolphin (*Stenella coeruleoalba*)					Rare
Orca (*Orcinus orca*)					Infrequent visitor
Minke whale (*Balaenoptera acutorostrata*)					Common / seasonal
Humpback whale (*Megaptera novaeangliae*)					Rare
Grey seal (*Halichoerus grypus*)					Resident/ abundant
Common / harbour seal (*Phoca vitulina*)					Resident/ abundant
Basking shark (*Cetorhinus maximus*)					Seasonally frequent
Sunfish (*Mola mola*)					Infrequent visitor

Source: Adapted from MERC Environmental Consultants and IWDG (2011)[26]

Basking sharks are seasonally abundant off the area but there are large fluctuations between years. Historically Achill Island to the south of the site was a major fishing ground for basking sharks (McNally, 1976) but they do not appear as abundant as previously documented. Marine turtles are rarely seen in the study area (King and Berrow, 2009); however, a large leatherback turtle (*Dermochelys coriacea*) was seen incidentally during bird surveys in 2020 (IWDG Consulting, 2021).

There is a high diversity of species recorded around the study area when compared to sites elsewhere in Ireland. This is due to relative proximity to the continental shelf edge, which may bring typically offshore species close to the coast, and the extensive survey effort carried out as part of the AMETS project and in association with the Corrib Gas field offshore of Broadhaven Bay. The importance of areas to the south of the study area as breeding sites for grey seals (Inishkea Islands) also means that abundance of this species in the area is well-known, with up to a third of the national population thought to breed there.

Mirimin *et al*. (2011) showed that the bottlenose dolphins in the Connemara-Mayo coastal waters belong to a single breeding population, which is genetically distinct from the

[26] Original EIAR

Shannon Estuary population and from a third distinct offshore population. Site surveys began in 2001 and ran to 2009 (Ingram *et al*., 2001; 2003; 2009) and showed the northwest from Slyne Head to Broadhaven Bay were important for bottlenose dolphins. Vessel-based surveys in both inshore and offshore areas in Mayo and Connemara carried out between March 2008 and October 2012, comprising 117 surveys in total, recorded 1308 individual bottlenose dolphins (Oudjans *et al*., 2015). Of the total dolphins recorded, there were 286 individuals identified through photo-identification. A higher survey effort was concentrated in the Mayo area than in Connemara and subsequently more individuals were encountered. The study found through social network analysis that bottlenose dolphins encountered in the inshore waters of Mayo and Connemara form a single community whose movements appear to be restricted to a 3 km strip of coastal habitat. Abundance estimates between 2009 and 2021 showed around 170-200 individuals use the West Connacht Coast SAC and numbers were consistent during this 12-year period (Ingram *et al*. 2009; Nykänen *et al*., 2015; Berrow *et al*., 2021). These studies show that the AMETS site forms a key part of the range of the inshore community of bottlenose dolphins in Irish waters, and that any degradation of this habitat could have consequences at the population level.

8.4.3 Relevant Guidance

Scoping has been undertaken according to the Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Barnes, 2017). In addition to this guidance, the following guidance will be taken into consideration in the full for the assessment of impacts on marine mammals, megafauna and reptiles:

- guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 1 (SEAI, 2018 a)
- guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 2 (SEAI, 2018 b)
- guidance on wind energy development in accordance with the European Union nature legislation (EU, 2010)
- guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2019)
- appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (NPWS, 2010)
- guidance document on wind energy developments and EU nature legislation (EC, 2020)
- assessment and Monitoring of Ocean Noise in Irish Water (EPA, 2011)
- guidance on Survey and Monitoring in Relation to Marine Renewables Deployments in Scotland. Volume 2. Cetaceans and Basking Sharks (SNH and Marine Scotland, 2011)
- guidance on Survey and Monitoring in Relation to Marine Renewables Deployments in Scotland. Volume 3. Seals. (SNH and Marine Scotland, 2011)
- methodologies for Measuring and Assessing Potential Changes in Marine Mammal Behaviour, Abundance or Distribution Arising from the Construction,

Operation and Decommissioning of Offshore Windfarms. (Diederichs *et al*., for COWRIE Ltd, 2008)

- recommendations for the Presentation and Content of Interim Marine Bird, Mammal and Basking Shark Survey Reports for Marine Renewable Energy Development (Scotland Natural Heritage, 2014)
- statistical Modelling of Seabird and Cetacean Data: Guidance Document (Marine Scotland, 2014)
- guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (Department of Arts, Heritage and the Gaeltacht, 2014).

8.4.4 Design Parameters

Project design parameters relevant to marine mammals, megafauna and reptile ecology are listed in Table 8-18. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 8-18: Design parameters and relevance to marine mammal, megafauna and reptile ecology

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Higher MW would have a greater impact on noise sensitive species, e.g., large elasmobranchs and possibly reptiles. Thus, cable protection and burial are important.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B.	The impact will be greater where more FOW devices are located at a greater density. If multiple floaters are installed at the site at one time, and are operating at one time, impacts on marine mammals and reptiles will be greater – in terms of noise disturbance, sediment resuspension, entanglement and collision risk, EMF effects etc. The extent of habitat disturbance will be dependent on the size of the turbines.
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor	Type of anchoring system will affect benthic prey species for marine mammals. The extent of disturbance is dependent on the mooring system utilised, the number and size of anchors. The impact on cetaceans will be greater if hammered or drilled piling is utilised to secure FOW device.

Design parameter	Technical details – worst case scenario	Relevance
Minimum deployment period FOW devices	12 months minimum Anchors may stay throughout the lifespan of the site (35 years) for use by subsequent technology demonstrators.	Length of deployment will determine duration of impacts to marine mammals, megafauna and reptiles.
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will result in physical disturbance of seabed, and potentially resulting in benthic disturbance to prey species of marine mammals.
Vessel access for deployment and access	Vessel access will be required during the construction approximately once per month during operation of the project.	Potential impacts on noise sensitive species relating to noise of vessels and possible collisions will be increased with a greater vessel presence.

8.4.5 Embedded Mitigation

Mitigation measures are set out in below:

- all construction will be carried out within the minimum timeframe and as efficiently as possible
- to minimise contamination from oil pollution, all vessels used for construction and operational maintenance work will have an oil pollution emergency plan and carry emergency response equipment
- presence of Marine Mammal Observers (MMOs) to ensure the best practises accordingly to the guidelines/National Parks and Wildlife Services (NPWS) (e.g., geophysical site surveys, during any high noise generating activities, placing of rock armour)
- inclusion of a Construction Environmental Management Plan (CEMP) that will cover aspects such as any accidental spills of environmentally harmful substances
- ongoing monitoring of marine mammal activity and noise monitoring in the surroundings of the AMETS during operational periods.

Additionally, other mitigation measures can be incorporated into the project design and may include the following:

- timing of operations to avoid key breeding and migration times, especially in relation to more impactful operations
- spatial considerations – e.g., avoiding disturbance to key breeding grounds
- discussions with stakeholders to minimise the risk of ghost gear entanglement with moorings and cables. In the case of ghost fishing gear, ensure the FOW operators are aware and organise for the retrieval of gear if possible

- presence of Marine Mammal Observers (MMOs) to ensure the best practises accordingly to the guidelines/National Parks and Wildlife Services (NPWS) (e.g., geophysical site surveys, during any high noise generating activities, placing of rock armour)
- routine inspections of infrastructure and cable to ensure that any entanglement potential is minimised, and no debris enters the surrounding ocean
- if piling is being considered, mitigation measures may include use of bubble curtains, screening and/or ramp-up/start-up procedures (Boyle *et al*., 2018).

It is also recommended that once any FOW demonstrators have been deployed, a comprehensive monitoring programme with onsite observations of marine mammals when devices are operational should be put in place to guide management.

8.4.6 Scoping of EIA

As described in this document, marine mammals are described as a Marine EIA Topic that requires consideration in the EIA process for offshore renewable projects. The potential impacts on marine mammals are divided into three phases: deployment/ installation, operation, and decommissioning phases. The deployment phase is generally considered the most disruptive period for marine mammals with underwater noise, potential disruption of habitats, collisions with construction vessels, chemical contamination, and physical impact during rock armouring as the main potential effects. During the operational phase, there could be one to five FOW devices deployed within Test Area A and one deployed in Test Area B generating power which will be transmitted through the submarine cables to the substation on shore. These arrays and noise pollution from the FOW devices could potentially create a physical/acoustic barrier and disturbances to feeding habits and movement of marine mammals. Some disturbances can also be due to the interference of EMF (Inger *et al.*, 2009). During decommissioning, a large number of increased noise sources and vessel traffic can lead to disturbances to marine mammal movement patterns and foraging habits, leading to their avoidance of the area.

Table 8-19 lists potential impacts from project activities on marine mammals, megafauna and/or reptiles, together with proposals on whether they should be scoped in or out of the EIA phase dependent on their likelihood of having a significant effect.

Table 8-19: Activities and potential impacts scoped in or out

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment/ installation		
Underwater noise from installation activities resulting in harm or disturbance to sensitive species	In	Underwater noise can occur during deployment / installation, operation, and decommissioning stages. Underwater noise can impact marine mammals, megafauna and reptiles in many ways, such as interfering with navigation, communication and behaviour. If piling is to take place, significant underwater noise impacts could occur and additional mitigation measures should be proposed.

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Direct habitat loss of breeding and feeding grounds from installation of cables and other infrastructure.	In	Degradation or loss of habitats can occur when installing the anchoring system and power cables on the seabed.
Indirect habitat loss of breeding and nursery grounds from disturbance through installation of cables and other infrastructure.	In	Habitat loss due to the infrastructure installed may cause disturbance in the migratory behaviour which could impact breeding and/or nursery areas.
Accidental events, e.g., oil or fuel spill (also applicable to operation and decommissioning)	Out	Potential impacts of non-planned events (where sufficient good practice measures are in place to render the chance of such events occurring minimal) are proposed to be scoped out. As such possible spills and pollution incidents are scoped out. Each site developer will prepare an Environmental Management Plan which will include a Pollution Management Plan.
Operation		
Underwater noise from operation of FOW devices.	Out	Noise pollution from working devices is likely to be less than that during installation and only detectable short distances from each FOW device. Therefore, an individual marine mammal would need to approach the device to experience operational noise, therefore it is not considered a disturbance impact.
EMF impacts from cables	In	Possible disturbance of feeding and migratory behaviour by the effects of EMF along the power cables.
Direct habitat loss of breeding grounds from presence of cables and other infrastructure.	In	Degradation or loss of habitat can occur as moorings can create a physical barrier to the movement of marine mammals.
Impact on prey species.	In	Impacts on some prey species can occur due to disturbance to their migratory behaviour.
Lost fishing gear entanglement in infrastructure – leading to ghost fishing.	In	Entanglement risk can lead to reduction in population numbers of species in the area.
Decommissioning		
Decommissioning impacts – as above for installation works.	In	As during installation works, similar impacts are expected.

8.4.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-1 and Figure 6-2 identifies those projects which may have cumulative impacts with Protected Sites and Species impacts from the AFLOWT project and will be considered in the EIAR.

Other ongoing activities that may result in cumulative impacts with the project include:

- climate change: As for all marine species, marine mammals and reptiles are under severe pressure from climate change. Possible impacts include changes in distribution, growth rates, behaviour, spawning, survival, and migratory routes for some species. Though these changes are difficult to predict, they will be interacting with the project impacts.

8.4.8 Scope to Appropriate Assessment

Marine mammal aspects will be addressed in Appropriate Assessment - see section 2.5 and 8.1.8 – as the West Connacht Coast SAC is designated for bottlenose dolphins. Marine mammals are highly mobile, and as the study area encompasses a 100 km ZoI, which also includes Duvillaun Islands SAC and Inishkea Islands SAC, with grey seals as a qualifying species, an AA screening will be undertaken.

8.4.9 Approach to EIA

The approach to the EIAR chapter for marine mammals will follow the general guidance set out in section 6.1 and more specific guidance set out in section 8.4.3:

- a desk-based literature review will be undertaken to expand on the marine mammal, megafauna and reptile species identified within the project area in the Scoping Report, and to identify further information on breeding and nursery grounds. The desk-based study will include furthering the review of cumulative impacts, and also include a review of any relevant stakeholder consultations
- the marine mammal, megafauna and reptile key receptor groups will be identified, with the sensitivities of each group identified, e.g., cetaceans and pinnipeds
- potential habitat loss and disturbance footprints from individual project activities will be calculated as the starting basis of the impact assessment. The key receptor groups will be assessed for the impact of the project activities on each group, based on sensitivity of receptor, magnitude, duration, frequency of impact etc. The significance of impacts will be determined, and appropriate mitigation and monitoring measures set out if any significant impacts are identified
- baseline surveys as described below suggested.

The Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 2 SEAI (2018 b) states that the possible impacts on marine mammals have been extensively reviewed, however empirical measurements are lacking due to the limited number and types of devices employed. Impacts on marine mammals will vary depending on the number, type and locations of the devices, the species occurring in that location and their interactions with marine renewable energy devices. Impacts also vary depending on the three stages of the development: deployment/installation, operation, and decommissioning. Direct impacts include noise and physical disturbance, collisions with marine renewable energy devices and entanglement. Indirect impacts include disturbance of feeding and changes in sedimentary and oceanography processes. One possible impact may be the use of hard substrates as a Fish Aggregating devices (FADS) as they may lead to an artificial reef type effect. Nonetheless, these impacts are all speculative due to the limited empirical data. For offshore wind projects, the impacts occurring in the construction stage have the most concern, however less information is available for the operational or decommissioning stages. Pile driving during installation stage has been identified as the most significant impact on harbour porpoise and some dolphin species, in the absence of mitigation.

8.4.9.1 Baseline Surveys

Cetaceans:

The survey methods for cetaceans encompass:

- visual surveys both land, boat and aerial based along pre-determined line-transects and distance sampling, including use of high-definition cameras and concurrent with seabird surveys
- passive Acoustic Monitoring (PAM) using towed hydrophones are typically used in addition to visual techniques during boat-based surveys
- static Acoustic Monitoring (SAM) is used at smaller scale, usually coastal, sites as it can provide high quality temporal data although SAM can be spatially constrained depending on the number of units deployed
- use of C-PODs or hydrophones in order to detect clicks and whistles from some species (e.g., harbour porpoise, dolphins, sperm and pilot whales)
- equipment such as SM2M, EAR or other recording equipment can be used for baleen whales, and to distinguish between dolphin species.

It is also recommended that at least two years and preferably, three years of pre-construction data is required to account for inter-annual variability, with two years considered an absolute minimum where data is lacking.

Seals:

Haul out surveys are the most useful method to assess how seals use a specified site. Surveys are recommended to be carried out during breeding season (June-August for harbour seals and August-November for grey seals), or moult (August-September for harbour seals and December-March for grey seals). Moreover, seals, especially grey seals are highly mobile, and they can forage at long distances from their breeding site therefore the absence of haul out sites near marine renewable energy sites does not imply the site is not used by seals.

8.4.10 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below and in the corresponding sections of each subject section.

- Do you identify any further SACs that should be considered for marine mammals and/or reptiles?
- Are you content with the approach taken to the design of the baseline surveys, including duration of surveys?
- Do you identify any further mitigation measures that should be implemented?

8.5 Offshore Ornithology

8.5.1 Receiving Environment

The study area for birds covers an area of open sea from Annagh Head to Inishglora Island, to Cross Point inland and along the shoreline to Annagh Head, encompassing coastal, intertidal and open water habitat areas for birds. The area also encompasses Annagh beach, Emlybeg and Belderra Strand.

The study area includes a bay and an area of open sea. The “Bay” extends from Annagh Head across to Inishglora Island, inland to Cross Point and along the shore back to

Annagh Head. The Bay includes all coastal, intertidal and open water habitats within these points. From the Bay the overall study site extends 15 km west, to include an area of “open sea” approximately 12 km x 15 km in size. The open sea part of the study site is marine in nature with water depths mainly between 50 m and 100 m. At its eastern extent the open sea study area overlaps with the Bay and with the coastal waters of the Mullet Peninsula. At its western extent the open sea area reaches into waters > 100 m deep. Annagh Head is a known sea watching location for observing migratory seabirds, and two existing reports on the seabirds of Ireland’s offshore waters provide relevant information on the open sea study area (Pollock, *et al*. 1997; Mackey *et al*. 2004).

In previous surveys carried out at the site (SEAI, 2011), the main bird species identified included wintering waders, common sandpiper (*Actitis hypoleucos*), ringed plover (*Charadrius hiaticula*), sanderling *(Calidris alba)* and Manx shearwater (*Puffinus puffinus*). Annex I species identified included the Great Northern diver (*Gavia immer*) and eider duck (*Somateria mollissima*), Arctic tern (*Sterna paradisaea*), little tern (*Sternula albifrons*) and sandwich tern (*Thalasseus sandvicensis*). Passage migrants, the Great skua (*Stercorarius skua*), Great shearwater (*Ardenna gravis*) and sooty shearwater (*Ardenna grisea*) were also identified.

The study area lies within the Mullet Peninsula, within which there are SPAs designated under the EU Birds Directive for both coastal waterbird populations and breeding seabird colonies: within 5 km of the Test Areas are Inishglora and Inishkeeragh, Termoncarragh Lake and Annagh Machair, and Blacksod/Broadhaven Bay SPA; within 15 km of the Test Areas are Inishkea Islands, Duvillaun Islands; and within 30 km of Test Areas there are llaunmaster and Stags of Broadhaven SPAs. Carrowmore Lake SPA lies within 20 km of the cable landfall site. A summary of designated sites considered at this stage, and which will be considered within the EIAR, are provided in section 8.1.

8.5.2 Data sources and Baseline

A range of existing data sources are available which assist in supporting the understanding of baseline conditions at the site. These include surveys of the wider marine environment, specific studies undertaken to inform the EIA process for an earlier application for wave energy at the site and a range of studies to develop an up-to-date baseline undertaken specifically in relation to this application. The range of studies, reports and specific survey effort which will be applied to understand and document the baseline conditions in the EIA are set out in Table 8-20.

Table 8-20: Data sources for ornithology for AFLOWT scoping

Source	Date Accessed	Relevant Data Overview
National Parks and Wildlife Service designated sites database.	2021	Location site boundaries and qualifying interests of SPAs for bird species relevant to the offshore environment.
I-WeBS winter waterbird monitoring scheme.	2021	Populations of non-breeding waterfowl and waders within relevant count sectors along the Mullet coastline.

Source	Date Accessed	Relevant Data Overview
The distribution of seabirds and cetaceans in the waters around Ireland (Pollock *et al*., 1997)	2021	Broad distribution and abundance information of Seabirds, including off the west coast.
Cetaceans and Seabirds of Ireland's Atlantic Margin. Volume I – Seabird distribution, density and abundance (Mackey *et al*., 2004)	2021	Broad distribution and abundance information of Seabirds, including off the west coast. The primary study area for the project consisted of the offshore waters to the southwest and west of Ireland commonly termed "Ireland's Atlantic Margin".
Seabird 2000 (JNCC, 2013)	2021	Population data for seabirds within the wider biogeographic area.
ESAS boat-based surveys were completed in 2009 - 2010 to inform the EIAR and AA for an application to install wave energy technology at both Berth A (Test Area A) (outer birth) and Berth B (Test Area B) (inner berth). As described in Section 2.1.1 a foreshore lease was granted for these Test Areas in 2015. In parallel to the completion of consenting processes further boat based transect surveys were planned and completed in 2011 – 2012 and 2012 – 2013.	2021	Site specific transect based data and associated estimates of abundance and density. Some data gaps exist for winter periods due to challenging weather.
Shore based surveys were completed in 2009 - 2010 to inform the EISand AA for an application to install wave energy technology at both Berth A (outer berth) and Berth B (inner berth).	2021	Data presents baseline information for the near shore environment used to inform cable route impact assessment.
Tracking database (BirdLife International, 2020).	2021	Bird tracking information.
Boland, H., Crowe, O. and Walsh, A. (2012), 'Irish Wetland Bird Survey: results of waterbird monitoring in Ireland in 2010/11'.	2021	Irish wetland birds.
Seabird Population Trends and Causes of Change: 1986–2019 Report (JNCC, 2021)	2021	Seabird population trends over a long time period.
Seabird Populations of Britain and Ireland: results of the Seabird 2000 census (1998-2002) (Mitchell *et al*., 2004)	2021	Seabird census

8.5.2.1 Baseline

Table 8-21 shows temporal occurrence of regularly recorded marine birds within the AMETS offshore environment; where distinct peaks in abundance are noted these are indicated in darker green. Prior to 2020-2021 no data was available for September, November or December.

Table 8-21: Temporal occurrence of regularly recorded marine birds within the AMETS offshore environment, based on data collected prior to 2020.

Species	January	February	March	April	May	June	July	August	September	October	November	December
Fulmar *(Fulmarus glacialis)*									n/a		n/a	n/a
Gannet *(Morus bassanus)*									n/a		n/a	n/a
Kittiwake *(Rissa tridactyla)*												
Herring gull *(Larus argentatus)*					Assumed present			Assumed present	n/a		n/a	n/a
Lesser Black backed gull *(Larus fuscus)*	TBC likely peak numbers present during summer months										n/a	n/a
Great Black backed gull *(Larus marinus)*									n/a		n/a	n/a
Common gull *(Larus canus)*	TBC likely peak numbers present during summer months										n/a	n/a
Storm petrel *(Hydrobates pelagicus)*									n/a		n/a	n/a
Puffin *(Fratercula arctica)*									n/a		n/a	n/a
Razorbill *(Alca torda)*									n/a		n/a	n/a
Guillemot *(Uria aalge)*									n/a		n/a	n/a
Black guillemot *(Cepphus grylle)*									n/a		n/a	n/a
Manx shearwater (*Puffinus puffinus*)									n/a		n/a	n/a
Sooty shearwater *(Ardenna grisea)*									n/a		n/a	n/a

Species	January	February	March	April	May	June	July	August	September	October	November	December
Great shearwater *(Puffinus gravis)*									n/a		n/a	n/a
Great skua *(Stercorarius skua)*												
Arctic skua *(Stercorarius parasiticus)*												
Arctic tern *(Sterna paradisaea)*												

In addition to the regularly encountered species detailed above, boat-based surveys reported small numbers of scarce or rare species across a survey period extending between October 2009 – June 2013, these species are included in Table 8-22.

Table 8-22: Relative abundance of marine birds within the study area

Species	Relative abundance	Total Count	Comment	Species	Relative abundance	Total Count	Comment
Gannet	Abundant	3901	Present in all months surveyed	Arctic tern	Frequent	174	Highly seasonal May – July peak
				Barnacle goose *(Branta leucopsis)*	Scarce	14	
Manx shearwater	Abundant	2592	Seasonal	Long tailed duck *(Clangula hyemalis)*	Scarce	8	
Fulmar	Abundant	2087	Present in all months surveyed	Brent goose *(Branta bernicla)*	Scarce	7	
Razorbill	Common	1234		Oystercatcher *(Haematopus ostralegus)*	Rare	4	
Kittiwake	Common	1134	Potential highest abundance in winter	Cormorant *(Phalacrocorax carbo)*	Rare	3	
Great shearwater	Common	869	Count reported from a single October survey	Dunlin *(Calidris alpina)*	Rare	2	

Species	Relative abundance	Total Count	Comment	Species	Relative abundance	Total Count	Comment
Herring gull	Occasional	81		Great Northern Diver	Rare	2	Shore based counts identify more abundant presence in inshore waters.
Lesser Black backed gull	Occasional	65		Pomarine skua *(Stercorarius pomarinus)*	Rare	2	
Great Black backed gull	Frequent	391		Black headed gull	Rare	1	
Common gull	Occasional	23		Common tern	Rare	1	
Storm petrel	Frequent	446	Seasonal presence – June – October peak	Glaucous gull *(Larus hyperboreus)*	Rare	1	
Puffin	Common	994	Seasonal peak April to July	Grey phalarope *(Phalaropus fulicarius)*	Rare	1	
Black guillemot	Scarce	10		Little auk *(Alle alle)*	Rare	1	
Guillemot	Frequent	402		Red necked phalarope *(Phalaropus lobatus)*	Rare	1	
Sooty shearwater	Occasional	81	Later summer / autumn presence	Red throated diver *(Gavia stellata)*	Rare	1	
Shag *(Phalacrocorax aristotelis)*	Occasional	46					
Great skua	Occasional	25					
Arctic skua	Scarce	10	Seasonal – April – September				

As indicated in chapter 4 a meeting was held with NPWS on 30 November 2020 to introduce the project and discuss survey scopes. The NPWS contact indicated that the Project must be clearly defined to facilitate scoping for EIAR and AA.

With regards to the question of whether 12 months of survey data is sufficient, given that there is historical data for the site, it was stated that It must be clear throughout the EIA Scoping and wider EIA process that the current data validates the historical data, as the concept has been proved and requirement is to ensure no departure from the habitat. It

was emphasised that data provided must enable robust and reasoned scientific assessment.

In addition to the completion of survey effort for previous consents described above, a series of boat based transects, supported by digital aerial surveys were completed between August 2020 and July 2021 for the AFLOWT project. Survey data has been collected from boat-based platform in all months while aerial surveys supplemented existing data gaps in the months of November, and December and augmented data in February and May.

Figure 8-6: AMETS Ornithological Boat Transect Routes

Source: EcoÉireann October (2020)

Boat Based Survey

Boat based surveys were completed using the standard JNCC European Seabirds at Sea (ESAS) survey methodology in line with up-to-date guidance described by Webb and Dunrick (1992) and Camphuysen *et al.* (2004). The boat-based data will be analysed to inform the EIA baseline reporting. The transect pattern covering the test site areas and wider study area which is being applied and broadly reflects the study area used during

baseline studies to inform previous license applications is included in Figure 8-6 (boat based) and aerial surveys in Figure 8-7.

Aerial Survey

Where appropriate the outputs from aerial survey will be used alongside boat-based data to inform density / abundance analysis. Examples of arial survey transects for November and December 2020 are included in Figure 8-7 and Figure 8-8.

Figure 8-7: AMETS Ornithological November 2020 Aerial Transect Routes

Source EcoÉireann (November 2020 – January 2021)

Figure 8-8: AMETS Ornithological December 2020 Aerial Transect Routes

Source: EcoÉireann (November 2020 – January 2021)

Shore Based Survey

Throughout the year a series of shore-based observations monitoring seabird passage were completed from Annagh Head. The series includes data collection during periods in which conditions were not suitable for boat-based survey, to examine the likely differences in seabird assemblages (and behaviour) present within the study area during higher winds / sea states. The location of the Vantage points is included in Figure 8-9.

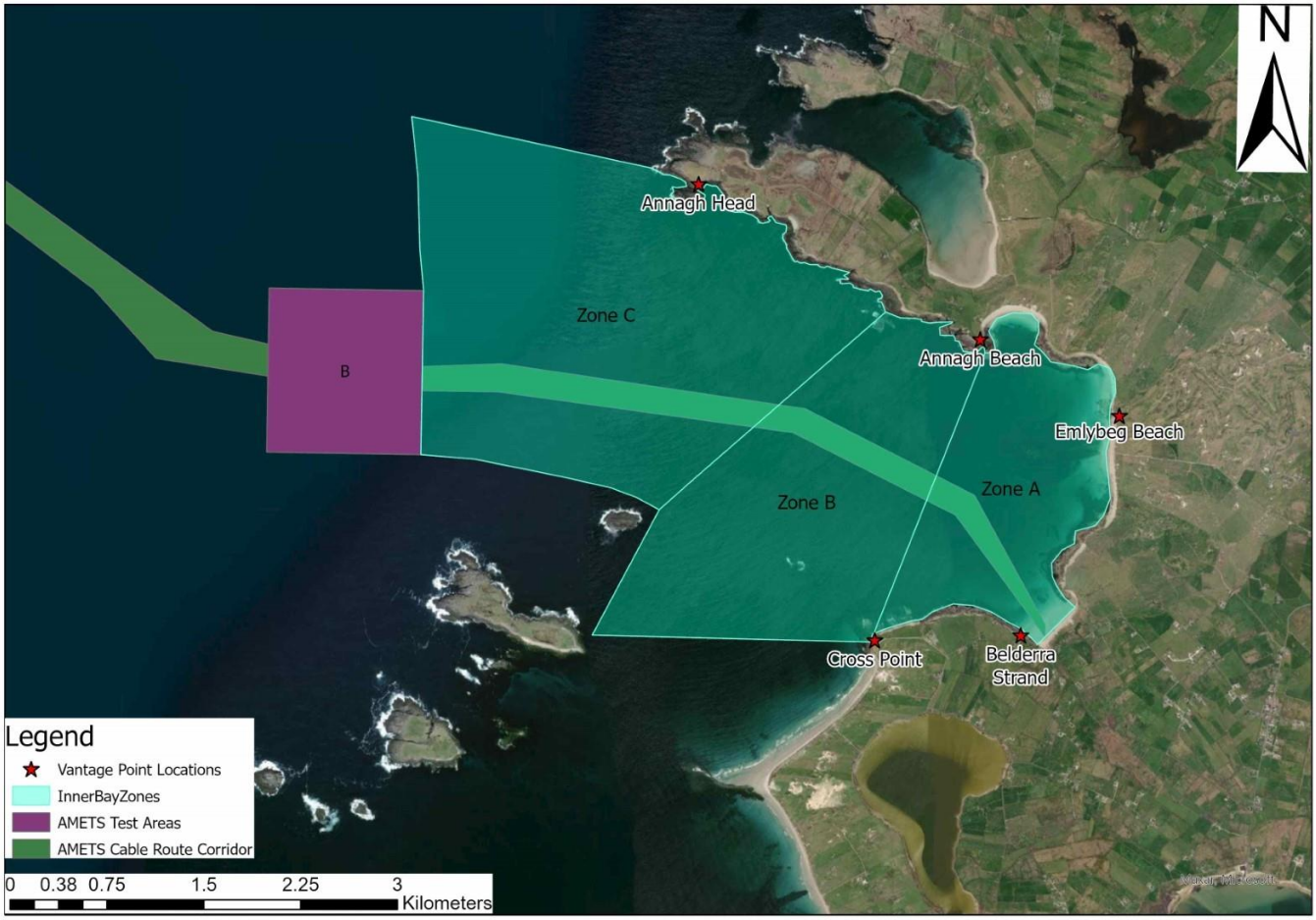

Figure 8-9: Inner Bay Count Sectors and Vantage Point Locations Used During the Land-based Survey

Source: EcoÉireann (October 2020)

A series of bespoke dusk/dawn surveys were completed throughout the overwintering period to capture the movement of Whooper Swan and Barnacle Goose within or between relevant SPA habitats, including foraging and roosting sites. Distribution surveys of shorebirds using I-WeBS methods were completed on a monthly basis throughout the year on shoreline habitats surrounding the study area and will be analysed to inform the EIA baseline. Flight lines indicating Goose roost movements to and from the surrounding islands over the inner bay are indicated in Figure 8-10.

Figure 8-10: Goose Roost Movement Flight-line Map

Source: EcoÉireann (October 2020)

Ordnance Survey Ireland

8.5.3 Relevant Guidance

The following guidance documents, which align with that which is available for the offshore renewables industry, will be used for the assessment of impacts on offshore ornithology:

- Bird Census Techniques (Bibby *et al*., 2000)
- Trialling a Seabird Sensitivity Mapping Tool for Marine Renewable Energy Developments in Ireland (Burke, 2018)
- Towards standardised seabirds at sea census techniques in connection with environmental impact assessments for offshore wind farms in the U.K.: a comparison of ship and aerial sampling methods for marine birds, and their applicability to offshore wind farm assessments (Camphuysen *et al*., 2004)

- Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments January 2017 (Joint SNCB, 2017)
- Developing an avian collision risk model to incorporate variability and uncertainty (Masden, 2015)
- Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas (Thaxter *et al*., 2012)
- Seabird monitoring handbook for Britain and Ireland (Walsh *et al*., 1995)
- Counting birds from ship'. In J. Komdeur; J. Berelsen and G. Cracknell Manual for aeroplane and ship surveys of waterfowl and seabirds (Webb and Durink, 1992)
- Assessing the Sensitivity of Seabird Populations to Adverse Effects from Tidal Stream Turbines and Wave Energy Devices (Furness *et al*., 2012)
- Developing Guidance on Ornithological Cumulative Impact Assessment for Offshore Wind Farm Developers (King *et al*., 2009)
- Renewable Energy Technologies and Migratory species: Guidelines for Sustainable Deployment (UNEP, 2014)
- Revised Best Practice Guidance for the Use of Remote Techniques for Ornithological Monitoring at Offshore Windfarms (RPS, University of Aberdeen, FERA and COWRIE, 2009)
- Offshore Wind Plan, Technical Note: Updated Bird Foraging Ranges (ABPmer, 2020 b)
- The avoidance rates of collision between birds and offshore turbines (Cook *et al*., 2014)
- Assessing vulnerability of marine bird populations to offshore wind farms (Furness *et al*., 2013)
- Barriers to movement: impacts of wind farms on migrating birds (Masden *et al*., 2009).

8.5.4 Design Parameters

Project design parameters relevant to offshore ornithology are listed in Table 8-23. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 8-23: Design parameters and relevance to offshore ornithology

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade site from 10 MW to 20 MW.	Scale of proposal will affect the extent of overall risk / impacts to offshore ornithology.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test	Scale of proposal will affect the extent of overall risk / impacts to offshore ornithology. Overall relevance of seabed lease site is limited given

Design parameter	Technical details – worst case scenario	Relevance
	Area A, 1 single or dual rotor FOW on Test Area B	likely levels of deployment. Floater system may be relevant in terms of attracting species which may utilise infrastructure as a roost feature such as gull species or terns.
Maximum tip height	300 m Test Area A, 110m Test Area B	Minimum and maximum tip heights will have relevance. Scale of turbine has been used in defining height bands in baseline recording.
Maximum speed of turbine rotation (tip speed) and blades per turbine	3 MW is smallest turbine – maximum rotation speed is based on a turbine of this diameter. Number of blades 2 or 3.	Speed of rotation and number of blades will be relevant.
Colour of turbine	Likely grey	Turbine colour relevance to detection / avoidance by birds will be examined as part of EIA process.
Separation distance between FOW devices	Minimum anchoring area is about 2.5 km^2 for the turbines	Fishing activities are limited within study area. Exclusion may limit abundance of species which associate with presence of fishing vessels. The extent of exclusion is unlikely to influence bird species on a detectable level.
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor	Type of anchoring system will affect benthic prey species for birds. The extent of disturbance is dependent on the mooring system utilised, the number and size of anchors.
Minimum deployment period FOW devices	12 months minimum Anchors may remain for lifetime of site for use for subsequent deployment of demonstration devices.	Duration of deployment for individual turbines / overall lifetime of unit deployment will be relevant.
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will result in physical disturbance of seabed, and potentially resulting in benthic disturbance to prey species of birds.
Helicopter access	Emergency helicopter access may be required.	Helicopter access may result in short term disturbance during operation.

Design parameter	Technical details – worst case scenario	Relevance
Navigational lighting	Devices will meet with international requirements for lighting.	Installation of lighting may be relevant to certain species of seabirds where light can act as a source of attraction to the units.
Aviation lighting	Devices will meet with international requirements for lighting and Irish Aviation Authority.	Installation of lighting may be relevant to certain species of seabirds where light can act as a source of attraction to the units.

8.5.5 Embedded Mitigation

No specific design measures have been included at early stages to avoid risks to bird populations, however the following parameters are noted:

- the overall scale of the proposed development is limited in terms of magnitude relevant to offshore wind
- the site is located outside the boundaries of all Natura 2000 sites present
- cables buried where possible to minimise EMF effects on seabird prey species and carried out during summer months where possible
- efficiency of operations to minimise installation and decommissioning time, thus disturbance
- limiting of intertidal construction activities to summer months when weather conditions are better, helps to avoid disturbance to wintering waders
- inclusion of a Construction Environmental Management Plan (CEMP) that will cover aspects such as any accidental spills of environmentally harmful substances.

The following mitigation measures may be considered for ornithological impacts:

- vessels restricted to defined navigational routes to minimise disturbance.
- soft start procedures implemented for noisy equipment and activities, to reduce underwater noise risk for diving birds
- devices designed to avoid entrapment of birds.

8.5.6 Scoping of EIA

Table 8-24 lists potential impacts from project activities on offshore ornithology, together with proposals on whether they should be scoped in or out of the EIA phase dependent on their likelihood of having a significant effect.

Table 8-24: Activities and potential impacts scoped in or out

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment/ installation		
Underwater noise from installation activities resulting in harm or disturbance to sensitive species	Out	Diving species spend limited time under water and so disturbance through underwater noise created by deployment / installation works is limited.
Accidental events, e.g., oil or fuel spill (also applicable to operation and decommissioning)	In	Potential impacts of non-planned events (where sufficient good practice measures are in place to render the chance of such events occurring minimal) are minimal, however should such an accident happen the consequences may have severe impacts on offshore ornithology. Each site developer will prepare an Environmental Management Plan which will include a Pollution Management Plan.
Operation		
Underwater noise from operation of FOW	Out	The underwater noise from FOW devices is lower during operation and so disturbance is limited.
Creation of physical obstacles increasing collision risk	In	FOW devices may be placed in migratory or foraging pathways resulting in an increased risk of collisions between bird species and turbines (see Table 8-25).
Direct habitat loss of feeding grounds from presence of cables and other infrastructure	In	Placement of FOW devices may cause displacement impacts for species (see Table 8-25); however, the devices are unlikely to create barrier effects to feeding grounds
Impact on prey species	In	Aggregation of fish around FOW device may increase collision risk. Changes in prey distribution may alter bird species distribution.
Lost fishing gear entanglement in infrastructure – leading to ghost fishing	In	Entanglement risk may be a factor for diving bird species, potentially leading to a reduction in population numbers.
Cumulative impacts	In	Impact interactions may arise from different FOW activities, over the installation, operation and decommissioning phases. Cumulative impacts may also occur from interactions with other projects in the area.
Decommissioning		
Decommissioning impacts – as above for installation works.	In	As during installation works, similar impacts are expected.

Table 8-25 below sets out a review of potential effects on species recorded during offshore surveys completed prior to 2020 in the nearshore and offshore waters off the Mullet Peninsula. The table draws on sensitivity parameters reported by Burke *et al* (2018). However, sensitivity has been more coarsely assigned as 'low' or 'high' in relation to relevant effect pathways, applying conservative boundaries drawn from the scale of values applied by Burke *et al*. (2018) for collision risk and displacement. Throughout further detailed assessment, the scope of assessment may be refined further such as in the case of some species where presence in the study area is too limited to draw robust conclusions.

A series of further impacts (on a broader range of species) associated with nearshore and terrestrial ornithological elements will be applied to the environmental assessment process associated primarily with construction stage effects however these are not considered in detail in the table below and a good range of ornithological data is held to enable impact assessment and identification of mitigation measures for such features.

Table 8-25 presents a worst-case scenario in relation to species and impacts which may be considered; further analysis of contemporary and existing data may reduce the overall scope of detailed assessment in relation to relevant pathways.

Table 8-25: Potential impacts scoped in or out in relation to species recorded to date

Species	Sensitivity		Impact Pathway to be considered including rationale				Comments
	Collision risk (<60 = Low)	Disturbance / displacement (<5 = Low)	Collision Risk	Displacement	Barrier	Pollution	
Gannet	High	Low	Yes – abundant in study area and a high risk of collision	Yes – seasonal abundance of Gannet likely to be present on migration	Due to limited scale of development barrier effects are unlikely to be detectable for all species.	Yes – risk of pollution during construction and operation	Most abundant species in the study area recorded to date.
Manx shearwater	Low	Low	Yes - based on abundance, typical flight behaviour limits risk	Yes – large numbers of Manx shearwater present at times		Yes – risk of pollution during construction and operation	Consideration of most impact pathways required due to relative abundance as opposed to sensitivity. Recorded and published flight heights may mean that Collision Risk Modelling (CRM) is not undertaken.
Fulmar	Low	Low	Yes – based on abundance typical flight behaviour limits risk	Yes – large numbers of Fulmar present at times		Yes – risk of pollution during construction and operation	Consideration of most impact pathways required due to relative abundance as opposed to sensitivity. Recorded and published flight heights may mean that CRM is not undertaken.

Species	Sensitivity		Impact Pathway to be considered including rationale				Comments
	Collision risk (<60 = Low)	Disturbance / displacement (<5 = Low)	Collision Risk	Displacement	Barrier	Pollution	
Razorbill	Low	High	Yes	**Y**es		Yes – risk of pollution during construction and operation	Consideration of most impact pathways required due to relative abundance and sensitivity. Recorded and published flight heights may mean that CRM is not undertaken.
Kittiwake	High	High	Yes – abundant in study area and a high risk of collision	Yes – seasonal abundance of kittiwake likely to be present on migration		Yes – risk of pollution during construction and operation	
Great shearwater	Low	Low	Yes - Infrequent visitor to study area and flight characteristics limit exposure to risk	Yes- Infrequent visitor to study area and flight characteristics limit exposure to risk		Yes – risk of pollution during construction and operation	Recorded and published flight heights may mean that CRM is not undertaken.
Herring gull	High	Low	Yes	No		Yes – risk of pollution during construction and operation	Existing data indicates low abundance, and therefore lower risk of impact. This will be confirmed through the EIA process.
Lesser black backed gull	High	Low	Yes	Yes		Yes – risk of pollution during	Existing data indicates low abundance, and therefore lower risk

Species	Sensitivity		Impact Pathway to be considered including rationale				Comments
	Collision risk (<60 = Low)	Disturbance / displacement (<5 = Low)	Collision Risk	Displacement	Barrier	Pollution	
						construction and operation	of impact. This will be confirmed through the EIA process.
Great black backed gull	High	High	Yes	Yes		Yes – risk of pollution during construction and operation	Existing data indicates low abundance, and therefore lower risk of impact. This will be confirmed through the EIA process.
Common gull	High	Low	Yes	Yes		Yes – risk of pollution during construction and operation	Existing data indicates low abundance, and therefore lower risk of impact. This will be confirmed through the EIA process.
Storm petrel	Low	Low	No – unlikely to be sufficient data for activity at risk heights to provide a robust assessment or meaningful risk	Yes		Yes – risk of pollution during construction and operation	While the species is of low sensitivity populations are likely to be associated with SPA breeding colonies
Puffin	Low	High	Yes	Yes		Yes – risk of pollution during construction and operation	. Recorded and published flight heights may mean that CRM is not undertaken.

Species	Sensitivity		Impact Pathway to be considered including rationale				Comments
	Collision risk (<60 = Low)	Disturbance / displacement (<5 = Low)	Collision Risk	Displacement	Barrier	Pollution	
Black guillemot	Low	High	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	Yes		Yes – risk of pollution during construction and operation	
Guillemot	Low	High	Yes	Yes		Yes – risk of pollution during construction and operation	Recorded and published flight heights may mean that CRM is not undertaken – (this relates to instances where flight heights available are not sufficient to be plugged into modelling software)
Sooty shearwater	Low	Low	Yes	Yes		Yes – risk of pollution during construction and operation	Recorded and published flight heights may mean that CRM is not undertaken.
Shag	High	High	Yes	Yes		Yes – risk of pollution during construction and operation	Near shore distribution may limit risk on detailed assessment.
Great skua	High	Low	Yes	Yes		Yes – risk of pollution during construction and operation	

Species	Sensitivity		Impact Pathway to be considered including rationale				Comments
	Collision risk (<60 = Low)	Disturbance / displacement (<5 = Low)	Collision Risk	Displacement	Barrier	Pollution	
Arctic skua	High	Low	Yes	Yes		Yes – risk of pollution during construction and operation	Existing data indicates low abundance, and therefore lower risk of impact. This will be confirmed through the EIA process.
Arctic tern	High	High	Yes	Yes		Yes – risk of pollution during construction and operation	
Barnacle goose	High	High	Unlikely at this stage due to the known distribution and use of the study area at this stage.	No	No	Yes – risk of pollution during construction and operation	Onshore distribution will minimise any impacts associated with displacement or barrier effect.
Long tailed duck	n/a	n/a	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	Unlikely at this stage due to the known distribution and use of the study area at this stage		Yes – risk of pollution during construction and operation	
Brent goose	High	n/a	Unlikely at this stage due to the known	No		Yes – risk of pollution during	

Species	Sensitivity		Impact Pathway to be considered including rationale				Comments
	Collision risk (<60 = Low)	Disturbance / displacement (<5 = Low)	Collision Risk	Displacement	Barrier	Pollution	
			distribution and use of the study area at this stage.			construction and operation	
Oystercatcher	n/a	n/a	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	No		Yes – risk of pollution during construction and operation	Main impacts relate to cable landfall operations.
Cormorant	High	High	Yes	Yes		Yes – risk of pollution during construction and operation	Near shore distribution may limit risk on detailed assessment.
Dunlin	n/a	n/a	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk			Yes – risk of pollution during construction and operation	Main impacts relate to cable landfall operations.
Great Northern diver	High	High	*Yes*	*Yes*		Yes – risk of pollution during construction and operation	

Species	Sensitivity		Impact Pathway to be considered including rationale				Comments
	Collision risk (<60 = Low)	Disturbance / displacement (<5 = Low)	Collision Risk	Displacement	Barrier	Pollution	
Pomarine skua	High	n/a	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk		Yes – risk of pollution during construction and operation	
Black headed gull	High	High	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk		Yes – risk of pollution during construction and operation	
Common tern *(Sterna hirundo)*	High	High	Yes	Yes		Yes – risk of pollution during construction and operation	Existing data indicates low abundance, and therefore lower risk of impact. This will be confirmed through the EIA process.
Glaucous gull *(Larus hyperboreus)*	High	High (tbc)	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk		Yes – risk of pollution during construction and operation	

Species	Sensitivity		Impact Pathway to be considered including rationale				Comments
	Collision risk (<60 = Low)	Disturbance / displacement (<5 = Low)	Collision Risk	Displacement	Barrier	Pollution	
Grey phalarope	Low	High (tbc)	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	Yes		Yes – risk of pollution during construction and operation	
Litte auk	n/a	High (tbc)	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk			Yes – risk of pollution during construction and operation	Recorded and published flight heights may mean that CRM is not undertaken.
Red necked phalarope	Low	High (tbc)	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk		Yes – risk of pollution during construction and operation	
Red throated diver	High	High	No – unlikely to be sufficient data or activity to provide a robust assessment or meaningful risk	Yes		Yes – risk of pollution during construction and operation	Impacts likely to relate primarily to nearshore construction / cable laying.

8.5.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-1 and Figure 6-2 identifies those projects which may have cumulative impacts with Protected Sites and Species impacts from the AFLOWT project, and will be considered in the EIAR.

8.5.8 Scope to Appropriate Assessment

Offshore ornithology aspects will be addressed under Appropriate Assessment- see section 2.5 and 8.1.8.

While the site is located outside of relevant SPA designations, the proposed development is well within the foraging range of a significant number of species associated with the SPAs; the minimum extent of SPA sites that will be considered are presented in section 8.1.

For any non-Irish designated sites identified, the relevant authorities will be consulted with: Natural England for sites in England, the Northern Ireland Environment Agency (NIEA) and Natural Resources Wales (NRW) for sites in Wales.

8.5.9 Approach to EIA

The approach to the EIAR chapter for marine mammals will follow the general guidance set out in section 6.1 and more specific guidance set out in section 8.5.3:

- A desk-based literature review will be undertaken to expand on the offshore and coastal species identified within the project area in the Scoping Report, and to identify further information on breeding and wintering grounds. Desk-based study will include furthering the review of cumulative impacts, and also include a review of any relevant stakeholder consultations
- boat-based survey data will be analysed to bolster the baseline desk-based study and will feed into the ornithological impact assessment.

The EIAR chapter will include consideration of the following data analyses for key species. The consideration of relevant risk will be proportionate to the scale of the proposals:

- Distance analyses – to produce measures of bird density and abundance where sufficient data allows. As a guide, this will be undertaken for species where there are more than 60 separate records over the survey period
- collision Risk Modelling – will be undertaken to provide model outputs for key species accounting for worst case design parameters and relevant seabird biometric data. The species which will be considered in relation to CRM are likely to be those whose flight characteristics place them at higher risk, which will include as a minimum Gannet and Kittiwake, but may extend to a range of other gull or skua species. The relevant version of CRM modelling will be applied in agreement with stakeholders; currently it is expected that the Marine Scotland CRM tool will be applied
- displacement analyses – will be undertaken where appropriate in relation to those species where sufficient data is available. Species considered within any

assessment of displacement risk will be undertaken in accordance with contemporary guidance on the subject likely to be that prepared by JNCC in 2017.

- population viability analysis – Where key impacts are identified through consideration of long-term risks. Where impact assessment (collision mortality and displacement effects) suggests that population modelling will be required to determine that the proposed development would have no likely significant effect on the relevant regional seabird populations.

In addition to the data derived from boat and aerial surveys further context will be brought to the assessment form bespoke coastal observations of seabird movements in addition to observations of usage of the bay area, and coastline in relation to the cable landfall. The overall assessment will be informed by up-to-date seabird populations of key sites where possible where these have been subject to survey in 2021 by National Parks and Wildlife Service or as part of the project ornithology survey scope.

A high-level initial review of species which may be subject to potential effects, and which will be considered in the EIA process, is set out above. It is likely based on the volume of available data that the focus of the EIAR will be in relation to a smaller number of species than are included once a detailed review of the volume of available contemporary information has been undertaken.

8.5.10 Scoping questions

The following points are made regarding the surveys and data available:

- the study area has been subject to a range of surveys using boat-based and shore-based platforms between 2009 – 2013. A gap analysis completed identified that while survey data is available over a number of years, some gaps in survey information are present. Notably gaps or limited data is available during the winter period
- following the identification of data limitations, a series of surveys were commenced from August 2020 - July 2021. Through careful planning a full 12 months of data from a boat-based platform has been collected across the period, with no data gaps. This data has been augmented in months where data gaps were previously identified through the application of digital aerial survey
- in addition to the application of boat and aerial survey, vantage point surveys have been undertaken from Annagh Head in a range of conditions to attempt to close potential data gaps relating to seabird movements under conditions which are not suited to the completion of either boat based or aerial survey effort.

Considering these points, do you consider that the data is suitable to inform both the EIA and AA processes?

9 HUMAN ENVIRONMENT

9.1 Ports, Shipping and Navigation

9.1.1 Receiving Environment

The study area for ports, shipping and navigation has been defined as AMETS Test Areas A and B and export cable route plus a 10 nm buffer. This is consistent with the original AMETS EIA. For AMETS the traffic analysis area of interest was 10 nautical miles from any point on the boundary of Test Area A. Other parameters such as ports, harbours, fishing areas outside this area have been included, however.

There are a number of navigational hazards inshore from the Test Sites including islands, rocks and shoals. The closest navigational light is on Eagle Island to the northeast.

Shipping activity in the area includes commercial, fishing and recreational vessels.

Commercial fisheries interaction is also covered in section 9.4 and risk of major accidents and disasters is covered in section 9.6.

9.1.2 Data sources and Baseline

As indicated in section 5.5.2 the development of ports and harbour facilities for offshore renewable energy projects is under review by the Department of Transport. Pending a review of overall National Ports Policy in 2022, the Department in conjunction with the Irish Maritime Development Office (IMDO), carried out an assessment of the options for Irish commercial State Ports to facilitate the ORE sector and assist in Ireland achieving its emission reduction targets. A Ports Co-ordination Group will be established to coordinate port responses and maintain policy alignment. (DoT, 2021).

For the original AMETS EIA carried out in 2011, a Navigation Risk Assessment (NRA) was undertaken for the proposed offshore wave energy devices Test Site. The original NRA will be reviewed and updated for the proposed development, noting that the FOW proposals are markedly different. The assessment of impacts will be based on the revised NRA.

The data sources in Table 9-1 were used to gather data on ports, shipping and navigation for this scoping report:

Table 9-1: Data sources

Name of Source	Date accessed	Data overview
AMETS EIS - Chapter 12 – Navigational Risk Assessment (SEAI, 2011)	19/10/2021	Desktop and survey data detailing the navigational risks associated with the site. Navigation risk assessment based on: • Investigation of the existing environment • Consultation with stakeholders, users of area (fishing industry, marine industry, marine leisure), and relevant national authorities and harbour authorities

Name of Source	Date accessed	Data overview
		• Semi-quantitative analysis of the traffic data in the area, based on 28 days of vessel traffic survey data collection in area in 2010/2011 (winter survey 26/11/2010 to 10/12/2010; summer survey 23/05/2011 to 14/06/2011). Combination of three sources: AIS data, shore-based radar, visual observations. • Data for the months of January and July 2010 sourced from the Irish Coastguard.
AMETS EIS – Appendix 9 – AMETS Navigational Risk Assessment (SEAI, 2011)	19/10/21	Further detailed information on navigational risk for the Test Site.
Admiralty Sailing Directions, Irish Coastal Pilot, NP 40, (17th Edition) (UK Hydrographic Office, 2006)	19/10/21	Provides information on navigational risks such as location of wrecks, metocean data, etc.
Ireland's Marine Atlas (Marine Institute, 2022)	2022	Presence of national ferry routes, ports, navigation buoys, lighthouses and vessel density.
EMODnet – Human Activities and CLS (2021)	2022	Vessel density information.

9.1.2.1 Navigational features

Hazards to navigation in the area include Edye Rock (known locally as Mainistir), the islands along the Mullet Peninsula (Eagle Island, Inishglora, Inishkeeragh, Inishkea North and Inishkea South), and the Usborne Shoal, see Figure 9-1.

There are a number of navigational lights in the vicinity of AMETS as shown in Figure 9-2. The closest light to Test Areas A and B is on Eagle Island to the northeast.

No commercial shipping lanes intersect either Test Area location. The nearest ferry route from Test Area A is the Clare Island ferry 51.21 km away. The distance from Belmullet Port to Test Area A is approximately 23km and approximately 13km to Test Area B. There are no merchant shipping ports in close proximity to the AMETS site, the closest commercial ports include West Port which is 60.05 km from Test Area A, Galway to the southeast and Sligo to the northeast, see Figure 9-3. There are fisheries harbours at Rossaveal, west of Galway and at Killybegs, north of Sligo. Killybegs is a deep-water harbour and is also used by non-fishing vessels including offshore supply vessels and an increasing number of passenger lines. Smaller harbours, piers and slipways are dotted along the coast in the area, see Figure 9-4. There are no vessel routeing measures in place in the locality of the AMETS site.

No wrecks were identified during the seabed survey carried out for the site evaluation and selection report. Admiralty maps for the area close to the AMETS location also have no record of the presence of wrecks. A license for Site investigation surveys was applied

for to the Foreshore License Unit in January 2020, once this is approved further information will be available.

In terms of other users, there are no dredging activities in the vicinity of the AMETS site and no military exercise areas. There is a large operational natural gas field (Corrib) located approximately 65 km offshore from northwest County Mayo. This gas field has been developed as a subsea 'tie-back' facility, connected by a pipeline to an onshore processing terminal (Bellanaboy Bridge Gas Terminal). The offshore pipeline is laid on the seabed for the majority of its 83 km length, with a rock buried section in inshore waters covering the landfall approaches at Glengad. The closest point of the offshore gas pipeline is approximately 2.9 nautical miles (nm) to the north of Test Area A, see Figure 6-3 in Section 6. Since going into operation, the degree of vessel traffic associated with the project is typically limited to annual surveys of the offshore pipeline, with other periodic maintenance and upgrade works to the pipeline and other seabed infrastructure.

Inshore fishing is the principal type of fishing in the region of the AMETS and is carried out along the entire coast. Generally inshore vessels will not travel more than 25 miles west of the mainland when fishing. The fishing effort is largely focused on crab and lobster potting, with some gill netting and trawling, see Figure 9-5. The inshore fishing season extends from March to November, with the busiest time during the summer months. There is also whitefish or pelagic fishing with larger vessels to the west of the AMETS site in deeper waters.

Marine leisure traffic includes boating and sailing, sea angling and diving and water sports (surfing, rowing, kayaking, etc).

According to the *Admiralty Sailing Directions – Irish Coastal Pilot*, Irish coastal waters enjoy 'a mild maritime climate although it is also a boisterous one with strong winds and high seas. Higher seas are experienced off the west coast of Ireland than in any other coastal region of the British Isles'. Consultation also identified fog as a navigational hazard, with extremely heavy fog being common in summer.

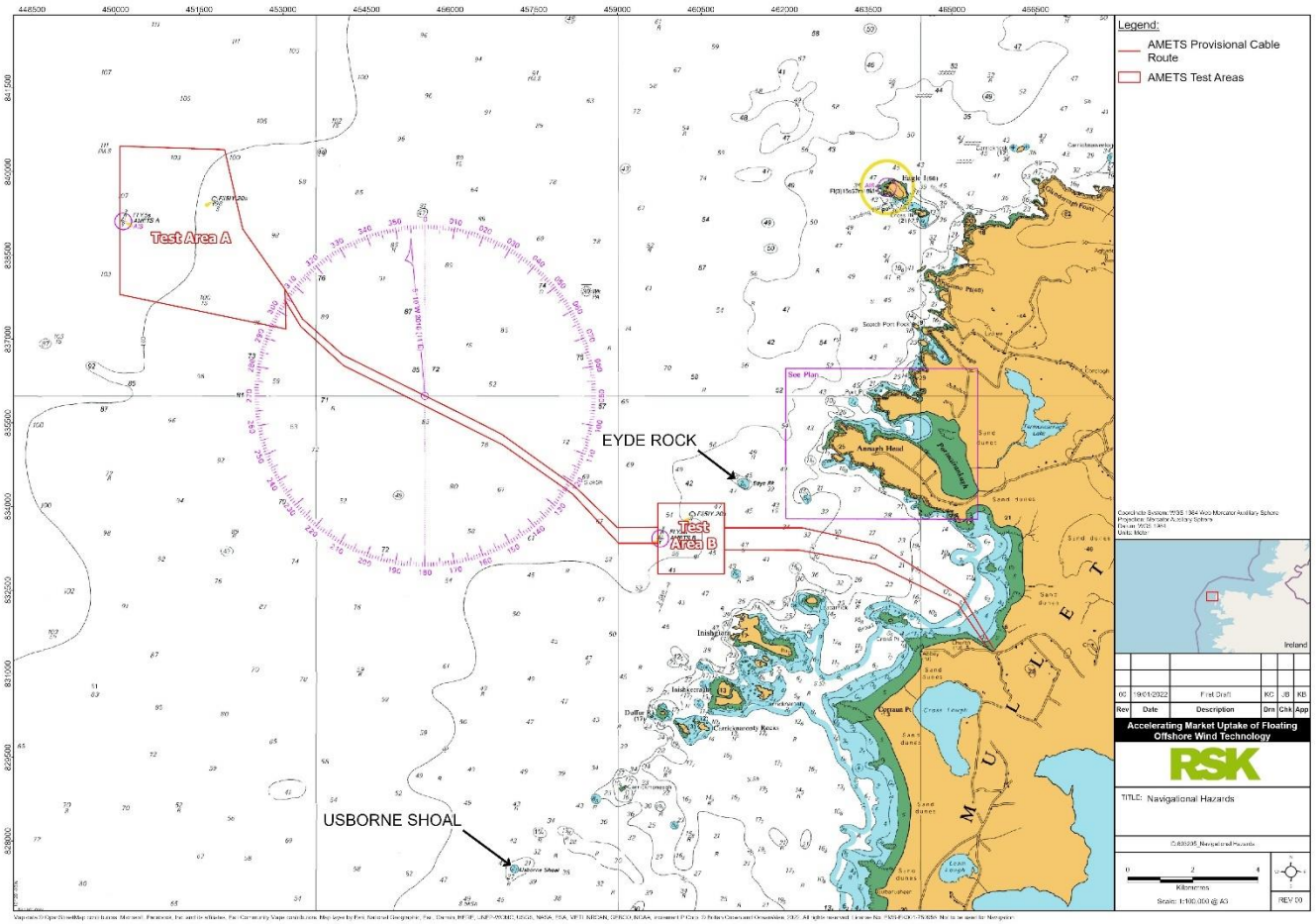

Figure 9-1: Navigational Hazards: Location of Edye Rock and Usborne Shoal

Source: Based on information in Sustainable Energy Authority of Ireland (2011)

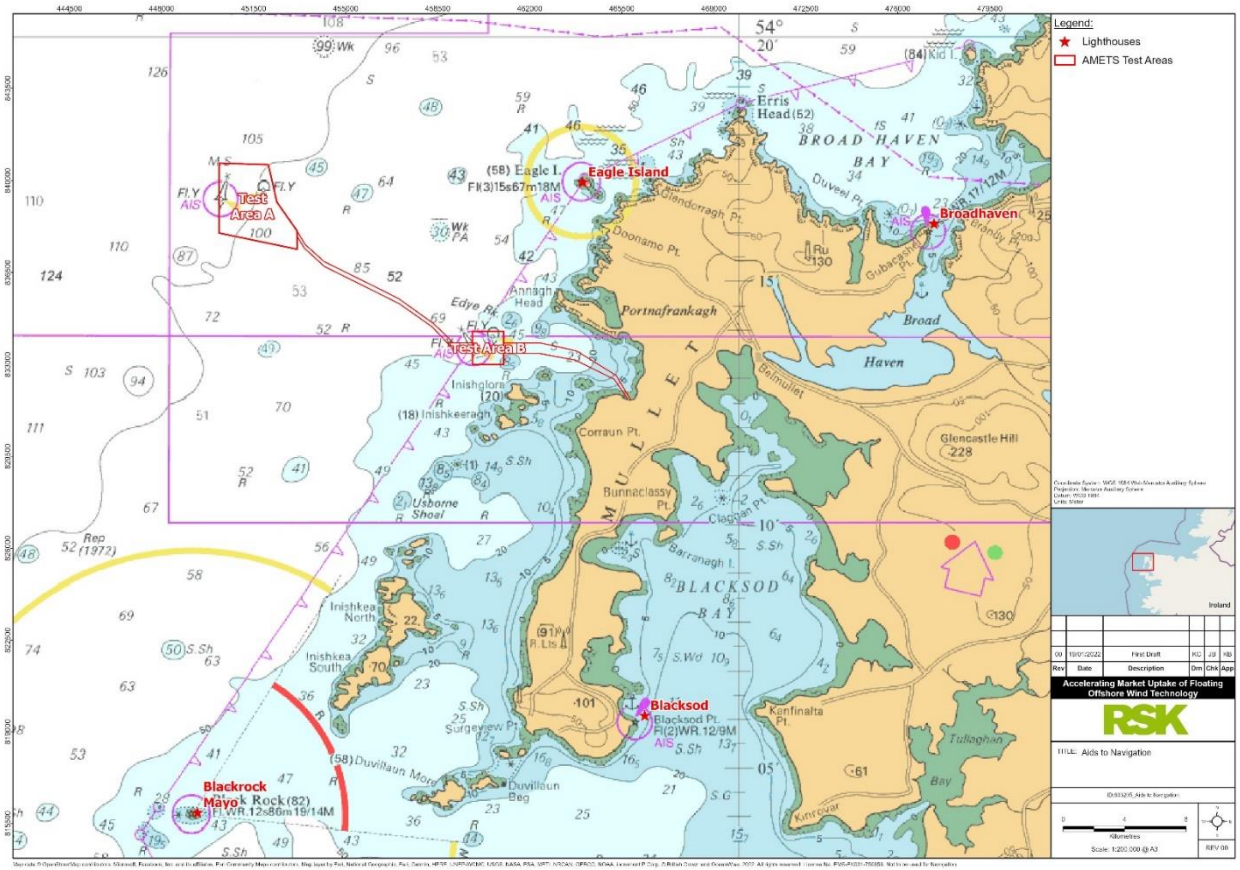

Figure 9-2: Aids to navigation in the vicinity of the AMETS site

Source: Based on information in Sustainable Energy Authority of Ireland (2011)

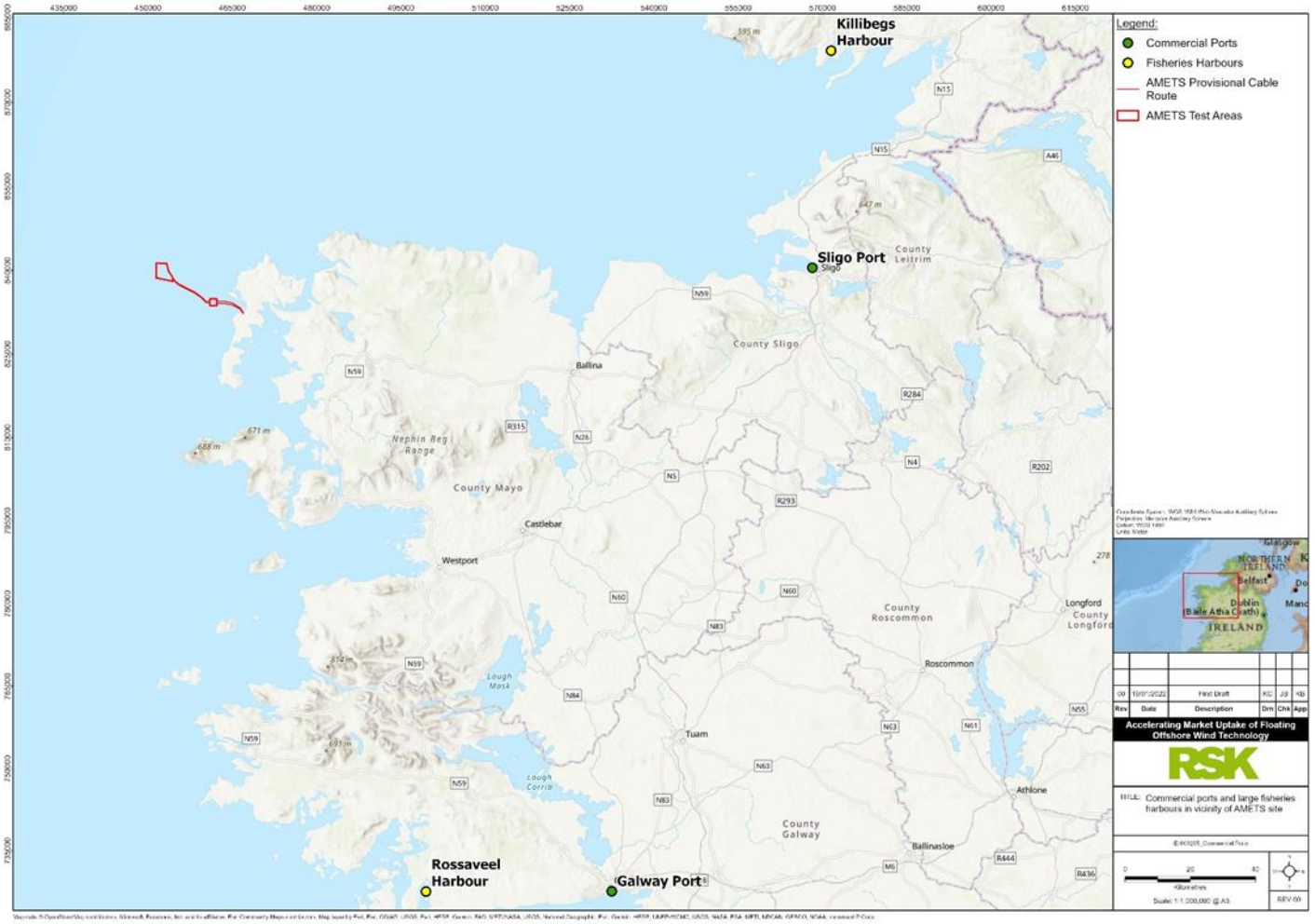

Figure 9-3: Commercial ports and large fisheries harbours in vicinity of AMETS site

Source: Based on information in Sustainable Energy Authority of Ireland (2011)

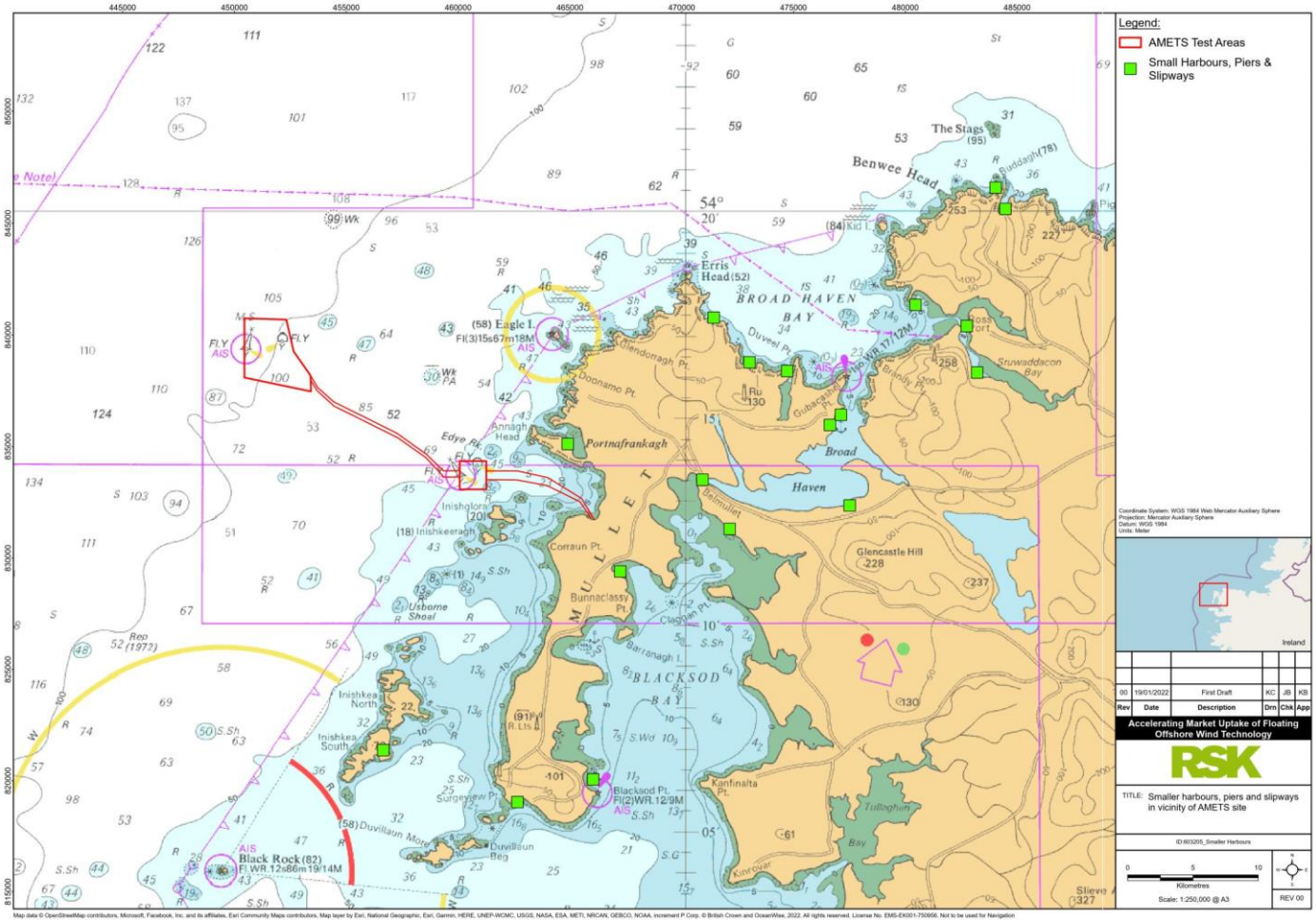

Figure 9-4: Smaller harbours, piers and slipways in vicinity of AMETS site

Source: Based on information in Sustainable Energy Authority of Ireland (2011)

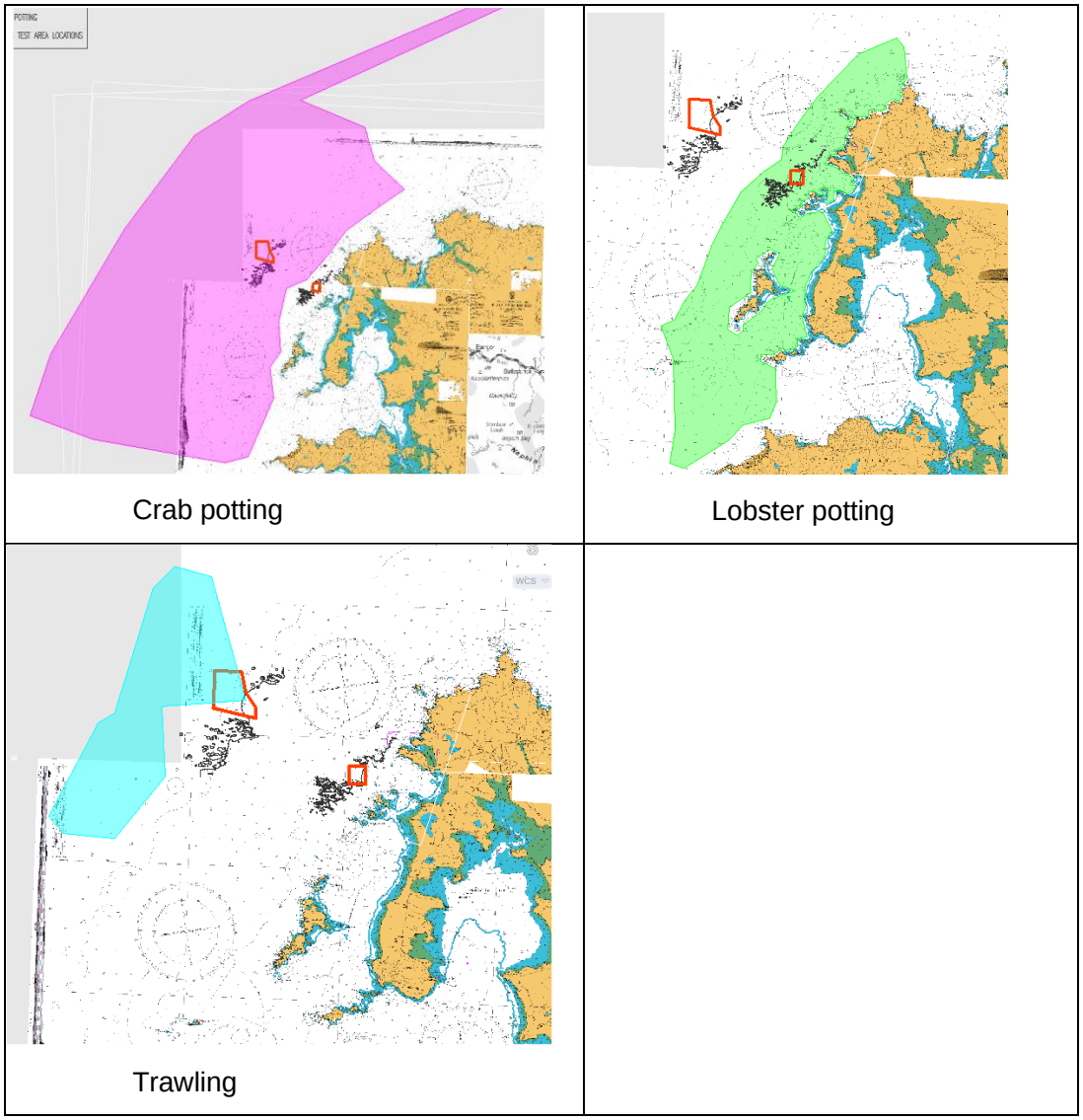

Figure 9-5: Fishing areas in vicinity of AMETs site

Source: Sustainable Energy Authority of Ireland (2011)

9.1.2.2 Vessel traffic

As specified in Section 9.1.2.1, vessel traffic information was collected during a winter and summer period (2010 / 2011) using Automatic Identification System (AIS) data, shore-based radar, and visual observations. It is noted that the data is several years' old and given recent events having an impact on shipping, such as Brexit and COVID-19 (RTE, 2021; Irish Maritime Development Office, 2021), updated vessel traffic data will be reviewed when the original NRA is updated for the subsequent EIA phase.

The 2010 / 2011 data indicated that there was a considerable number of vessels classed as cargo and 'other' travelling from east to west and vice versa to the north of the AMETS site. It was surmised that these vessels were probably involved in the Corrib gas field installation activities that were taking place at that time. Table 9-2 summarises the number of tracks associated with each category of vessel identified within the area of interest.

In the winter survey 11 out of 12 vessels passing within Test Area A were fishing vessels. The one remaining track was unidentified. During the summer survey the majority of tracks were again fishing vessel (7), with 1 cargo, 1 other and 1 unidentified. Little vessel navigation activity was recorded within the boundaries of Test Area B. No vessels tracks were identified during the winter survey and only 3 tracks recorded during the summer survey (1 fishing vessel, 1 recreational and 1 other).

Table 9-2: Number of AIS tracks per vessel type during winter and summer survey (across both Test Area A and B)

Number of AIS tracks per category (across both Test Area A and B)	Winter survey (2010) Location: Doonamoe blowhole to 54°15'53.96''N, -10°4'34.10''E Survey period: 15 days (but 11 days 21 hours considered)	Summer survey (2011) Location: Eagle Island lighthouse to 54°16.991'N, -10°5.573'E Survey period: 23 days (but 16 days 3 hours considered)
Fishing	84	58
General cargo	10	17
Recreational	1	15
Fish processing	7	0
Naval	0	2
Tanker	0	1
Other	0	12
Unidentified	3	4
Total	**105**	**109**

Figure 9-6 and Figure 9-7 present the vessel tracks passing within the area of interest over the two survey periods.

During the winter survey the highest vessel track density occurs in the inshore area along the coast between the two Test Areas as the vessels travel around Erris Head. The vessels continue along the coast passing outside the islands off the coast of Mayo. During the summer period, inshore fishing vessels were more frequently recorded, coinciding with the fishing season of March to November (Navigation Risk Assessment in SEAI, 2011) (see section 9.4 on commercial fisheries). There was higher vessel activity recorded to the north of the Test Areas, but this was related to the Corrib offshore gas field installation.

Limited recreational vessel[27] activity was identified passing within the area of interest around the AMETS site. The winter survey shows particularly limited activity with only

[27] It is important to note that carriage of AIS is not mandatory for recreational vessels, although some (probably larger) vessels carry it voluntarily. The recreational vessel not carrying AIS and travelling in the vicinity of the AMETS were recorded by radar and visually by personnel manning survey equipment at the survey site.

one recreational vessel track identified over the whole survey period. The summer survey recorded 15 recreational tracks which comprised yachts, sailing boats and RIBs. The vast majority of recreational vessels use the inshore area thus the routes taken by the vessels are a considerable distance from where Test Area A is located. The recreational vessels travel close to the location of Test Area B.

It is important to note that AIS is not compulsory for smaller fishing vessels (less than 15 m) and vessels less than 300 gross tonnage (which includes most recreational vessels), thus some tracks may have not been recorded.

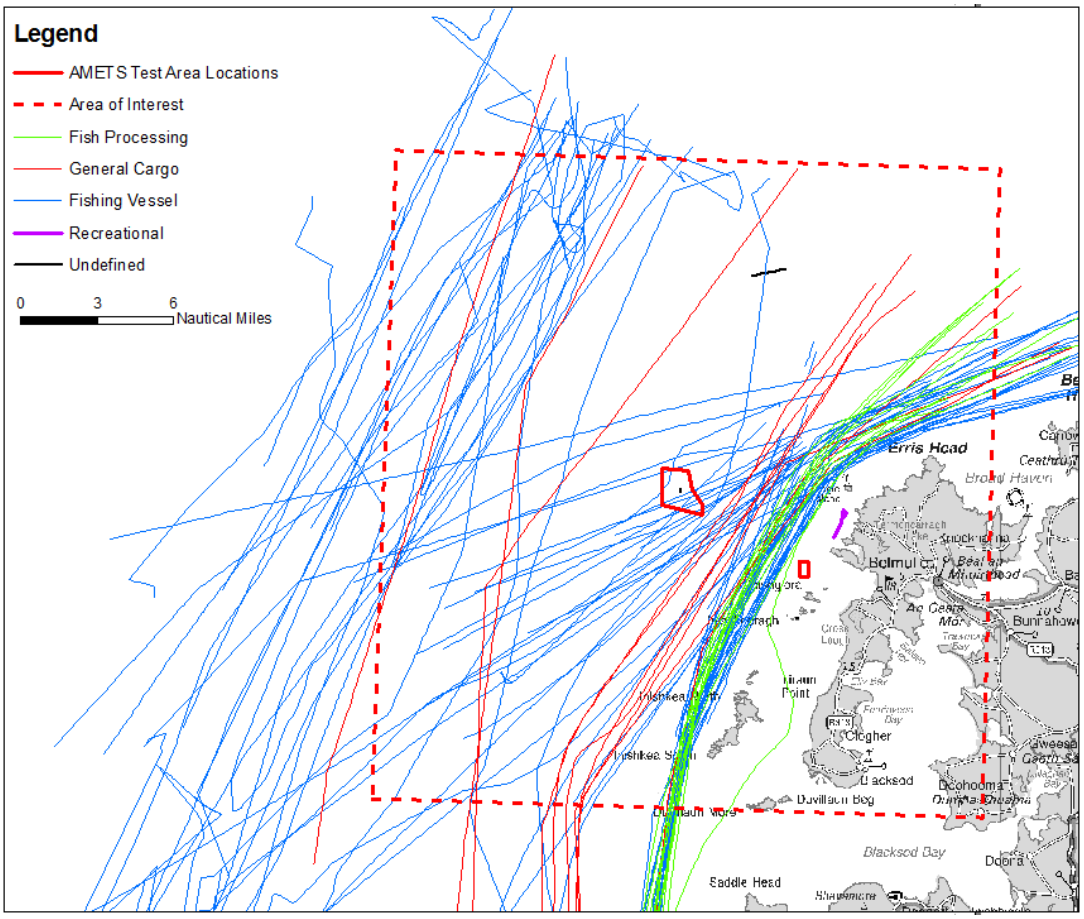

Figure 9-6: Vessel tracks colour-coded by vessel type - winter survey period

Source: ARUP for Sustainable Energy Authority of Ireland (2011)

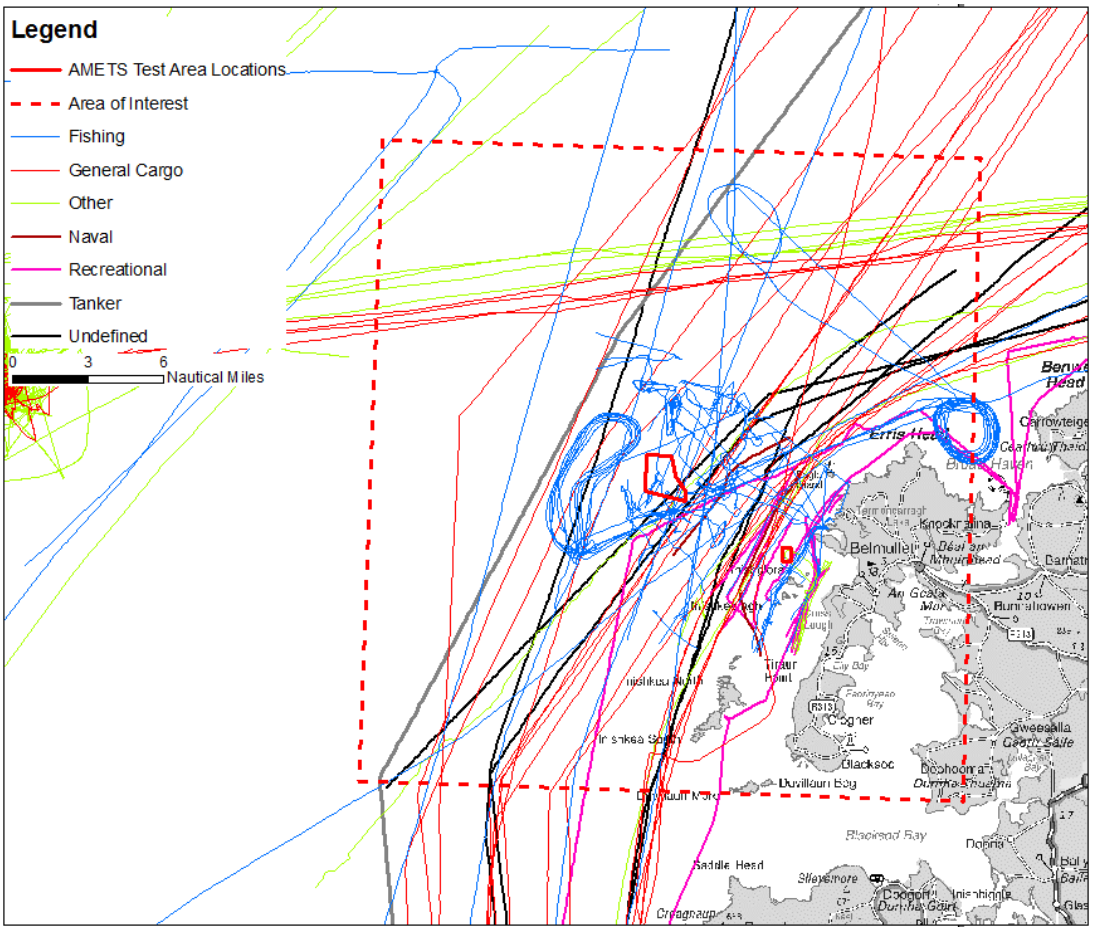

Figure 9-7: Vessel tracks colour-coded by vessel type - summer survey period

Source: ARUP for Sustainable Energy Authority of Ireland (2011)

More recently, vessel density in the area has been lower, likely due to reduced cargo vessels following Brexit (RTE, 2021). Figure 9-8 shows vessel density in the area for 2020.

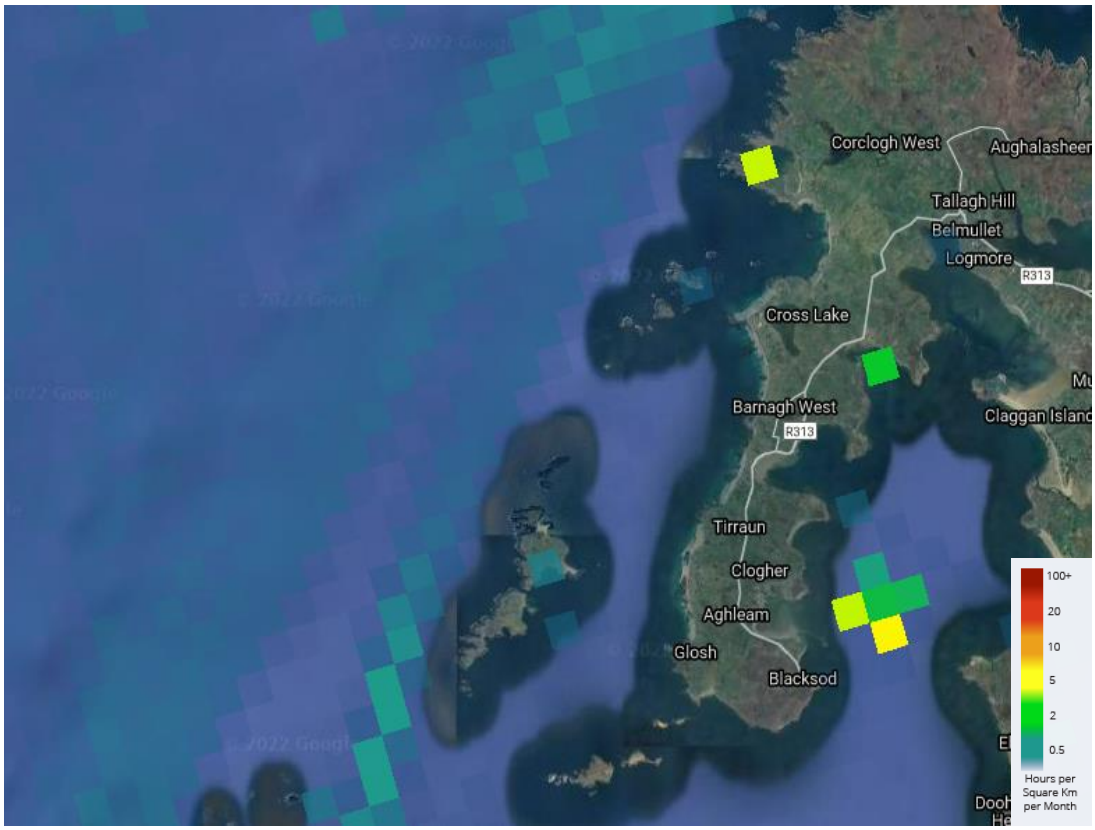

Figure 9-8: Vessel density 2020 around the AMETS study area

Source: EMODnet – Human Activities and CLS, 2021

9.1.3 Relevant Guidance

Scoping for ports, shipping and navigation has been undertaken according to the Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Barnes, 2017). In addition to this guidance, the following guidance will be taken into consideration in the full EIA and Navigation Risk Assessment:

- Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms (UK Government, 2013)
- R0139 (O-139) THE MARKING OF MAN-MADE OFFSHORE STRUCTURES Edition 3.0 (IALA, 2021)
- Working at sea: Guidance – Offshore Renewable Energy Installations: Impact on Shipping (UK Government, 2012 (updated 2021)).
- Revised Guidelines for Formal Safety Assessment (FSA) in the IMO (International Maritime Organization) Rule-Making Process (IMO, 2018)
- National Risk Assessment for Ireland (Department of Defence, 2021)

- Convention on the International Regulation for Preventing Collision at Sea (COLREGs) – Annex 3. London. (IMO, 1972/77)
- International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974/1980)
- Marine Guidance Note MGN 654 (M+F): Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response (Maritime and Coastguard Agency, 2021a)
- Methodology for Assessing Marine Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations (OREI) (Maritime and Coastguard Agency, 2021b)
- Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017).

9.1.4 Design Parameters

Project design parameters relevant to ports, shipping and navigation are listed in Table 9-3. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-3: Design parameters and their relevance to ports, shipping and navigation

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Scale of proposal could affect the extent of overall risk / impacts to ports, shipping and navigation.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B.	Scale of proposal could affect the extent of overall risk / impacts to ports, shipping and navigation. If multiple floaters are installed at the site at one time the navigational risk may be greater. The larger the size of the FOW structures, the greater the risk of vessel allision.
Minimum blade clearance	25 m from HAT	Blade clearance will affect navigational risk.
Maximum speed of turbine rotation (tip speed) and blades per turbine	3 MW is smallest turbine – maximum rotation speed is based on a turbine of this diameter. Number of blades 2 or 3.	Speed of rotation and number of blades will affect navigational risk.
Minimum depth of water for anchoring system	96-107 m Test Area A 41-56 m Test Area B	Depth of anchoring could affect navigational risk. However at these anchor depths navigation should be less impacted than in shallower water.

Design parameter	Technical details – worst case scenario	Relevance
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor.	Type of anchoring system will affect navigational risk. Vessel displacement may occur due to presence of the mooring system, and potentially throughout the Test Areas when technology is deployed. There is no legal basis in Ireland to establish navigational safety zones for renewable energy developments[28], thus consultation with other users is paramount.
Minimum deployment period FOW devices	12 months minimum Potential for anchors to remain throughout the lifetime of the demonstration site (35 years) should they be used by subsequent developers.	Length of deployment will determine extent of displacement to shipping and navigation. There could also be a permanent impact on dredging activities if anchors are left in place for the duration of the lifetime of the demonstration site.
Navigational lighting	Devices will meet with international requirements for lighting.	Navigational lighting required as warning to mariners regarding location of devices.

9.1.5 Embedded Mitigation

The following measures will be considered for integration into the project design. During the EIA stage, any additional mitigation measures that may be required will be noted.

- buoys and navigational lighting to be installed in line with Commissioner of Irish Lights and IALA Recommendation (2021)
- notices to mariners issued and updates to nautical charts in line with relevant guidance
- implementation of safety zones, if authorised by the competent authorities (e.g. harbour authorities), during installation and potentially throughout deployment
- marine Coordination and communication to manage project vessel movements
- coordination with RNLI with regard to safety and emergency preparedness
- appropriate burial depth and protection for cables reduces likelihood of interaction with vessel anchors
- project vessels to comply with COLREG (IMO, 1972/77) and SOLAS (IMO, 1974)

[28] The 'Electricity (Offshore Generating Stations) (Safety Zones) (Applications Procedures and Control of Access) Regulations 2007 (SI No 2007/1948)' and the DECC 'Guidance Notes - Applying for safety zones around offshore renewable energy installations' are not applicable in Ireland.

- FOW blades will have clearance from the Highest Astronomical Tide (HAT) of 25m, (in line with industry good practice)[29]
- possible use of a guard vessel during installation and decommissioning works
- in the case of damage to the technology, FOW devices will be tracked to ensure that they can be retrieved rapidly.

During consultation, any additional mitigation measures identified will be taken forward to the EIA phase.

9.1.6 Scoping of EIA

Potential impacts relating to the project activities have been set out, scoped in or out dependent on their likelihood of having a significant effect on ports, shipping and navigation present in the study area, see Table 9-4.

Table 9-4: Activities and potential impacts scoped in or out

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Vessel displacement due to installation activities	In	Vessels may be displaced from their existing routes due to installation activities
Vessel to vessel collision risk between a third-party vessel and a project installation vessel	In	The presence of project vessels during installation may increase the likelihood of vessel to vessel encounters and increase collision risk
Vessel to structure allision risk due to the presence of new structures associated with the project	In	Partially complete and completed structures within the site could create an allision risk to passing traffic
Reduced access to local ports due to installation activities	Out	Local ports well placed to service the needs of the offshore renewable energy industry. Number of project vessels required for pilot project not sufficient to reduce access or affect ports
Operation		
Vessel displacement (commercial, fishing, recreational) due to the presence of new structures	In	Vessels may be displaced from their existing routes due to presence of FOW units
Vessel to vessel collision risk between a third-party	In	The presence of project vessels carrying out maintenance may increase the likelihood of

[29] In the UK, blade clearance is referenced as Mean High Water Springs (MHWS). For FOW devices, changing tides are less relevant as the devices will move up and down with the tides.

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
vessel and a project maintenance vessel		vessel to vessel encounters and increase collision risk
Vessel to structure allision risk due to the presence of new structures associated with the project	In	Structures within the site could create an allision risk to passing traffic
Reduction of under keel clearance due to the presence of moorings, cables associated with FOW devices and cable protection risk of vessel damage	In	Reduction of keel clearance could lead to vessel damage and navigational accident
Vessel interaction with subsea cables and mooring lines associated with the project.	In	Presence of cables and mooring lines may increase likelihood of anchor or fishing gear interaction for third-party vessels
Loss of station - a mooring system failure could cause a structure to lose station and create a hazard to navigation away from its given location.	In	Drifting FOW devices could cause serious navigational accidents
Interference with marine navigation, communications and position fixing equipment from the new structures associated with the project.	In	Structures and subsea cables could affect communications and position fixing equipment
Reduction of emergency response capability due to increased incident rates and/or reduced access for SAR responders.	In	Presence of structures may reduce access for SAR responders. Increased number of vessels associated with project may result in increased incidents requiring emergency response
Decommissioning		
Impacts for decommissioning will be similar to those for installation phase	In	Similar to those aspects included above.

9.1.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6. Table 6-1 within section 6.6 identifies those projects which may have cumulative impacts with Ports, Shipping and Navigation impacts from the AFLOWT project, and will be considered in the EIAR.

Any additional projects that are identified between the scoping and EIA stage will also be considered for cumulative navigational impacts.

9.1.8 Approach to EIA

Following on from scoping, the NRA produced for the previous foreshore licence for WEC will be updated, taking into account the inclusion of FOW devices. Up to date AIS and vessel density data will be reviewed in order to update the NRA, alongside stakeholder consultation, as per the guidance set out in section 9.1.3.

The Revised Guidelines for Formal Safety Assessment (FSA) in the IMO (International Maritime Organization) Rule-Making Process (IMO, 2018) will be followed to assess impacts from the proposed project, resulting in a review and update of the previous NRA for the site to accompany the EIA.

Embedded mitigation measures will help to reduce the risks to navigation from the project (see section 9.1.5). For any risks with impacts that are considered to be 'unacceptable', additional mitigation measures beyond embedded mitigation will be proposed.

9.1.9 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below and in the corresponding sections of each subject section.

- Is the use of updated AIS data and limited stakeholder engagement sufficient for the purposes of the NRA and EIA noting that it will be building upon the NRA conducted for the same Test Areas in 2011 which incorporated survey data, AIS data and stakeholder consultation?
- are there any impacts proposed to be scoped out of the NRA, or that have not been identified at this stage, that are considered as requiring further assessment (both for the in isolation and cumulative scenarios)?
- are there any additional mitigation measures that should be included in embedded mitigation (section 9.1.5)?

9.2 Aviation Safety, Military Exercise and Telecommunications

9.2.1 Receiving Environment

Defining a standard study area is difficult for this subject topic. For civil radar in Ireland, a reasonable study area is 20 km from the AMETS site, as Ireland largely goes by Eurocontrol guidelines. For airspace there isn't really an associated range, rather any impacts need to be looked at in the context of the airspace that the project is within.

The Test Areas are located close to airspace where Air Traffic Service (ATS) responsibilities within specified lateral and vertical portions of airspace is delegated to the Shannon Area Control Centre (ACC). The Northern Oceanic Transition Area (NOTA) is just over 30 km north of the Test Areas and the Scottish Flight Information Region (FIR) is just over 40 km north-northeast of the Test Areas.

9.2.2 Data sources and Baseline

Data sources used to gather data on aviation safety, military exercise and telecommunications are set out in Table 9-5.

Table 9-5: Data sources utilised for aviation, safety, military exercise and telecommunications

Name of Source	Date accessed	Data overview
Integrated Aeronautical Information Package (IAIP) (Irish Aviation Authority, 2019)	19/10/2021	Provides aeronautical information essential to air navigation. Contains details of regulations, procedures and other information pertinent to flying aircraft in Ireland.
IAA Visual Flight Rules (VFR) Aviation Chart 1: 50,000	19/10/2021	Provides VFR navigation information within the boundaries of the Shannon Flight Information Region (FIR).
Pager Power	Provided 28/01/2022	RSK commissioned Pager Power (specialist in providing information on aviation, radar and communications issues) to provide input to this chapter. They will have further input during the EIA process.

Baseline

Airspace structure - the project is within the Shannon FIR that is classified as Class G Airspace[30] at the AMETS Test Area locations.

Military aviation - where the AMETS Test Areas are located no military infrastructure, military operating areas, prohibited areas, or danger and restricted areas currently exist. It should be noted, however, that the military rely on civil infrastructure to gather information for air control therefore consultation with the Department of Defence (DoD) will be progressed as part of the EIA process.

Civil aviation – the following infrastructure has been identified in the vicinity of the study area:

- Donegal Airport Primary Surveillance Radar (PSR) (150 km from the proposed development, the presence of the radar is not confirmed)
- MMSR Irish Aviation Authority Tower at Dooncarton (30 km from the project site) - no significant impact anticipated
- Truskmore (Sligo) VHF communications transmitter - no significant impact anticipated
- Connaught (Mayo) VOR/DME radio beacon - no significant impact anticipated

[30] Class G Airspace: aircraft can operate in this area of uncontrolled airspace without any mandatory requirement to be in communication with or receive a radar service from an air traffic control unit. Pilots of aircraft operate under Visual Flight Rules (VFR) in Class G airspace and are ultimately responsible for seeing and avoiding other aircraft and obstacles.

- Glencolumbkille (Donegal) VHF communications transmitter - no significant impact anticipated.

Of the above, it is considered that only the PSR at Donegal has the potential to be impacted by the proposed project.

Aerodromes – the closest aerodromes to the AMETS Test Areas are:

- Bellmullet (civil) – close to cable landfall site
- Knock (civil) – approximately 70 km southeast[31]
- Sligo (civil) – approximately 95 km east
- Connaught (civil) – approximately 95 km southeast
- Connemara (civil) – approximately 120 km south-southeast
- Galway (civil) – approximately 130 km southeast
- Donegal (civil) – approximately 150 km northeast.

Radar - no PSR radar has been identified in the proximity of the proposed project. A MMSR IAA Tower is located at Dooncarton (30 km from the proposed development).

Search and rescue – Coast Guard helicopter path SAR250002899 passes close to the Test Areas, however, it is not expected that the project will have a significant effect on SAR operations. Engagement with the relevant stakeholders (IAA and CHC Helicopters) will be progressed to understand their position and requirements.

Helicopter routes – there are no oil and gas platforms requiring helicopter access in the vicinity of the Test Areas.

Telecommunications - telecommunication infrastructure is not anticipated to be affected by the proposed development (telecommunication services offshore are not typically safeguarded).

9.2.3 Relevant Guidance

The assessment will be carried out with reference to the following published guidance:

- Irish Aviation Authority Policy on Land Use Planning and Offshore Development (Irish Aviation Authority, 2015)
- Managing the Impact of Wind Turbines on Aviation (Airspace and Safety Initiative (2013)
- Wind Energy and Aviation Interest Interim Guidelines (DTI, 2002)
- How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors (Eurocontrol, 2014)
- Irish Aviation Authority (Aerodrome Standards) Order 2008 (SI No 356 of 2008)
- Irish Aviation Authority (Air Traffic Control Standards) Order 2004 (SI No 856 of 2004)
- Irish Aviation Authority (En-Route Obstacles to Air Navigation) Order 1999 (SI No 423 of 1999)

[31] The Airport operates a 'procedural environment' meaning that the controllers separate aircraft procedurally without the use of radar

- Guidance Material on Off-Shore Wind Farms (Irish Aviation Authority, 2015)
- European Guidance Material on Managing Building Restricted Areas (Irish Aviation Authority, 2015)
- Land Use Planning and Offshore Development (Irish Aviation Authority, 2014)
- Irish Aviation Authority (Obstacles to Aircraft in Flight) Order 2005 (SI No 215 of 2005)
- Irish Aviation Authority (Rules of the Air) Order 2004 (SI No 72 of 2004)
- IAA Aeronautical Services Advisory Memorandum (ASAM) Guidance Material on Offshore Windfarms. ASAM No.018. Issue 2. 2015
- European Guidance Material on Managing Building Restricted Areas (International Civil Aviation Organisation (ICAO), 2015)
- Air Corps Wind Farm / Tall Structures Position Paper (draft) 8 August 2014
- Manning, T. (1999), Microwave Radio Transmission Design Guide, Artech House Books
- Aviation and Construction Co-Existing: Irish Aviation Authority Policy on Land Use Planning and Offshore Development – Draft for Public Consultation – (Irish Aviation Authority, 2014)
- European Plan for Aviation Safety 2021 – 2025
- Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Authority, Organisation and Operations Requirements for Aerodromes
- Certification Specifications and Guidance Material for Aerodrome Design.

9.2.4 Design Parameters

Project design parameters relevant to aviation safety, military exercise and telecommunications are listed in Table 9-6. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-6: Design parameters and their relevance to aviation safety, military exercise and telecommunications

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Scale of proposal will affect the extent of overall risk / impacts to aviation safety, military exercise and telecommunications.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B	Scale of proposal will affect the extent of overall risk / impacts to aviation safety, military exercise and telecommunications.
Maximum tip height	300 m Test Area A, 110 m Test Area B	Tip height will impact on aviation safety and telecommunications.

Design parameter	Technical details – worst case scenario	Relevance
Maximum speed of turbine rotation (tip speed) and blades per turbine	3 MW is smallest turbine – maximum rotation speed is based on a turbine of this diameter. Number of blades 2 or 3.	Speed of rotation and number of blades will impact aviation safety risk.
Colour of turbine	Likely grey	Turbine colour relevant to aviation safety risk.
Minimum deployment period FOW devices	12 months minimum Anchors may remain for the lifetime of the demonstration site (35 years) for use by subsequent technology developers.	Length of deployment will determine extent of impact.
Helicopter access	Annual visits to fixed turbines for checks and maintenance.[32]	Helicopter access may result in impacts to aviation safety, military exercise and telecommunications during operation.
Aviation lighting	Devices will meet with international requirements for lighting and Irish Aviation Authority.	Installation of lighting will be relevant for aviation safety.

The general principle of the aviation assessment is that for each receptor and potential impact, the EIA will be based on assessing a range of project design parameters and deciding on the worst-case scenario, which for aviation is a combination of the individual impact of physical obstruction to flight and/or radar detectability of the Test Area FOW turbines creating interference to CNS systems. For aviation this will be carried out on the tallest FOW turbine blade tip being proposed (300 m) and on the greatest number of FOW devices within the Test Areas (6).

9.2.5 Embedded Mitigation

The following designed-in measures are proposed:

- details of the project will be provided to the IAA to enable notification of the presence of the FOW turbines in appropriate aviation documentation and aviation charts; this will enable aviation operators to set an appropriate minimum safe altitude (MSA) over the Test Area
- as required by the IAA, the FOW turbines will be fitted with appropriate aviation lighting in accordance with Aeronautical Services Advisory Memorandum (2015): Guidance Material on Offshore Wind Farms. The specific lighting requirements will be discussed and agreed with the IAA once the final FOW turbine layout is known

[32] The nearness of the Test Areas to shore may mean that maintenance visits by helicopter will not be required. This will be confirmed during the EIA process.

- it is anticipated that single turbines or structures will require both high intensity strobe lights (red) and lights visible to night vision equipment (as per the Air Corps Wind Farm / Tall Structures Position Paper).

9.2.6 Scoping of EIA

Potential impacts relating to the project activities have been set out, and scoped in or out, dependent on their likelihood of having a significant effect on aviation safety, military exercise or telecommunications.

The SEAI (2017) guidance provides an indicative list of impacts that should be considered for aviation safety, military exercise and telecommunications when producing an EIAR. These are:

- collision risk
- radar interference
- designated military areas and disruption to military areas
- broadcast and telecommunications.

Table 9-7: Project activities and potential impacts on aviation safety, military exercise and telecommunications

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation, operation and decommissioning		
Creation of physical obstacles affecting air traffic	In	Any object higher than 90 m is considered significant in the Irish airspace[33]. Thus, the FOW devices will be assessed for their impact on aviation. Aircraft operating at low levels are required to set a minimum safe altitude (MSA); this is the lowest altitude set in areas to ensure safe separation between aircraft and known obstacles. The MSA for aircraft operating in Instrument Meteorological Conditions (IMC), essentially poor weather, enables aircraft to maintain a minimum of 1,000 ft (305 m) clearance between aircraft and known obstacles. The PDE will include wind turbines with a maximum tip height of c. 300 m above Mean High Water (984 ft). Therefore, the MSA in the Test Areas will need to be 2,000 ft (984 ft + 1,000 ft rounded to the next 100 ft) in order to maintain at

[33] Any object higher than 45 m considered significant in the Air Corps Wind Farm / Tall Structures Position Paper.

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
		least 1,000 ft vertical separation between the FOW turbines and aircraft. The potential impact on air traffic and associated mitigation measures will be assessed in the EIAR.
Interference with civil and military PSR systems	In	Wind turbines have been shown to have detrimental effects on the performance of PSRs. These effects include the desensitisation of radar in the vicinity of the turbines, shadowing and the creation of unwanted radar returns which air traffic controllers must treat as aircraft returns. The desensitisation of radar could result in aircraft not being detected by the radar and therefore not presented to air traffic controllers. Controllers use the radar to separate and sequence aircraft; therefore, maintaining situational awareness of all aircraft movements within the airspace is crucial to achieving a safe and efficient ATS, and the integrity of radar data is central to this process. The creation of unwanted returns displayed on the radar leads to increased workload for both controllers and aircrews. Furthermore, real aircraft returns can be obscured by a turbine's radar return, making the tracking of both conflicting unknown aircraft and the controllers' own traffic much more difficult. Given the distance of the proposed project from the closest PSR at (150 km) the impact on PSR systems is not expected to be significant. Consultation will be carried out with the IAA and DoD and potential impact on radar systems will be assessed in the EIAR.
Interference to military areas and disruption to military areas (installation, operation, decommissioning)	In	Whilst impacts on military infrastructure are not predicted, consultation with the DoD is recommended and military constraints included for completeness.

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Interference to broadcast and telecommunications	Out	Proposed offshore project not anticipated to affect broadcast and telecommunication infrastructure.

9.2.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-1 within section 6.6 identifies those projects which may have cumulative impacts with Aviation Safety, Military Exercise and Telecommunications impacts from the AFLOWT project, and will be considered in the EIAR.

Additionally, the Bellacorrick Onshore Wind Farm (55 km from the Test Site) will also be considered as a source of potential cumulative impacts with the AFLOWT project.

9.2.8 Approach to EIA

The following approach will be followed for the assessment of impacts to aviation safety, military exercise and telecommunications at the EIAR stage:

Consultation will be carried out with the IAA, DoD, aerodrome operators, SAR helicopter ops (IAA and CHC Helicopters), and Met Eireann (if within 20 km of a Met Office radar).

The technical assessment will be undertaken with reference to formal guidance and industry best practice to quantify any potential impacts. Where appropriate, mitigation requirements will be coordinated with the relevant stakeholders as part of the ongoing consultation.

9.2.9 Scoping Questions

The following questions have been identified for the competent authority, with regard to the scoping of this project's effects on aviation safety, military exercise and telecommunications. A summary of relevant stakeholders is included at Appendix A1. A summary of scoping questions is included at Appendix C. Table E1 within which includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below and in the corresponding sections of each subject section. A list of stakeholders is included at Appendix A1:

- Have all relevant statutory aviation consultees been identified and are you in agreement with the approach?
- Are there any unidentified projects that may result in cumulative impacts, and need to be assessed?

9.3 Socio-Economics, Recreation and Tourism

9.3.1 Receiving Environment

The proposed project location is off Belderra Strand, to the west of the town of Belmullet (Béal an Mhuirthead), in County Mayo, in the Mayo Gaeltacht area (Irish speaking) (SEAI, 2011). This section summarises the socio-economic status of the population in County

Mayo, with a focus on the Belmullet peninsula, and highlights important recreational and touristic activities taking place. It then sets out the potential impacts of the proposed project on these aspects.

Traditional employment in the area was focussed on fishing and farming. However, the area was affected by the global and national economic crisis, and since the 1990s, occupations have shifted towards services, tourism and manufacturing industries (SEAI, 2011). Based on 2016 census data, the average age in the county is 40, which along with Kerry is the highest in Ireland, and the county has a high and increasing old age dependency percentage (28.3%) and youth dependency percentage of 32.8% in 2016 (Central Statistics Office, 2016 a). The census is due to be updated in 2022. In terms of education, in Mayo, 17.4 % of people over the age of 15 had no formal or primary education, and the unemployment rate was 14.3 % according to the census in 2016. The unemployment rate was higher in the Mayo Gaeltacht, at 22.3% in 2016. Those people with lower education status were more likely to be unemployed. In terms of deprivation, County Mayo was classed as 'disadvantaged' with a relative Pobal HP deprivation score of -3.5 in 2016. In the Mayo Gaeltacht, wherein the proposed project is located, the relative deprivation index is stark, at -11.6 in 2016 (Irish Research Council, 2018).

County Mayo and the Belmullet Peninsula is popular with tourists and recreational users, due to its wild beauty and being part of the Wild Atlantic Way. Some of the popular locations include Keem Bay, Annagh Head, views to Inishglora island with the Children of Lir legend, the Mullet peninsula with Erris Head, sandy white beaches, surf beaches and walking trails. Wildlife watching tours to see many marine mammals and seabirds are popular. Watersports are also popular, as is angling. There is a watersports centre (UISCE) in Erris, which combines watersports with learning of the Irish language. Surfing in the area is a popular, surf spots include Carrowniskey, Achill Island, Annagh Strand, Belderra Strand, Bertra Beach, Carramore, Clare Island, Dugort, Elly Bay West, Gubnahardia Strand and Lackan Bay (Mayo Ireland, 2019; Visit Belmullet, 2021; Magic Seaweed, 2021).

9.3.2 Data sources

The following data sources were utilised to scope for potential impacts of the proposed project on socioeconomics, recreational and touristic factors in County Mayo and the receiving community.

Table 9-8 Data sources on socio-economics, recreation and tourism in County Mayo

Name of Source	Date accessed	Data overview
Census 2016 Reports (CSO, 2016)	14/10/21	Census for 2016 for County Mayo and the whole of Ireland (to be updated in 2022).
Socio-Economic Profile of the seven Gaeltacht Areas in Ireland', Seanad Éireann (Irish Research Council, 2018)	14/10/21	Information on socioeconomic factors of the Gaeltacht area of Mayo.
Wild Atlantic Way (Mayo Ireland, 2019)	14/10/21	Information on tourism in Mayo.
Things to do (Visit Belmullet, 2021)	14/10/21	Information on tourism and recreation in Mayo.

County Mayo Surfing (Magic Seaweed, 2021)	14/10/21	Information on surfing in Mayo.

9.3.3 Relevant Guidance

There are several plans in the area focussing on social and economic development, the objectives of which are relevant to this project, and have been used to guide this chapter:

- Mayo Local Economic and Community Plan 2015 - 2021 and LECP Action Plan 2016 - 2017: Guiding principles set out in the plan include reducing number at risk of poverty by creating jobs, promoting a more resource efficient, green and inclusive economy by creating jobs in renewable energy, maximising returns from resources and a vision for Mayo that is 'sustainable, inclusive, prosperous and proud.
- Mayo County Development Plan 2014-2020 (Incorporating Variations No. 1 and No. 2) (Mayo County Council, 2017)
- Draft County Mayo County Development 2021 – 2027 (Mayo County Council, 2021)
- National Spatial Strategy and Regional Planning Guidelines for the West Region 2010-2022 (The West Regional Authority, 2022)
- Guidance on Environmental Impact Assessment of Offshore Renewable Energy Development on Surfing Resources and Recreation (SAS, 2009)
- Guidelines on the Treatment of Tourism in an Environmental Impact Statement (Fáilte Ireland, 2011).

9.3.4 Design Parameters

Project design parameters relevant to socio-economic factors, recreation and tourism are listed in Table 9-9. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-9: Project design parameters and their relevance to socio-economic factors, recreation and tourism

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Scale of proposal will affect the extent of overall risk / impacts to socio-economic factors, recreation and tourism.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B	Scale of proposal will affect the extent of overall risk / impacts to recreational and tourism activities, via reduced access to facilities. If multiple floaters are installed at the site at one time, and are operating at one time, impacts on recreational and touristic boats in the area will be greater – in terms of collision risk. The extent of

Design parameter	Technical details – worst case scenario	Relevance
		reduced access to facilities and the environment for recreational and touristic activities disturbance will be dependent on the size of the turbines. Navigational safety zones may be applied, if authorised by the competent authorities.
Colour of turbine	Likely grey	Colour may have a visual impact, affecting tourism.
Separation distance between FOW devices	Minimum anchoring area is about 2.5 km2 radius for the turbines	An increased exclusion limit will impact recreational and touristic activities.
Minimum deployment period FOW devices	12 months minimum Anchors may remain for the lifetime of the demonstration site (35 years) for use by subsequent technology developers.	Length of deployment will affect impacts to all receptors.
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Test Area A, 6 km from Test Area B.	Installation of cable will impact on recreational and touristic activities.
Navigational lighting	Devices will meet with international requirements for lighting.	Lighting may impact tourism and recreational activities.
Aviation lighting	Devices will meet with international requirements for lighting and Irish Aviation Authority.	Lighting may impact tourism and recreational activities.
Vessel access for deployment and access	Vessel access will be required during the construction approximately once per month during operation of the project.	Vessel access will impact touristic and recreational boats.

9.3.5 Embedded Mitigation

Mitigation measures for socio-economic, recreational and touristic factors will be incorporated into the project design, and may include the following:

- extensive stakeholder engagement throughout the project design and delivery, including initial stakeholder consultation meetings and a full engagement plan setting out regular meetings throughout

- local businesses contacted and advertisements made for positions within the area
- local contractors used where possible, e.g., work boats
- warning provided to all users, including recreational users and tourism operators, before any construction or decommissioning works take place.

9.3.6 Scoping of EIA

Potential impacts relating to the project activities have been set out, scoped in or out dependent on their likelihood of having a significant effect on socioeconomic factors in the study area. These impacts may cover construction, operation and/or maintenance, and decommissioning stages, but levels of impact may differ during different stages.

Table 9-10: Project activities and potential impacts to socio-economic factors, recreation and tourism

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation, operation and decommissioning		
Positive impact on local economy through creation of jobs and increased spend in the area.	In	Development of FOW technology at the AMETS will create jobs through installation, operation and decommissioning, over its lifetime of 35 years. The site is also expected to generate more jobs in the longer-term, through the development of the area as a hub for ocean energy research, development and operation. The project will also increase local spend. Local contractors will be required, such as for work boats, research, maintenance, office services etc.
Direct impact on tourism	In	Tourists may be deterred from visiting the area during installation. Tourists may also be attracted to the area following construction, to learn about ocean energy.
Direct impact on recreational activities	In	Access to recreational activities may be reduced directly around cable landfalls, around the Test Areas and during installation and decommissioning activities. Waves may also be affected from the FOW installations, impacting surfers.
Positive impact on aging population and age dependency	In	Creation of jobs and regeneration of the area as an ocean energy hub will attract people of a working age to the area, helping to reduce the average age of the population and reduce age dependency.
Positive impact on coastal infrastructure	In	May drive improvements in coastal facilities such as pier improvements, access roads and moorings.
Positive impact on poverty and deprivation	In	Employees will develop new transferrable skills; economy of the area will be improved, and more related jobs created.

Accidental events, e.g., oil or fuel spill	Out	Potential impacts of non-planned events (where sufficient good practice measures are in place to render the chance of such events occurring minimal) are proposed to be scoped out. As such possible spills and pollution incidents are scoped out. Each site developer will prepare a CEMP which will include a Pollution Management Plan.

9.3.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6. Table 6-1 within identifies those projects which may have cumulative impacts with Socio-economic, recreation and tourism impacts from the AFLOWT project, and will be considered in the EIAR.

The cumulative impact process will be iterative throughout the project, as information on some future potential interacting activities may not yet be known or available. Cumulative impacts will be assessed at the EIA stage.

9.3.8 Approach to EIA

The following approach will be followed for the assessment of any significant impacts to socio-economic factors, recreation and/or tourism at the EIAR stage:

- an initial baseline condition assessment following a desk-based approach.
- Early-stage consultation and ongoing stakeholder engagement.
- assessment of significant impacts
- identification of mitigation measures
- assessing residual impacts following implementation of mitigation measures
- ongoing monitoring as part of the project.

9.3.9 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions.

9.4 Commercial Fisheries, Shellfish and Aquaculture

9.4.1 Receiving Environment

The study area is located off the west coast of Ireland, near Belmullet in Co. Mayo and the project is located within International Council for the Exploration of the Sea (ICES) rectangle 37D9 division 27.7b (Figure 9-9). The project deployment activities will include laying of cables, with burying or rock protection/rock mattresses as well as the installation of anchors and FOW devices. The export cable corridor will make landfall at Belderra sand (detailed in Section 5).

Both Test Area A and Test Area B are located within the 12 nautical mile limit, meaning the majority of commercial fishing vessels active in the area are likely to be small inshore vessels (under 12 m in length).

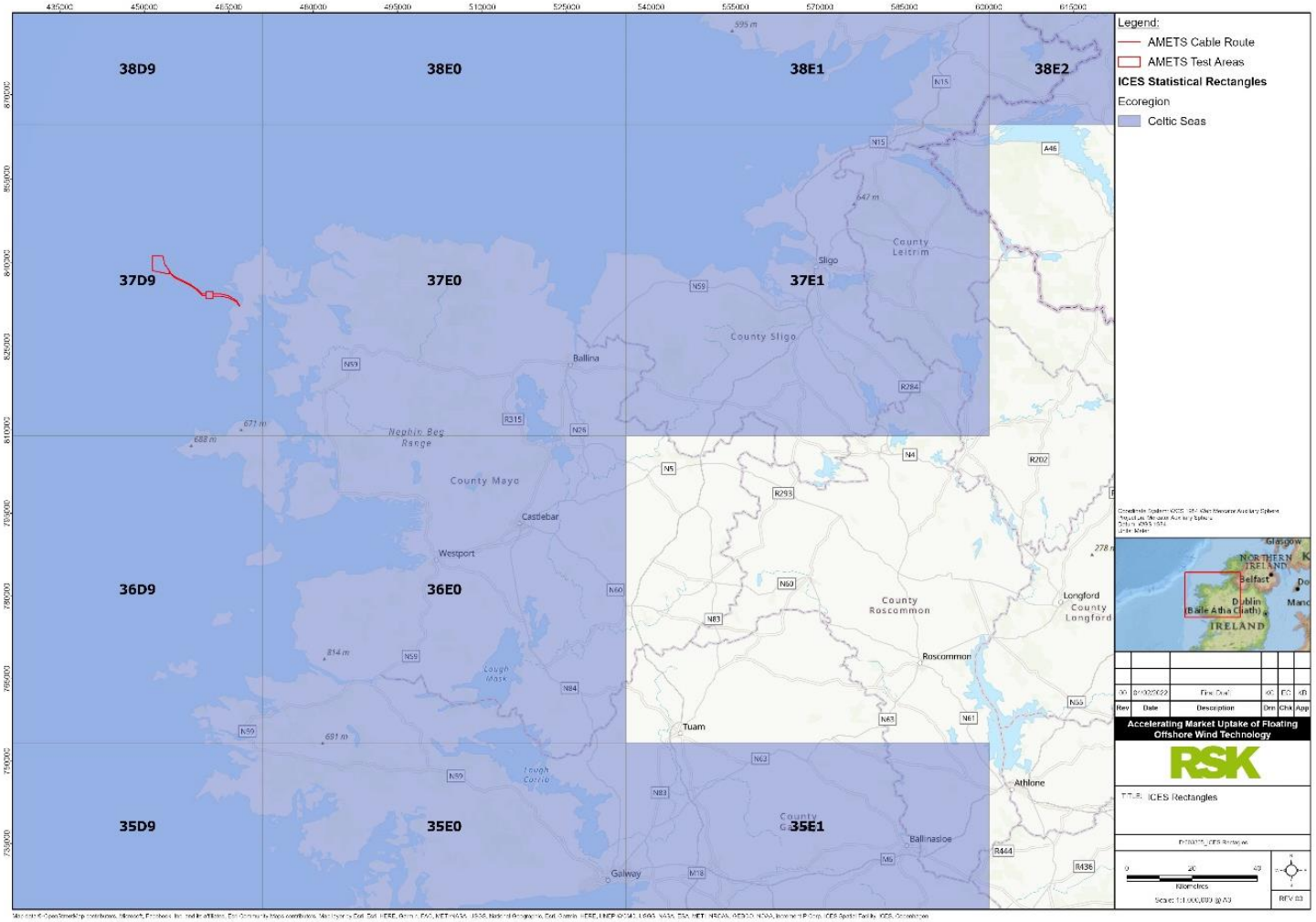

Figure 9-9: Location of AMETS site in reference to ICES rectangles

9.4.2 Data sources and Baseline

In order to ensure a thorough baseline of commercial fisheries within the study area, data will be collected from publicly available sources and complemented via data requests to specific organisations and from consultation with fishermen operating in the area. The EIA baseline will be based on the last five years' of available fisheries data for Irish vessels. In addition, available information on fishing activities by foreign fleets will be reviewed and assessed where appropriate.[34]. The following key datasets will be collated:

- Landings (tonnage and value);
- Location of fishing activities and effort, where available; and
- Operating patterns and practices.

Table 9-11 outlines key available data sources anticipated to be used to characterise the commercial fisheries baseline for the AFLOWT EIA.

Table 9-11: Data sources available for baseline assessment

Name of Source	Date accessed	Data overview
Fish Landings data (Sea Fisheries Protection Authority (SFPA)) Sea Fisheries Protection Authority > Statistics > Annual statistics (sfpa.ie) and/ or Marine Institute.	11/10/21	Includes annual and quarterly statistics for landings into ports for deep-water pelagic, demersal and shellfish. Also includes vessel landing statistics, e.g. specific species, gear types and ICES rectangle, as well as data from the Irish Marine Atlas.
Aquaculture production figures for bottom grown mussel industry/ seed mussel (Bord Iascaigh Mhara (BIM)) BIM - Fisheries	12/10/21	Reports on fisheries and aquaculture site locations and species. Data available for mussel seed surveys. (Initial indications from the Irish Marine Atlas suggests that mussel dredging grounds do not overlap with the site).
BIM and Marine Institute, Shellfish Stocks and Fisheries Review 2019_FINAL.pdf (marine.ie)	15/10/21	Shellfish Stocks and Fisheries Review annual reports
Analysis of fishing activity, stock characteristics and stock status (Marine Institute Data Catalogue	12/10/21	Data repository of publicly available data and data request services. Data available for varying species, fishing methods

[34] Only French vessels have historic rights for access between the 6 and 12 nm in that area https://www.sfpa.ie/LinkClick.aspx?fileticket=C-zp2zfeFG0%3d&portalid=0&resourceView=1 -there may also be specific arrangements to allow access to Northern Irish vessels.

Name of Source	Date accessed	Data overview
		and in different regions around Ireland.
Ireland's Marine Atlas - Showcases - data.gov.ie	12/10/21	Fishery effort and value for different gear types (inshore and offshore fisheries).[35]
Department of Agriculture, Environment and Rural Affairs (DAERA – Northern Ireland) https://www.daera-ni.gov.uk/topics/fisheries	12/10/21	Fisheries policies, information on fishing activity, licences and information for businesses.
Marine Management Organisation (MMO, UK)	12/10/21	UK vessel and port landings and effort data.
The Irish Government's Commercial Sea Fishing Network Portal FishingNET - Fishingnet Home	12/10/21	Cross-agency project which aims to bring all links to relevant information for people involved in the Fishing Industry.
Atlas Commercial Fisheries around Ireland - Datasets - data.gov.ie	12/10/21	Information on fishing activity around Ireland.
Irish Defence Forces Fisheries Monitoring Centre (military.ie)	12/10/21	Information on fishing activity.

A preliminary summary of publicly available data and information regarding commercial fishing activity in the study area is provided below. This includes consideration of the information previously collected for the original EIS.

It is understood that the main commercial fishing activity undertaken in area of the project is potting for crab and lobster. This is primarily undertaken by smaller local vessels. The Test Areas are located over sandy areas of substrate directly adjacent to hard bedrock. The transition zone between the two substrates was defined in the original EIS as a recognised crab fishing zone and the shallower bedrock areas closer to land as predominantly lobster potting areas. In addition, in the original EIS, some activity by bottom otter trawlers was reported to occur over sandy substrate in the study area, by members of the Killybegs Fishermen's Organisation (KFO), including within a discrete area overlapping with Test Area A. Monkfish, megrim, rough skate and haddock were identified as the primary species fished by bottom otter trawlers in the area.

Available information from Ireland's Marine Atlas with regard to inshore activity by vessels under 15 m in length, indicates that the study area supports various other fishing

[35] Effort and value is only given under the "offshore fisheries data layer as that is based on VMS combined with logbook data. The inshore fisheries data layer, is based on interviews/consultation with fishermen undertaken by the Marine Institute in support of assessments of activity in Natura 2000 sites and only includes info on vessels under 15 m in length."

activities, including netting for crayfish and fish, potting for shrimp and whelk, periwinkle harvesting and dredging for species such as scallop, razor clam and surf clam. With the exception of netting, however, these activities have not been reported to occur with the boundaries of the project.

Whilst the majority of activity in areas of relevance to the project is expected to be undertaken by local small vessels, larger vessels may target grounds within the wider study area at times. Data on the distribution of fishing effort by vessels over 12 m in length (2014 -2018) are available from Ireland's Marine Atlas, however, it is suggested there is limited potential for the area of the project to support activity by this type of vessels.

Figure 9-10 shows the inshore fishing grounds by method. Whilst some effort has been recorded in the wider study area by over 12 m bottom otter trawls, dredgers, gillnetters, long liners, pelagic trawlers, potters and seines, in general terms fishing activity by these vessels within the boundaries of the project is anticipated to occur at very low levels

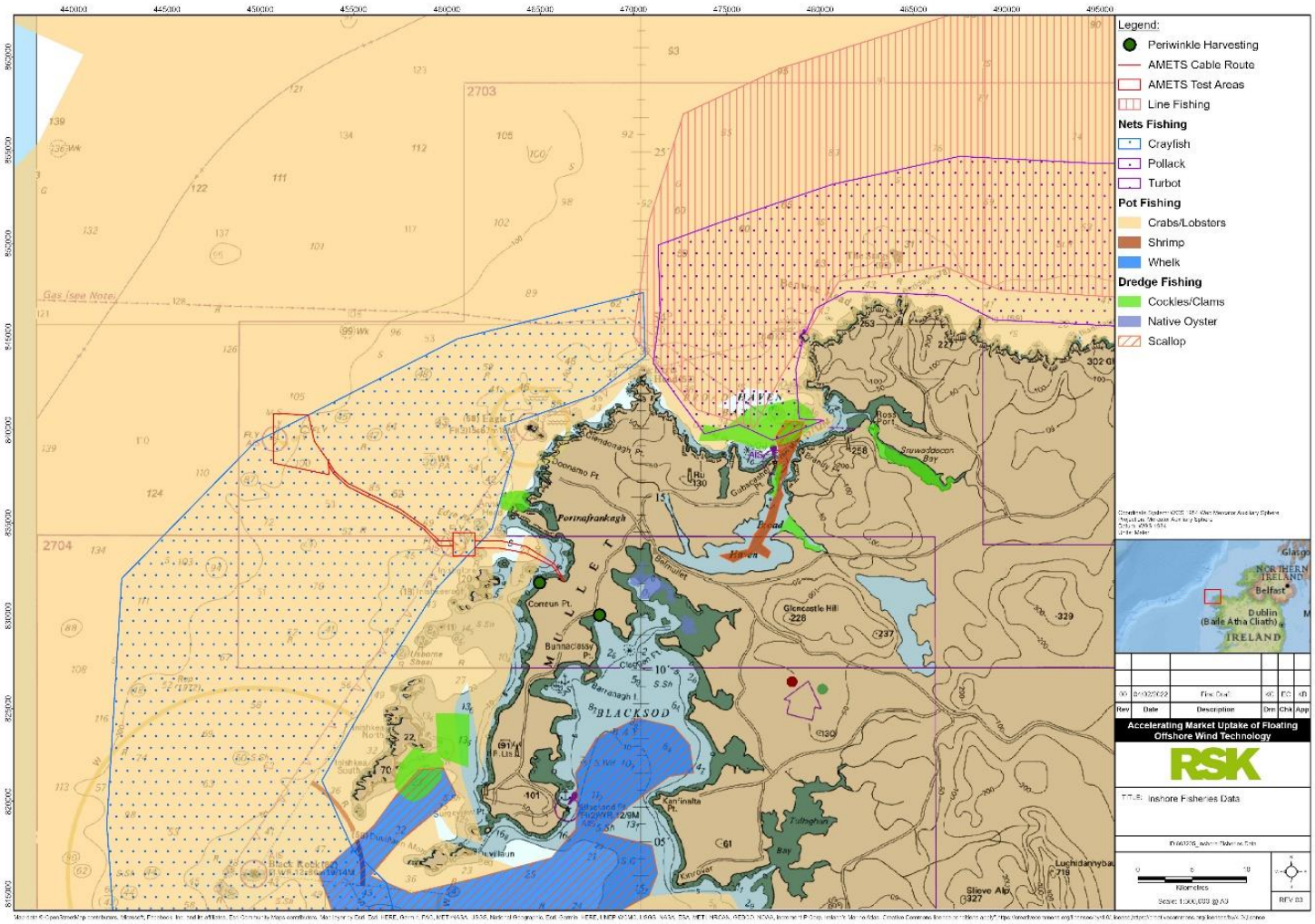

Figure 9-10: Inshore fishing by method in proximity to the AMETS site

The closest port in relation to the project is Ballyglass (SFPA, 2020), which is one of the smaller ports in Ireland (786 t landed in 2020, with shellfish accounting for 58% and pelagic species for the other 42% of the total landed) (SFPA, 2020)). The value of shellfish landed into Ballyglass in 2020 was €989,692 and the value of pelagic species landed was €308,760. The largest port in the study area, Killybegs, is located well to the east from Belderra and landed 231,774 t in 2020, significantly more due to the pelagic trawlers which land their catch here (mackerel, horse mackerel, blue whiting).

It is not anticipated that site-specific surveys will be necessary to characterise the commercial fisheries baseline. It is recognised, however, that the available spatial information on the fishing activity of vessels <12m[36] in length is often limited. To ensure that the activity of these vessels is accurately captured, the analysis of available fisheries data will be complemented through the undertaking of consultation with fisheries stakeholders. This would allow the collection of additional information and help validate that available from existing fisheries datasets (see section 9.4.2 above).

There are no aquaculture sites in the immediate vicinity of the project, as shown in **Figure 9-11**. The closest aquaculture sites are in Blacksod Bay with two cultivating seaweed and one rearing shellfish; as well as one in Broadhaven Bay cultivating seaweed; and two in the mouth of Sruwaddacon Bay for oysters. There are more aquaculture sites, predominantly for shellfish, situated in the more sheltered bays along the coast.

Figure 9-11: Aquaculture sites in proximity to the AMETS site

[36] Irish vms dataset is available for vessels over 12 m

9.4.3 Relevant Guidance

No specific legislation exists specific to the scope of an impact assessment of commercial fisheries, however the guidance listed below will be considered to inform the commercial fisheries assessment. This is in addition to the guidance outlined in Section 3.1 and 6.1:

- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison (2014)
- Best practice guidance for fishing industry financial and economic impact assessments Sea Fish Industry Authority and UK Fisheries Economic Network (UKFEN, 2012)
- Economic Impact Assessments of Spatial Interventions on Commercial Fishing: Guidance for Practitioners. Second Edition (Seafish and UKFEN, 2013)
- Guidance Note for Environmental Impact Assessment In respect of Food and Environment Protection Act 1985 (FEPA) and Coastal Protection Act (CPA) requirements, Version 2 (CEFAS, 2004)
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Cefas contract report: ME5403 - Module 15 submitted to Defra and the MMO (CEFAS, 2012)
- Guidance on Environmental Considerations for Offshore Wind Farm Development. Reference Number: 2008-3 (OSPAR, 2008).

9.4.4 Design Parameters

The project design parameters outlined in chapter 5 that are of relevance to commercial fisheries are set out in Table 9-12. As the Project Design Envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-12: Project design parameters and their relevance to commercial fisheries

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices	5 single rotor FOW devices or 2 dual rotor FOW devices on Test Area A, 1 single or dual rotor FOW on Test Area B	The greater the number of FOW devices the greater the footprint of the project on the seabed and therefore the greater the potential loss of fishing grounds.
Separation distance between FOW devices	Maximum anchoring area is about 2.5 km2 radius for the turbines. (The actual separation critical parameter is the width of corridor clear of infrastructure between FOW devices, which will be determined during the EIA process).	The distance between FOW devices will affect the extent of area potentially available for fishing. This extent will be mainly influenced by the positioning and extent of the anchoring systems. (A navigational safety zone may be implemented, if authorised by the competent authorities, which would also affect fisheries. If it is assumed that cables within the Test Areas are dynamic cables, as a worst-case scenario it will have to be assumed that fishing will not be able to resume).

Design parameter	Technical details – worst case scenario	Relevance
Inter-array cables	Potential use of dynamic cables	The use of dynamic cables constitutes a snagging risk to fishing vessels and would result in loss of access to fishing where they are deployed. From a construction perspective dynamic cables would have less impacts on benthic environment, but over the life of the project there is potential for ongoing benthic impacts as they would routinely disturb the benthic environment as they rise and fall, however if as a consequence they then have to close off the area to trawling then that would be beneficial to the benthic environment.
Minimum deployment period FOW devices	12 months minimum. Anchors may remain for the lifetime of the demonstration site (35 years) for use by subsequent technology developers.	Length of deployment will determine duration of impacts and loss of access to fishing grounds.
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Site A, 6 km from Site B.	Export cables will be buried to a target depth of 1 m and protected where burial to a sufficient depth cannot be achieved. As a worst case scenario, it has been assumed that up to 16 km of export cable may require cable protection. The presence of cable protection may result in loss of fishing grounds associated with its footprint and pose a snagging risk to fishing vessels operating gear in the area, particularly in the case of mobile gear fisheries.

9.4.5 Embedded Mitigation

Embedded mitigation specific to commercial fisheries will be finalised and included in the EIAR when submitted. The need of a fisheries co-existence strategy/ fisheries management and mitigation strategy (FMMS) is outlined in the NMPF and it is likely that something will be required to be in place of this nature. Scouting surveys would be helpful to assisting in survey work and installation but are not strictly necessary for EIA purposes.

The embedded mitigation is likely to include:

- appointment of Fisheries Liaison Officer (FLO) to carry out consultation and engagement with the fishing industry
- appointment of Fishing Industry Representatives (FIRs) where appropriate.

- adherence to appropriate guidance with regard to fisheries liaison and mitigation (i.e., FLOWW guidance or Irish equivalent when developed)
- development of a Fisheries Management and Mitigation Strategy (FMMS)
- timely and efficient distribution of Notice to Mariners (NtM) and navigational warnings
- export cables will be buried to a suitable depth where possible and protected where sufficient burial cannot be achieved. (Inter-array cables could potentially be dynamic)
- where cable protection is used, this will be designed taking account of consideration that minimise potential snagging risk
- the location, extent and nature of any cable protection used, will be shared with the fishing industry and clearly marked on charts
- undertaking of post-lay and burial cable inspection surveys and where appropriate and practicable, undertaking of rectification works
- use of advisory safety zones around installation vessels during construction and major maintenance works[37].
- all contractors undertaking works will be contractually obliged to ensure compliance with standard offshore policies, including those that prohibit the discarding of objects or materials overboard and that require the rapid recovery of accidentally dropped objects where feasible

9.4.6 Scoping of EIA

The following potential activities (Table 9-13) have been identified which could impact commercial fishing receptors during construction (and decommissioning) and operation. Table 9-13 indicates which are proposed to be assessed within the EIA.

Table 9-13: Project activities and potential impacts to commercial fisheries

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Temporary loss or restricted access to fishing grounds	In	The need to implement advisory safety zones and safe passage distances around devices, construction activities/vessels would result in a loss of access to fishing grounds. In addition, fishermen will be advised to avoid areas where cables may be temporarily vulnerable (i.e. sections of export cable awaiting burial or protection or sections that may become exposed over time) and static gear may need to be removed or relocated to allow installation works.
Temporary displacement of fishing activity into other areas	In	The potential loss of access to fishing grounds associated with the deployment/installation phase could result in fishing effort being displaced to neighbouring areas, potentially

[37] It is RSK's understanding that these are currently advisory as a navigation mitigation measure – for fishing the implementation of safety zones would result in the potential loss of fishing grounds/access to grounds.

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
		causing increase competition for grounds and conflict between fishermen.
Temporary increase in steaming time to fishing grounds	In	The need to implement advisory safety zones and safe passage distances around devices, construction activities/vessels may result in localised increased in steaming times/distances to traditional fishing grounds.
Interference with fishing activities (particularly static gear fisheries)	In	The transiting of project vessels undertaking installation works could cause interference with fishing activities (i.e. fouling of static gear marker lines by transiting vessels).
Snagging risk and associated loss or damage to fishing gear	In	The presence of project infrastructure, particularly anchoring systems, dynamic cables and vulnerable sections of export cables (i.e. cables awaiting burial or protection) have potential to represent a snagging risk for fishing gear. Similarly, seabed obstacles which may arise as a result of installation works (i.e. accidentally dropped objects, sediment berms) may also pose a snagging risk.
Potential impacts on commercially exploited species	In	There is potential for the installation/deployment phase result in impacts on the ecology of fish and shellfish species, including species of commercial importance (see section 8.3). This could in turn affect the productivity of the fisheries that depend on them.
Accidental events, e.g., oil or fuel spill (also applicable to operation and decommissioning)	Out	Potential impacts of non-planned events (where sufficient good practice measures are in place to render the chance of such events occurring minimal) are proposed to be scoped out. As such possible spills and pollution incidents are scoped out. Each site developer will prepare a CEMP which will include a Pollution Management Plan.
Operation		
Loss of access to fishing grounds	In	For the purposes of the assessment, it has been assumed that access to fishing will be lost within the Test Areas and a 50 m radius around them as a result of the need to implement a fishing safety zone to prevent entanglement and ensure safety. Fishing would be able to continue along export cables, except in areas where advisory safety zones may need to be in place (i.e. around maintenance works and/or vulnerable sections of cables).

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Increase in steaming time to fishing grounds	In	For the purposes of the assessment, it has been assumed that the transiting of fishing vessels will be excluded from a radius of 50 m around the Test Areas as a result of the need to implement a navigation exclusion zone to prevent entanglement and ensure safety. This may result in localised increased in steaming times/distances to traditional fishing grounds. Fishing vessels would however be able to transit the area of the cable corridor.
Interference with fishing activities (particularly static gear fisheries)	In	The transiting of project vessels undertaking maintenance works could cause interference with fishing activities (i.e. fouling of static gear marker lines by transiting vessels).
Snagging risk and associated loss or damage to fishing gear.	In	The presence of project infrastructure, particularly anchoring systems, dynamic cables and vulnerable sections of export cables (in the event that sections of cables become exposed) have potential to represent a snagging risk for fishing gear. Similarly, seabed obstacles which may arise as a result of maintenance works (i.e. accidentally dropped objects) may also pose a snagging risk.
Potential impacts on commercially exploited species.	In	There is potential for the operation of the Project to result in impacts on the ecology of fish and shellfish species (see Section 8.3), including species of commercial importance and aquaculture. This could in turn affect the productivity of the fisheries that depend on them.
Decommissioning		
As for installation and operation above.	In	As for installation and operation above.

Fisheries receptors to be assessed will be determined once the baseline has been established. Based on information identified in this Scoping Report the main receptors will be:

- Static gear fisheries (potting and netting)
- Mobile gear fisheries (predominantly trawling[38])
- Recreational fishing (if required – See other users).

9.4.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6. Table 6-1 within section 6.6 identifies those projects which may have cumulative impacts with

[38] There is minimal pelagic trawling in the area of the project (from VMS).

Commercial Fisheries impacts from the AFLOWT project, and will be considered in the EIAR.

As different fisheries vary in spatial scale, cumulative projects requiring assessment may vary on a fisheries specific basis.

9.4.8 Approach to EIAR

The approach to the EIAR chapter for commercial fisheries will follow the general guidance set out in Section 6.1 and more specific information set out in Section 6.4:

- a desk-based literature review will be undertaken to expand on the commercial fisheries receptors identified within the project area in the Scoping Report, and to identify further information on inshore fishing fleets (vessels <12 m). This will include analysis of landings (tonnage and value), location of fishing activities and effort where available (e.g., VMS)
- consultation with fishermen and collection of information via the project's FLO on key fishing grounds, and operating patterns and practices, predominantly relating to the inshore fleet, where data is more limited
- consultations with fisheries organisations, representatives and stakeholders, e.g., BIM, National Inshore Fisherman's Association/ Regional Fisheries Office, Erris Lobster Conservation and Restocking Association (ELCRA), the Errish Inshore Fishermen's Association (EIFA), Killybegs Fishermen's Organisation, and Federation of Irish Fishermen (FIF)
- the fish and shellfish ecology chapter will be reviewed on completion, to identify any synergies and additional information of relevance to commercial fisheries. In addition, the outcomes of the fish and shellfish ecology chapter will inform the assessment of the potential impact of the project on commercial fishing as a result of impacts on the ecology of exploited species.

Data, reports and local knowledge will be used to understand commercial fishing activity within the study area to allow for a thorough assessment of impacts, both direct and indirect, upon identified receptors.

9.4.9 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A list of stakeholders is included at Appendix A1

9.5 Airborne Noise

9.5.1 Receiving Environment

Background noise levels in the Belderra area are low and as expected for a rural area, (SEAI, 2011). They may be raised by breaking waves or from passing vehicles. Noise levels closest to the Belderra Strand junction are higher than in other areas (SEAI, 2011). As of 2018, there are three national primary road routes in County Mayo (the N5, N17 and the N26) and five national secondary routes (N58, N59, N60, N83 and the N84). The one rail network is between Westport/Ballina and Dublin, and the one airport present is West Airport Knock in the East (County Mayo Council, 2018). None of these are kikely to impact noise levels at Beldera Sands.Onshore noise monitoring was undertaken during the previous EIA (SEAI, 2011), and found to be 30 decibels (dB) or more for most of the time.

9.5.2 Data sources and Baseline

The following data sources were utilised to scope for potential impacts of the proposed project on noise in the receiving community.

Table 9-14: Sources utilised for airborne noise

Name of Source	Date accessed	Data overview
Transport Infrastructure Ireland (2022)	11/2021	Roads in the area
Previous foreshore licence for this project (SEAI, 2011)	11/2021	Background noise levels from previous assessments
County Mayo Council Pollution Control and noise maps (Mayo County Council, 2022)	11/2021	Background noise levels
Google maps	11/2021	Housing, roads, infrastructure locations etc.

9.5.3 Relevant Guidance

Provided below is a list of guidance which will be considered when carrying out the impact assessment on noise in the area.

- EU Directive 2002/49/EC (Environmental Noise Directive) transposed into Irish Law by the Environmental Noise Regulations 2006 SI No. 140 of 2006
- BSI Standards Publication. Code of Practice for noise and vibration control on construction and open sites. Part 1: Noise
- The Working Group on Noise from Wind Turbines. The assessment and rating of noise from wind farms
- Institute of Acoustics. A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise
- World Health Organization Europe. Night Noise Guidelines for Europe.

9.5.4 Design Parameters

Project design parameters relevant to airborne noise are listed in Table 9-15. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-15: Project design parameters and their relevance to airborne noise

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Scale of proposal could affect the extent of airborne noise throughout the deployment life cycle. However given the distance offshore of both

Design parameter	Technical details – worst case scenario	Relevance
		Test Area A and B this would be likely to only be minimal.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on site A, 1 single or dual rotor FOW on site B	Scale of proposal could affect the extent of airborne noise throughout the deployment life cycle. However given the distance offshore of both Test Area A and B this would be likely to only be minimal.
Cable Landfall	Installation method	Installation technique could have a short term impact on local residents. Unlikely to be significant.

9.5.5 Embedded Mitigation

Embedded mitigation is likely to include:

- scheduling of transport to avoid busy times, e.g., school pick-ups, to reduce any delays to project operations which would also avoid higher traffic levels that could result in increased noise
- noise levels maintained within limits set in National Roads Authority guidelines.

9.5.6 Scoping of EIA

Table 9-16 identifies potential impacts which could impact on airborne noise levels:

Table 9-16: Project activities and potential impacts to airborne noise

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Transport of materials and construction machinery to ports for use offshore.	Out	Transport of materials and other infrastructure to ports will be within the usual levels of port traffic.
Construction noise offshore at the FOW sites.	Out	Activities will take place offshore well away from any noise sensitive onshore areas.
Cable landfall works	In	Installation technique could have a short term impact on local residents. Unlikely to be significant but could depend on technique used.
Operation		
Operational noise from FOW devices.	Out	Activities will take place offshore, well away from any noise sensitive onshore areas.
Decommissioning		
Decommissioning noise offshore at the FOW sites.	Out	Activities will take place offshore, well away from any noise sensitive onshore areas.

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Cable removal works	In	Removal technique could have a short term impact on local residents. Unlikely to be significant but could depend on technique used.

9.5.7 Scoping of Cumulative Assessment

It is proposed to scope out cumulative airborne noise assessment from consideration under cumulative impacts.

9.5.8 Approach to EIAR

It is proposed that airborne noise will be scoped out of consideration in the EIAR once cable installation and removal has been further assessed.

9.5.9 Scoping questions

The following questions have been identified for the competent authority, in regard to the scoping of this project's effects on airborne noise:

- Are you content with the data sources utilised for airborne noise description?
- Are you content with scoping out airborne noise from the full EIAR?

9.6 Risk of Major Accidents and Disasters

9.6.1 Receiving Environment

Major accidents and disasters are defined as events or occurrences (either natural or man-made) which may interact with the project's activities, resulting in significant adverse impacts on the surrounding environment – affecting receptors including human health, industry and the environment.

As per the 2014 EIA Directive (EU, 2014), EIAs must consider the risk of the proposed project to major accidents and disasters, including climate change and natural disasters. The following should be included in the EIA:

"A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned." (EU, 2014).

The 2014 Directive also requires that projects consider how their vulnerability to major accidents and disasters could result in significant adverse effects on the surrounding environment. Sensitive receptors for this project in relation to major accidents and disasters include protected species and habitats (section 8), and other marine users – e.g., touristic/recreational users (section 9.3) and commercial fisheries (section 9.4).

9.6.1.1 Unexploded Ordnance (UXO)

UXO is unlikely in the study area, as there are no military exercise areas within the study area or close vicinity (SEAI, 2011). Geological surveys being undertaken will confirm this,

and UXO will be safely detonated if detected, prior to construction starting (with underwater noise impacts relating to this addressed in section 8). Carrying out a pre-construction survey will significantly reduce the risk of identifying UXO during construction.

9.6.2 Data sources and Baseline

The following data sources will be utilised for the assessment of the risk of major accidents and disasters:

Table 9-17: Sources utilised for risk of major accidents and disasters

Name of Source	Date accessed
EM-DAT The International Disaster Database (CRE, 2009)	01/2022
Technical chapters – Shipping and Navigation (9.1), Aviation Safety, Military Exercise and Telecommunications (9.2)	01/2022
Incident reports (MCIB, 2022)	2022

9.6.3 Relevant Guidance

The following guidance will be utilised for the preparation of the Risk of Major Accidents and Disasters chapter:

- IEMA Major Accidents and Disasters in EIA (IEMA, 2021)
- Safety, Health and Welfare at Work Act (HSA, 2005)
- National Risk Assessment for Ireland 2020 (Government of Ireland, 2021)
- ISO 31000:2018 Risk management — Guidelines (ISO, 2018)
- Health and Safety Authority Ireland (HSA, 2021)
- S.I. No. 14/1991 - Safety, Health and Welfare (Offshore Installations) (Emergency Procedures) Regulations, 1991. (Government of Ireland, 1991)
- Health and Safety Committee (Wind Energy Ireland, 2021).

9.6.4 Design Parameters

Project design parameters relevant to Major Accidents and Disasters are listed in Table 9-18. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-18: Project design parameters and their relevance to major accidents and disasters

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Scale of proposal will affect the risk of major accidents and disasters.

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on site A, 1 single or dual rotor FOW on site B.	Scale of proposal will affect the risk of major accidents and disasters.
Minimum depth of water for anchoring system	96-107 m Test Area A 41-56 m Test Area B	Depth of anchoring will affect risk of major accidents and disasters linked to interaction with other vessels.
Separation distance between FOW devices	Maximum anchoring area is about 2.5 km^2 radius for the turbines.	Scale of site will affect risk of major accidents and disasters.
Minimum deployment period FOW devices	12 months minimum. Anchors may remain for the lifetime of the demonstration site (35 years) for use by subsequent technology developers.	Length of deployment will affect risk of major accidents and disasters.
Navigational lighting	Devices will meet with international requirements for lighting.	Lighting will affect risk of major accidents and disasters.
Aviation lighting	Devices will meet with international requirements for lighting and Irish Aviation Authority.	Level and types of lighting will affect risk of major accidents and disasters.
Vessel access for deployment and access	Vessel access will be required during the construction and approximately once per month during operation of the project.	Increased vessel deployment will affect risk of major accidents and disasters, e.g., pollution incidents, vessel collisions and UXO interaction.

9.6.5 Embedded Mitigation

Mitigation measures to minimise the risk of major accidents and disasters will be integrated into the project design, through the construction, operation and decommissioning phases. Where appropriate, measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies will be included. This will include preparation of the following:

- Construction Environmental Management Plan (CEMP) including Marine Pollution Contingency Plan and Vessel Management Plan
- Hazard Identification (HAZID)
- a Hazard and Operability Analysis (HAZOP)
- a Control of Major Accident Hazards (COMAH) licence

- an environmental permit (see Table 3.1 in chapter 3)
- an Emergency Response Plan.

9.6.6 Scoping of EIA

Potential major accidents and disaster risks relating to the project activities have been scoped in or out dependent on their likelihood of having a significant effect from the project on the surrounding environment. These impacts may cover construction, operation and/or maintenance stages, but levels of impact may differ during different stages. Table 9-19 sets out the potential impacts that we propose are scoped in and out of the EIA.

Table 9-19: Project activities and potential impacts to risk of major accidents and disasters

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Encounters with UXO	In	Explosions and significant adverse effects on the surrounding environment. (It is possible this may be scoped out once the results of the Site investigations surveys are known).
Vessel collisions	In	Significant safety concern and could also lead to significant oil and chemical spills
Natural disasters, e.g., tsunamis, volcano eruptions and coastal flooding	Out	Very unlikely to occur offshore Ireland
Operation		
Encounters with UXO	In	Explosions and significant adverse effects on the surrounding environment. (It is possible this may be scoped out once the results of the Site investigations surveys are known).
Explosion / fire risk of offshore infrastructure	In	Significant adverse effects on the surrounding environment.
Terrorism incidents	In	Risk very low for offshore environment, but impact would be high
Natural disasters, e.g., tsunamis, volcano eruptions and coastal flooding	Out	Very unlikely to occur offshore Ireland
Decommissioning		
As for installation and operation	In	As for installation and operation

Navigational risks are addressed in section 9.1.6 and Aviation risks in section 9.2.6.

9.6.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6. Table 6-1 within section 6.6 identifies those projects which may act cumulatively with Major Accidents and Disasters impacts/risks from the AFLOWT project and will be considered in the EIAR.

Other ongoing activities that may result in cumulative impacts with the project include:

- Climate change leading to sea level rise and increased storms/extreme weather events – risk of damage to FOW devices and cables, leading to possible environmental effects.

9.6.8 Approach to EIAR

The following assessment will be carried out to determine the significant impact that the risk of major accidents and disasters will have in relation to the project:

- a full desk-based review will be undertaken to identify any further risks relating to major accidents and disasters and confirm the scoped-out risks
- consultation with relevant authorities and organisations, as per the stakeholder engagement process set out in section 4
- define the worst-case scenarios for the identified risks, then assess the likelihood of the risks occurring, and whether each risk could result in a major accident or disaster
- assess whether the risk is reduced to As Low as Reasonably Practicable (ALARP) with proposed mitigation measures.

9.6.9 Scoping questions

The following question has been identified for the competent authority, in regard to the scoping of the risk of major accidents and disasters:

- Do you identify any additional risks from major accidents and disasters?
- Do you agree with the proposed embedded mitigation measures?

9.7 Human Health

9.7.1 Receiving Environment

Employment and recreational activities are covered in section 9.3. Noise emissions are covered in section 0. Visual amenity is covered in section 9.9. This section covers air emissions and electromagnetic fields. Though the project is offshore, receptors may be present within the wider study area of County Mayo. The closest receptors are residential properties in Belderra Strand, and recreational users of the area.

As of 2016 (the census is due to be updated in 2022), in County Mayo 364 people were in very bad health, and 1,939 in bad health, of a total of 130,507 people (Central Statistics Office, 2016 b). There are several hospitals in the County Mayo area, with the closest being the Community Hospital in Belmullet, others include Westport Primary Care Centre, Mayo General Hospital in Castlebar, Mayo University Hospital in Castlebar, Sacred Heart Hospital in Castlebar.

9.7.1.1 *Air quality*

Though air quality across Ireland is generally considered good, there is still concern around levels of particulate matter and nitrogen dioxide (NO_2). Traffic is considered the primary source of NO_2, though domestic burning of fuels also contributes (SEAI, 2011). As of October 2021, average particulate matter ($PM_{2.5}$) was 6.01 µg/m³, average PM_{10} was 8.02 µg/m³ (measured at Ballina station) (EPA, 2021). Recent results at the Castlebar station are slightly different but still low, with PM_{10} of 12.92 µg/m³, ozone (O_3) of 37.78 µg/m³ and NO_2 of 9.53 µg/m³.

9.7.1.2 *Electromagnetic fields (EMF)*

Electromagnetic fields are present naturally from the currents in the outer layer of the earth's core, with background field values between 30 microtelsa (µT) at the equator and 60 µT at the poles. Subsea electric cables also produce electromagnetic fields (SEAI, 2011).

9.7.2 Data sources and Baseline

The following data sources have been for the assessment of human health impacts:

- Central Statistics Office (CSO) (2021)
- Demography SAPMAP (CSO, 2016)
- Air pollution data collected by County Mayo Council, at stations in Ballina and Castlebar (EPA, 2021)
- Environmental Protection Agency (EPA) Ireland Air Quality Index for Health (EPA, 2022)
- Previous foreshore licence application (SEAI, 2011).

9.7.3 Relevant Guidance

The following guidance will be used for the assessment of human health impacts, in addition to that set out in section 3:

- County Mayo Development Plan 2014 to 2020 (County Mayo Council, 2017) (and update 2021 to 2027 to be published in 2022)
- Project Ireland 2040 National Planning Framework (Government of Ireland, 2019)
- Directive on ambient air quality and cleaner air for Europe (CAFE) - replaces the air framework directive and the first three daughter directives - 2008/50/EC (EC, 2008)
- Guidance on Electromagnetic Field Regulations 2016 (HSA, 2016).

9.7.4 Design Parameters

Project design parameters relevant to Human Health are listed in Table 9-20. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-20: Project design parameters and their relevance to human health

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Scale of proposal will affect the impact to human health, e.g., through increased vessel engine/exhaust emissions from increased vessel traffic in area.
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on site A, 1 single or dual rotor FOW on site B.	Scale of proposal will affect the impact to human health, e.g., through increased vessel traffic in area, and number of cables required (EMF effects).
Vessel access for deployment and access	Vessel access will be required during the construction and approximately once per month during operation of the project.	As above increased vessel usage will affect impact to human health.

9.7.5 Embedded Mitigation

The following mitigation measures will be incorporated into the project design to minimise air emissions:

- regular maintenance of vessels to minimise emissions
- efficient use of vehicles and vessels, to minimise the number required, and minimise the time required for.

The following measures apply to EMF fields:

- Cables will be installed in line with guidance and legislation, with sufficient burial of cables and protection.
- Monitoring of the cables will be undertaken, to check for damage and repair if needed.

9.7.6 Scoping of EIA

Potential human health (air quality and EMFs) risks relating to the project activities have been scoped in or out dependent on their likelihood of having a significant effect from the project on the surrounding environment. These impacts may cover construction, operation and/or maintenance stages, but levels of impact may differ during different stages. Table 9-21 sets out the potential impacts that we propose are scoped in and out of the EIA.

Table 9-21: Potential impacts of project activities on human health

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation, operation and decommissioning		
Increased vessels in the area, leading to increased air emissions offshore.	Out	As construction, operation and decommissioning will take place offshore, any emissions will occur far from onshore areas with higher risk of air pollution. Air emissions are likely to be dispersed rapidly in an offshore environment. The overall project outcome will be to help reduce air emissions, through development of renewable energy technologies.
Increased dust emissions during offshore construction and decommissioning.	Out	As above potentially from cable landfall works.
Increased EMFs in the area.	Out	The AMETS cable will use industry standard alternating current (AC) cables, which shield against electrical, but not magnetic fields. The magnetic fields may induce EMFs outside of the cable. Furthermore, field strengths will decrease rapidly with distance, burial will be undertaken and protection for sections of cable that cannot be buried. The strength of the field is expected to be between 2 and 35 µT – below reference exposure levels of 100 µT for residential areas, and 500 µT for occupational environments (SEAI. 2011). Thus, EMFs are expected to be minimal.
Accidental events, e.g., oil or fuel spill	Out	Pollution incidents could impact human health, however as the site is offshore and various management measures will be in place to reduce this risk, the risk to human health is low.

NB: Potential accidental impacts on human health from major incidents (such as entanglement of a third-party vessel in FOW anchor/mooring chains and subsequent capsizing) will be covered in the EIA chapter on Risk of major Accidents and Disasters.

9.7.7 Scoping of Cumulative Assessment

Human health impacts can be scoped out, as no significant effects have been identified.

9.7.8 Approach to EIAR

Human health impacts can be scoped out, as no significant effects have been identified.

9.7.9 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A list of stakeholders is included in Appendix A1.

9.8 Cultural and Archaeological Heritage

9.8.1 Receiving Environment

The survey completed in 2010 at the AMETS (Scall) identified some historical and archaeological deposits in the study area of the proposed development, yet no known protected or unprotected sites of cultural heritage were identified. The Admiralty Chart no. 2703 (SEAI, 2011) shows no shipwrecks or cultural heritage features in the area. However, the National Shipwreck Inventory (National Monuments Service, 2021 a) identified two possible vessels floundered in the surrounding area (not directly within the study area) of the Annagh Peninsula:

- St George, 26 January 1847, Belmullet, 128 ton sailing vessel
- Sisters, 13 March 1899 between Mayo and Belmullet - 21 tons.

However, locations of these vessels are imprecise.

Other records of wrecks in the surrounding area (not study area) include:

- George and Mary SV off Eagle Island 1915, Latitude 54.10417 Longitude -10.39267
- Tuskar steam ship off Eagle Island 1917: Lat 54.26667, Long -10.17500
- Unknown wreck off Mullet point, Lat 54.24222 Long -10.007861 (Marine institute, 2022).

There is also a possibility of non-ferrous (wooden) log boats in the area. The areas of Broadhaven and Blacksod are considered to be prehistoric, and there are various submarine peat deposits across the area (SEAI, 2011).

9.8.2 Data sources and Baseline

The following data sources will be utilised to scope the impacts of the project activities on Cultural and Archaeological Heritage:

- Geological Survey of Ireland Data and Maps (Geological Survey Ireland, 2022)
- Cartographic sources: Bald's map of County Mayo (1817), first edition of Ordnance Survey (O.S.) published 1838, OS map published 1900, OS revision published 1906.
- Database of Irish Excavations (Department of Housing, Local Government and Heritage, 2021)
- Mayo County Development Plan (2014 - 2020) contains record of protected structures (RPS) for County Mayo, and landscape appraisals (Mayo County Council, 2017)
- Mayo County Library
- Ports and harbours archive

- National inventory of Architectural heritage (Department of Housing, Local Government and Heritage (n.d.))
- Wreck Viewer webpage (National Monuments Service, 2021 a)
- Records of monuments and places (RMP) (National Monuments Service, 2021 b)
- Topographical files held in National Museum of Ireland
- Sources for Maritime History (National Archives, n.d.).

9.8.3 Relevant Guidance

The following guidance will be followed, to assess the impacts of the project on Cultural and Archaeological Heritage:

- Standard and Guidance for Desk Based Assessment (Chartered Institute for Archaeologists, 2017)
- Guidance for Assessment of Cumulative Impact on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology, 2008)
- The Code of Practice for Seabed Developers (Joint Nautical Archaeology Policy Committee, 2006)
- Architectural Heritage Protection; Guidelines for Planning Authorities (Department of Arts, Heritage and the Gaeltacht (2011)
- Framework and Principles for the Protection of the Archaeological Heritage (Department of Arts, Heritage, Gaeltacht and the Islands, 1999)
- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (Wessex Archaeology, 2021)
- Historic Environment Guidance for the Renewable Energy Sector (Wessex Archaeology, 2007)
- Collaborative Offshore Wind Research into the Environment (COWRIE), Historic Environment Guidance for the Renewable Energy Sector (Wessex Archaeology, 2007)
- Heritage Act (Government of Ireland, 2018 a)
- Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Historic Environment Desk-Based Assessment (CIfA, 2017).

9.8.4 Design Parameters

The project design parameters are set out below, taken from Section 5, and with their relevance to cultural and archaeological heritage (with non-relevant parameters excluded). As the design is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Project design parameters relevant to cultural and archaeological heritage are listed in Table 9-22. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-22: Project design parameters and their relevance to cultural and archaeological heritage

Design parameter	Technical details – worst case scenario	Relevance
Overall power generation	Application to upgrade from 10 MW to 20 MW.	Scale of proposal will affect the impact to cultural and archaeological heritage

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on site A, 1 single or dual rotor FOW on site B.	Scale of proposal will affect the impact to cultural and archaeological heritage
Minimum depth of water for anchoring system	96-107 m Test Area A 41-56 m Test Area B	Depth of anchoring will affect impact to cultural and archaeological heritage
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor	Anchor type and length of seabed will affect impact to cultural and archaeological heritage, e.g., through scouring.
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Site A, 6 km from Site B.	Installation of cable will result in physical disturbance of seabed, and potentially resulting in damage to unknown cultural and / or archaeological heritage.

9.8.5 Embedded Mitigation

Standard mitigation is likely to be included as part of the EIA process. Such measures would include:

- monitoring of submarine cable trenching works by a qualified archaeologist
- geological surveys of cable routes analysed by a qualified archaeologist
- consultation with the National Monument Service's Underwater Archaeology Unit, and integration of any additional mitigation measures attached as a condition of the licence
- monitoring of AEZs undertaken following a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries, to mitigate impacts on any previously unidentified features during works
- further archaeological surveys if required, e.g., diver surveys, Remote Operated Vehicle (ROV) surveys.

In addition as part of the embedded mitigation the following measures will be integrated into the construction, operational and decommissioning phases, to minimise the impact of the project on any cultural and archaeological features:

- Avoidance of any features or archaeological or cultural heritage, and micro-siting to ensure minimal disturbance during cable trenching and laying
- Archaeological exclusion zones (AEZ) set out if required, of 100 m for highly vulnerable features/sites, and a minimum of 50 m for others.

9.8.6 Scoping of EIA

Potential impacts relating to the project activities have been set out, scoped in or out dependent on their likelihood of having a significant effect on cultural and archaeological heritage in the study area. These impacts may cover construction, operation and/or maintenance stages.

Potential cultural and archaeological heritage impacts relating to the project activities have been scoped in or out dependent on their likelihood of having a significant effect from the project on the surrounding environment. These impacts may cover construction, operation and/or maintenance stages, but levels of impact may differ during different stages. Table 9-21 sets out the potential impacts that we propose are scoped in and out of the EIA.

Table 9-23: Potential impacts of project activities on cultural and archaeological heritage

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Installation of FOW device foundations and laying of cables could result in damage to the seabed.	In	Damage to the seabed could lead to damage of unknown cultural and/or archaeological features.
Indirect disturbance to the setting could occur from installation of infrastructure, affecting the cultural and heritage setting's character.	In	The installation of FOW devices will affect the area's character.
Accidental events, e.g., oil / fuel spills.	In	Pollution incidents could impact archaeological and cultural heritage features.
Operation		
Movement expected from floaters, mooring lines, drag anchors dynamic cables could damage the seabed.	In	Damage to the seabed could lead to damage of unknown cultural and/or archaeological features.
Indirect disturbance to features could occur from disturbance, through sedimentation and changes in water quality etc.	In	Increased in sedimentation and decreasing water quality could damage cultural and/or archaeological features.
Exposure of buried remains during construction could lead to damage.	In	Unknown cultural and archaeological features may be present and become exposed over the lifetime of the project.
If additional cultural and archaeological heritage features are identified, this	In	This would be a positive impact for the project.

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
data could be published to benefit cultural and archaeological knowledge of the area.		
Decommissioning		
Removal of infrastructure could cause damage to seabed.	In	Damage to the seabed could lead to damage of unknown cultural and/or archaeological features.

9.8.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6.6. Table 6-2 identifies those projects which may have cumulative impacts with Cultural and Archaeological Heritage impacts from the AFLOWT project, and will be considered in the EIAR.

9.8.8 Approach to EIAR

Additional data will be collated from the geophysical and geotechnical surveys of the proposed project area, and the subsea cable route. Archaeological assessment will be undertaken on the collated data to identify any additional underwater heritage assets. Following this data collation, a desk-based assessment will be undertaken to determine the impacts taken forwards from this scoping stage. Consultation will be undertaken with the National Monuments Service, with any additional required mitigation measures incorporated into the project design.

9.8.9 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below and in the corresponding sections of each subject section.

- Do you agree on the approach to the EIAR, utilising data collected in geophysical and geotechnical surveys to undertake a desk-based assessment? (It is noted that the results may be delayed).

9.9 Seascape, Landscape and Visual Impact

The FOW design envelope is in its early stages, with environmental and physical data still being collected, and the final specifics of the design not yet known. The worst case parameters based on responses from an Industry questionnaire in 2021 have been used to assess the likely impacts on seascape, landscape and visual amenity at this scoping stage. The analysis of seascape, landscape and visual amenity will feed into the final design envelope for the demonstration site, and this process will be set out in the EIAR (Barnes, 2017).

9.9.1 Receiving Environment

AMETS Test Areas A and B, with the corresponding WTG devices and cabling, are located off the coast of County Mayo Landscape Character Unit (LCU) B: North West

Coastal Moorland (County Mayo Council, n.d.). LCU B is described as a ‘complex of low-lying islands and peninsulas with varying topographical and land cover characteristics but unified by its proximity to the coast.’ The County Mayo Development plan 2014 to 2020 (to be updated with plan 2021 to 2027) (County Mayo Council, 2017) describes the area as having ‘Uninterrupted vistas across the water to bays and channels to opposing shorelines.’ and ’Smooth terrain – within which distances can appear shorter.’

In 2011 a landscape and visual impact assessment (LVIA) was undertaken by URS Scott Wilson for proposed offshore wave energy devices at each of the Test Areas and a proposed substation and cable connection at the location described in this report. The information in the URS Scott Wilson report will be reviewed and may inform the SLVIA for the proposed development. However, with the exception of the substation and cable connectors, the proposed development is markedly different and industry guidance and advice on SLVIA has changed since 2011. New baseline information will therefore be gathered on which the assessment of effects will be based. The baseline assessment will focus on defining seascape units in accordance with guidance that provide a robust evidence base while allowing a proportionate assessment of effects.

The baseline information will augment the published Mayo Landscape Appraisal with fieldwork observations and seascape character areas will be defined in accordance with published guidance using an approach that will be agreed with stakeholders.

According to the Mayo Landscape Appraisal (County Mayo Council, n.d.), the west coast of the Mullet Peninsula is described as ‘vulnerable’, with ’very distinctive features with very low capacity to absorb new development, without significant alterations of existing character over an extended view’. Sensitive landscape types present include beaches, dunes, sands and natural grassland. The exposed nature of the area would not support introduced vegetation and planting.

Scenic walks in the area include the Erris Head loop walk, and the Slí na Sláinte walking routes Broadhaven and Blacksod). The scenic road route R313 is also present, between Belmullet and Blacksod.

The project development lies partly within LCU B: North West Coastal Moorland as defined in the County Mayo Landscape Appraisal. The LCU includes the Belmullet Peninsula, composed of extensive areas of pastureland with dunes along the west coast. Only the onshore elements are in the LCU. The LCU is a landscape character appraisal but does include seascape elements although not extending out to the Test Areas. The County Mayo landscape appraisal identifies the following ‘critical landscape factors’ within the LCU: coastal vistas, smooth terrain, low vegetation and prominent ridge lines. Beaches, dunes and sands at Cross Point, Carraun Point, South of Tiraun Point and from Annagh Head to Belderra Strand are classed as ‘sensitive’ areas, as well as natural grassland present. A vista on the R313 route from Blacksod Point to Fallmore Bay is identified as a ‘highly scenic vista'. A major feeder road is present near to the western coastline. LCU B coincides partly with Policy Area 2: ‘Lowland Coastal Zone’ in which the following policies are listed in the County Mayo Landscape Appraisal:

- Policy 8: Recognise the substantial pockets of residential and rural land uses in some locations and the emerging pressures for differing land uses of industry, wind energy and residential development in this policy area.

- Policy 9: Continue to facilitate appropriate development in a progressive and clustered manner that respects the scale character and sensitivities of the landscape.

- Policy 10: Recognise that in this low-lying open environment, tall and bulky development can have a disproportionate impact against the landscape when viewed from the predominantly low-lying areas of the public realm.

- Policy 11: Encourage development that will not have a disproportionate effect on the existing character of the landscape in terms of location, design, and visual prominence.

The preliminary study area for the assessment of impacts will extend to 45 km with a likely detailed study area of 20-30 km. A Zone of Theoretical Visibility (ZTV) will be generated for the preliminary 45 km study area based on relevant guidance (based on rotor tip heights of up to 110m+). The detailed study area for the assessment of impacts will be refined based on the areas of visibility identified by the ZTV and the location of sensitive receptors.

The ZTV will be used to identify viewpoints which will be photographed in accordance with industry guidance and presented as visualisations that show the location of the proposed development. A preliminary ZTV and initial list of proposed viewpoints is shown on Figure 9.12. The proposed viewpoints are:

- VP1 – Belderra Strand
- VP2 – Cross Loop Walk
- VP3 – Lois na Sioga
- VP4 – Ceann an Eanaigh, Wild Atlantic Way
- VP5 – Dun na mBo, Wild Atlantic Way
- VP6 – Bellmullet
- VP7 – Elly Bay Beach
- VP8 – Ceann an Iorrais, Wild Atlantic Way
- VP9 – Doolough
- VP10 – Glosh
- VP11 – Mount Slievmore
- VP12 – Croaghaun Cliffs, Achill
- VP13 – N59, Ballycroy National Park

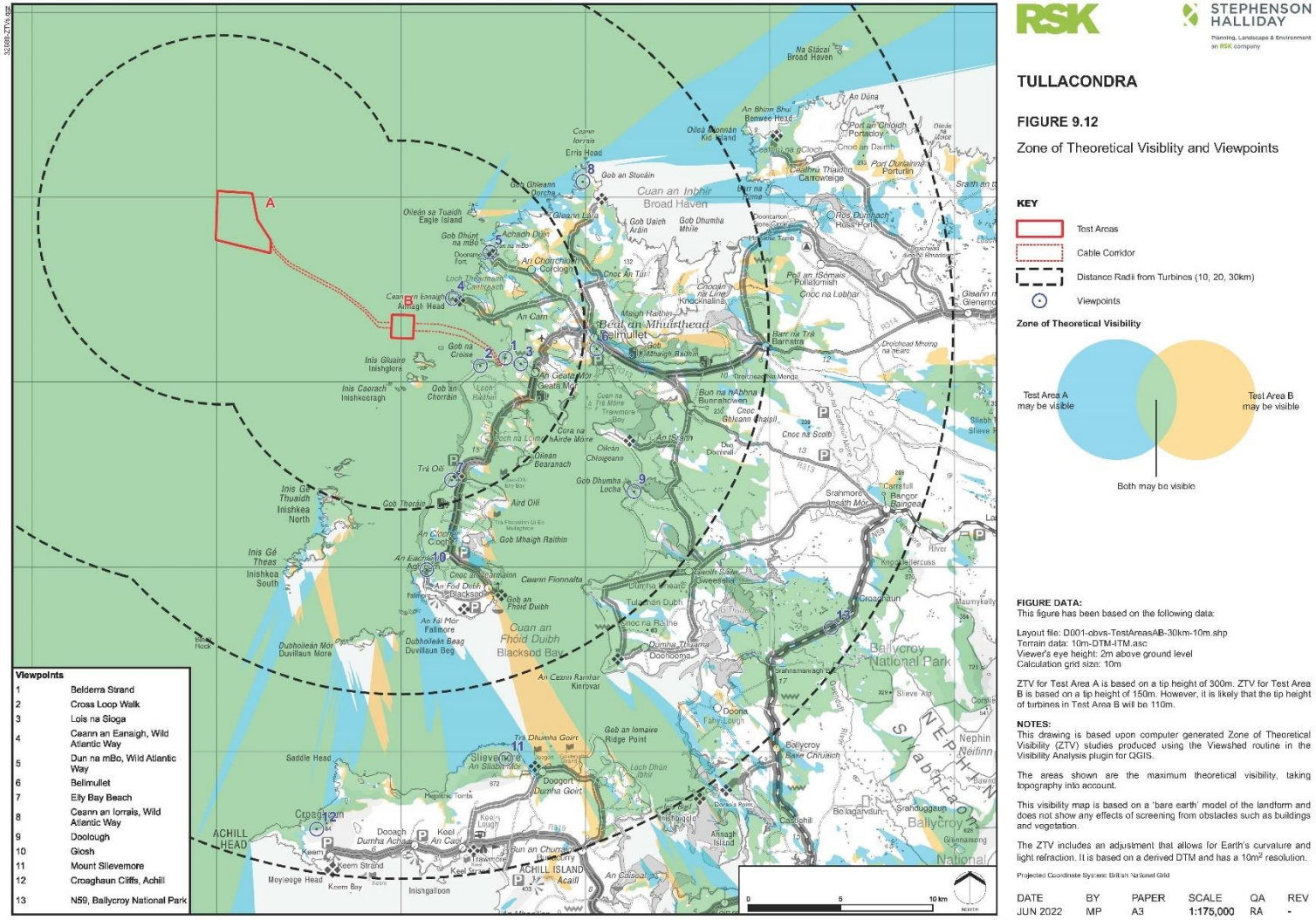

Figure 9-12: Zone of Theoretical Visiblity and Viewpoints

9.9.2 Data sources and Baseline

The data sources in Table 9-24 were utilised in the preparation of this Scoping Report chapter:

Table 9-24: Data sources on seascape, landscape and visual impacts

Name of Source	Date accessed	Data overview
Landscape Appraisal of County Mayo' (CAAS Ltd., n.d.)	10/21	Describes character units, area designations, principle policy areas and a landscape sensitivity matrix for County Mayo, Ireland.
Mayo County Development Plan 2014 to 2020 (Mayo County Council, 2017)	10/21	Sets out strategies and area plans for County Mayo, including for the Béal an Mhuirthead (Belmullet) area.
Draft Mayo County Development Plan 2021 to 2027 (Mayo County Council, 2021)	10/21	Sets out updated strategies and area plans for County Mayo, including for the Béal an Mhuirthead (Belmullet) area.
Walks.mayo.ie	10/21	Describes walking routes in County Mayo, along the West coast.
https://www.thewildatlanticway.com/	02/22	Describes the Wild Atlantic Way, provides maps and location of visitor attractions along the route.

Additional data will be gathered and prepared for the EIAR. This will include a digital ZTV to refine the study area, photography at viewpoints undertaken in accordance with current guidance taken during a site visit by a qualified landscape architect, visualisations showing the location of the proposed FOW devices, cumulative ZTVs as required for a proportionate assessment of for cumulative impacts and locations and heights of other windfarms in the vicinity for cumulative assessment.

9.9.3 Relevant Guidance

The Project design envelope will be considered during the EIA process and examples of different potential technology presented within the EIAR. Scoping for the SLVIA chapter has been undertaken according to the Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Barnes, 2017). In addition to this, the following guidance will be taken into consideration in the full EIA:

- Landscape Institute (2021), Technical Guidance Note 02/21 Assessing landscape value outside national designations
- Natural England (2019) An Approach to Landscape Sensitivity Assessment
- Visual Representation of Development Proposals Technical Guidance Note 06/19 (Landscape Institute, 2019)
- Using the Rochdale Envelope, Advice Note Nine: Rochdale Envelope. (The Planning Inspectorate, (July 2018)
- Scottish Natural Heritage (now NatureScot), (2017) Visual Representation of Wind Farms Version 2.2
- Landscape Institute and Institute of Environmental management and Assessment (2013), 'Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3)'
- Natural England (2014), 'An approach to seascape character assessment. Natural England Commissioned Report NECR105', Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/396177/seascape-character-assessment.pdf
- Guidance on Seascape and Visual Impact Assessment of Offshore Wind Farms (DTI, 2006)
- Guide to Best Practice in Seascape Assessment. (Countryside Council for Wales (CCW), Brady Shipman Martin, University College Dublin, (2001).

9.9.4 Design Parameters

Project design parameters relevant to landscape, seascape and visual impacts are listed in Table 9-25. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-25: Project design parameters and their relevance to landscape, seascape and visual impacts

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on site A, 1 single or dual rotor FOW on site B.	Scale of proposal will affect the of degree of impact, e.g., visual impact.
Maximum tip height	300 m Test Area A, 110 m Test Area B	Scale of proposal will affect the degree of impact, e.g., visual impact.
Colour of turbine	Likely grey	Colour may have a visual impact, affecting seascape. A grey colour is more likely to recede into the background whereas white or darker colours may be more noticeable.

Design parameter	Technical details – worst case scenario	Relevance
Separation distance between FOW devices	Minimum anchoring area is approximately 2.5 km2 radius for the turbines	Scale of site and layout of FOW devices will affect seascape character and views.
Minimum deployment period FOW devices	12 months minimum. Potential for anchors to remain throughout the lifetime of the demonstration site (35 years) should they be used by subsequent developers.	Length of deployment will affect seascape character and views.
Navigational lighting	Devices will meet with international requirements for lighting.	Lighting will affect seascape character and views.
Aviation lighting	Devices will meet with international requirements for lighting and Irish Aviation Authority.	Lighting will affect seascape character and views.

9.9.5 Embedded Mitigation

The scope of the SLVIA is proportionate and reflects the intended purpose of the Test Areas and the likely impacts associated with devices at each site The proposed development would comprise of Test Areas the purpose of which would be to analyse the performance of different technologies. The precise design of these technologies and the position of devices in each Test Area is yet to be confirmed. At this stage of design embedded mitigation for seascape, landscape and visual receptors is not available although we anticipate the following general principles may apply:

- use of industry compliant paint colours on the FOW devices
- Siting of taller devices in Test area A only.

The area of each Test Area and the anchoring systems that could be used means that a limited number of FOW devices could be deployed at any one time. Therefore, the potential to use layout design as mitigation is restricted.

9.9.6 Scoping of EIA

Potential impacts relating to the project activities have been set out, scoped in or out dependent on their likelihood of having a significant effect on seascape, landscape and visual features in the study area in Table 9-26.

Table 9-26: Potential impacts of project activities on seascape, landscape and visual impact

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Construction of FOW devices at Test Areas A and B	In	The installation of the FOW turbines at sea will result in effects on seascape character and visual amenity including scenic viewpoints and along scenic routes. Lighting during construction will also result in night-time impacts.
Operation		
FOW devices presence and operation	In	FOW devices at Test Area A will be visible from land during clear conditions. Intermittent lighting will be visible. FOW devices at Test Area B will be visible as will intermittent lighting. Seascape character will be influenced mainly by FOW devices at Test Area B. Sensitive receptors in the area include local residences, Carne golf club, some roads, Belderra strand, scenic vistas and a graveyard.
Decommissioning		
Decommissioning	In	As for construction.

It is proposed that the following potential effects are considered within the LVIA:

- effects on the landscape fabric of the substation site and cable connector
- effects on LCU B North West Coastal Moorland, LCU A Achill Clare and Island Complex, LCU C North West Coastal Bog, LCU D North Coastal Plateaux and LCU E North Mayo Mountain Moorland
- effects on visual receptors at representative viewpoints
- effects on sequential routes
- effects on residential visual amenity
- effects on visitors to key locations within the study area including locations identified on the Wild Atlantic Way and
- cumulative landscape and visual effects (including combined, successive and sequential visual effects).

9.9.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6. Table 6-1 within section 6.6 identifies those projects which may have cumulative impacts with Seascape, Landscape and Visual impacts from the AFLOWT project, and will be considered in the EIAR.

9.9.8 Approach to EIAR

The approach to the EIAR chapter for seascape, landscape and visual impact will follow the general guidance set out in section 6.1 and more specific information set out in section 3:

- baseline seascape, landscape and visual assessment of the study area, utilising desk-based research, available ZTVs and following assessment from a site visit
- the baseline seascape, landscape and visual assessment will feed into the final design envelope of the FOW Test Area. Consultation will be an important part of this process, involving key stakeholders, such as County Mayo council
- the effects of the final design envelope on seascape, landscape and visual amenity will be assessed, using a detailed methodology that complies with industry guidance. Sensitivity of the seascape, landscape and visual amenity features will be defined as high, medium or low and will be evaluated through a combination of susceptibility and value. The magnitude of change of the proposed development will be assessed in terms of its size or scale, geographical extent of the area or receptor that is influenced and its duration and reversibility. Magnitude will be defined as substantial, moderate, slight or negligible. The project's residual impacts on the seascape, landscape and visual amenity features will be defined as major, major/moderate, moderate, moderate/minor, minor or negligible, with moderate and major effects equivalent to likely significant effects. Where 'Moderate' effects are predicted, professional judgement will be applied to ensure that the potential for significant effects arising has been thoroughly considered
- up to 15 representative, illustrative or specific viewpoints will be used in the SLVIA showing the location of the proposed development. These will be selected using ZTV studies and through consultation with stakeholders
- the assessment of cumulative effects will focus on the 'additional cumulative change which would be brought about by the proposed development' as advised in NatureScot guidance
- residual effects following the implementation of mitigation measures will be assessed.

9.9.9 Scoping questions

The following questions have been identified for the competent authority, in regard to the scoping of this project's effects on seascape, landscape and visual amenity features of the study area:

- Are you satisfied with proposed 45 km radius for the preliminary study area with a smaller, refined detailed study area?
- Are you satisfied with the guidance set out for completion of the EIA chapter?
- Do you agree with our proposed approach to identifying seascape character areas?
- Do you agree with the number and initial list of viewpoints proposed and the approach to selecting these?
- Are you satisfied with the overall approach to the SLVIA given the potential dimensions of the proposed FOW devices and PDE?

9.10 Material Assets and Activities

9.10.1 Receiving Environment

9.10.1.1 Marine Users / Activities

Recreational users of the area are discussed in section 9.3, with commercial fisheries users being discussed in section 9.4. Military operations in the area are covered in section 9.2.

9.10.1.2 Material Assets

There are no subsea pipelines in the vicinity of the project works. There is an offshore gas pipeline to the north, and a telecommunications cable to the south (Marine Institute, 2026 and Telegeography, 2021), yet these are not close enough to interact with the project activities.

The Corrib offshore gas field is also off County Mayo, to the north of the project area (Vermilion Energy, 2021). The AFLOWT project area is outside of the Irish Sea Marine Aggregate Resource Study Area (Irish Marine Institute Ireland. 2016).

9.10.2 Data sources and Baseline

The following data sources have been utilised:

- Centre for Marine and Renewable Energy (MaREI);
- Department of Communications, Climate Action and Environment (DCCAE[39])
- Department of Housing, Planning and Local Government (DHPLG)
- Department for Transport, Tourism and Sport (DTTAS)
- Electricity Supply Board (ESB) - Networks
- Information on licensed projects for oil and gas via the Integrated Petroleum Affairs System (IPAS)
- Ireland's Marine Atlas Location of marine aggregates, cabling and disposal sites in the Irish Sea (Marine institute, 2022)
- Irish Offshore Operators Association (IOOA);
- Information on renewable energy projects Crown Estate (UK)
- National Offshore Wind Association of Ireland (NOW Ireland).

9.10.3 Relevant Guidance

Scoping for the Material Assets and Activities chapter has been undertaken according to the Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Barnes, 2017). In addition other guidance already named within this report will be taken into consideration in the full EIA as appropriate. The following guidance has been in the compilation of this scoping report and will be referred to when completing the EIAR.

- Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms (MCA, 2015)

[39] Since 2020, the Department of the Environment, Climate and Communications (DECC)

- Irish Maritime and Coastguard Agency (MCA), including MGN543 Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016)
- Cumulative Impact Assessment Guidelines - Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms (Renewable UK, 2013)
- International Association of Marine Aids to Navigation and Lighthouse Authorities Recommendation O-139 on the Marking of Man-Made Offshore Structures (IALA, 2013).

9.10.4 Design Parameters

Project design parameters relevant to material assets and activities are listed in Table 9-27. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-27: Project design parameters and their relevance to material assets and activities

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices and floater size	5 single rotor FOW devices or 2 dual rotor FOW devices on site A, 1 single or dual rotor FOW on site B.	Scale of proposal will affect impacts to material assets and activities e.g., interaction with marine users.
Mooring system	Anchor types include gravity, driven or drilled piles, drag embedment, suction pile, vertical load or torpedo piles. 3-6 anchors per FOW device. Indicative 50-300 m chain on seabed for each anchor	Type of mooring system could affect the level of interaction with other marine users.
Minimum deployment period FOW devices	12 months minimum. Potential for anchors to remain throughout the lifetime of the demonstration site (35 years) should they be used by subsequent developers.	Length of deployment will affect the duration of potential interactions with other marine users.
Export cabling	Up to 4 subsea export cables – 2 from Test Area A and 2 from Test Area B. Export corridor length 16 km from Site A, 6 km from Site B.	Extent of cable installation will affect the level of interaction with other marine users
Vessel access for deployment and access	Vessel access will be required during the construction and approximately once per month during operation of the project.	Increased vessel deployment will affect interaction with other activities in the area.

9.10.5 Embedded Mitigation

The following mitigation measures will be included in the project design (additional relevant mitigation measures are set out in chapters on recreational users, commercial fisheries users, navigational impacts and military activities):

- marking of activities on nautical charts
- providing sufficient information to stakeholders and relevant organisations, with marine notices issued
- construction area set up with buoys and lights - agreed for by Commissioner of Irish Lights and in line with O-139 (IALA, 2021)
- communication with other vessel users to manage vessel movements, and ensuring vessels comply with International Maritime Organization regulations
- monitoring of subsea cable protection.

9.10.6 Scoping of EIA

Potential impacts relating to the project activities have been set out, scoped in or out dependent on their likelihood of having a significant effect on material assets in the study area (see Table 9-28).

Table 9-28: Potential impacts of project activities on material assets

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Interference with normal activities during construction	In	Laying of subsea cables and / construction of FOW devices can interact with other activities in the area, and possibly have a negative impact.
Displacing normal activities	In	Can affect local activities, impacting on industry, recreation etc.
Operation		
Interfering with normal activities during operation	In	Can affect local activities, impacting on industry, recreation etc.
Decommissioning		
Interfering with normal activities during decommissioning	In	Can affect local activities, impacting on industry, recreation etc.

9.10.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6. Table 6-1 within section 6.6 identifies those projects which may have cumulative impacts with Material Assets and Activities impacts from the AFLOWT project and will be considered in the EIAR.

9.10.8 Approach to EIAR

Consultation will be required to gather additional information on marine users present in the project area, and to validate previously identified users. A stakeholder engagement plan will be set out and followed. Impacts identified in Table 9-28 will be taken forwards to the full EIAR and assess following consultation. Mitigation measures will be applied, with residual effects then assessed.

9.10.9 Scoping questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below. A summary of relevant stakeholders is included at Appendix A1. .

- Do you identify any additional marine users in the project area?

9.11 Climate Change

9.11.1 Receiving Environment

Climate change not only means changes in the average climate such as temperature but also changes in the frequency and intensity of extreme weather and climate events.

Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels with a likely range of 0.8°C to 1.2°C. According to the Environmental Protection Agency (2022) the climate in Ireland is changing in line with global trends, with a temperature increase of, on average, 0.8 °C compared with 1900. By the middle of this century (2041 – 2060) the average annual temperatures are projected to increase by between 1 - 1.2 ºC and 1.3 - 1.6 °C depending on the emissions trajectory. The number of warm days is expected to increase and heat waves are expected to occur more frequently. In Ireland, 2019 was the ninth consecutive year with temperatures above normal. Sea surface temperature in Irish waters has increased at a rate of approximately 0.6 °C per decade since 1994, which is unprecedented in the 150-year observational record.

Rainfall has also increased by 5% in Ireland over the period 1981 to 2010, in comparison to the period 1961 to 1990. Significant reductions in spring and summer rainfall are anticipated along with heavy precipitation events in autumn and winter.

Sea level rise has increased globally by 3.6 mm per year between 2006 and 2015 and is predicted to continue to increase. All major cities in Ireland are in coastal locations subject to tides, any significant rise in sea levels will have major economic, social and environmental impacts. Rising sea levels around Ireland would result in increased coastal erosion, flooding and damage to property and infrastructure. The number of very intense storms is also projected to increase over the North Atlantic region, projections suggest that the winter track of these storms may extend further south and over Ireland more often.

Under Ireland's Climate Action Plan (2021)40 a detailed proposal is set out to achieve, a 51% reduction in greenhouse gas emissions by 2030, and by 2050 to achieve net-zero emissions.

9.11.2 Data Sources and Baseline

9.11.2.1 Data sources

Baseline conditions will be identified through a detailed desktop review of Environmental Protection Agency (EPA) data on total national emissions of greenhouse gas (GHG) in Ireland including 'Ireland's Final Greenhouse Gas Emissions 1990-2019' (EPA, 2021 a). Information on emission projections will be obtained from 'Ireland's Greenhouse Gas Emissions Projections 2020-2040' (EPA, 2021b).

Other data and information sources may be identified during the review as part of the EIAR.

Estimates of GHG emissions from fabrication and installation of the FOW equipment will be based on literature review sources.

9.11.2.2 Baseline

In 2019, the EPA reported that total national emissions of GHG in Ireland were 59.78 million tonnes carbon dioxide equivalent ($MtCO_2e$), 4.4% lower (2.75 $MtCO_2e$) than emissions in 2018 (EPA, 2021a).

In 2019, the energy industries sector was the third largest individual contributor of GHG emissions at 15.8%. Public electricity and heat production accounted for 8.99 Mt of the total 9.45 $MtCO_2e$ for this sector. In the last three years energy industry emissions have decreased by over 3.2 Mt due to a reduced use of coal and peat and an increased use of natural gas and renewables in electricity generation (EPA, 2021a).

In 2019, electricity generated from wind and hydro increased by 16.0% and 27.7% respectively, reflected in a 13.6% decrease in the emissions intensity of power generation in 2019 (325 gCO_2/kWh) compared with 2018 (375 g/kWh) which is a new low in terms of carbon intensity. Renewables accounted for 37.6% of electricity generated in 2019 (up from 33.0% in 2018) (EPA, 2021a).

Despite the above, the final estimates of GHG emissions for the period 1990-2019 indicated that Ireland exceeded its 2019 annual limit set under the EU's effort sharing decision (ESD) by 6.85 $MtCO_2e$ (EPA, 2021a).

The EPA estimates emissions to 2040 using two scenarios as follows:

- 'With existing measures' – this scenario assumes that no additional policies and measures, beyond those already in place by the end of 2019 (latest national GHG inventory), are implemented; and
- 'With additional measures' – this scenario assumes that, in addition to the existing measures, there is also full implementation of planned policies and measures to reduce emissions, such as those in the 2021 climate action plan, which sets out a

[40] https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/

major programme of policies and measures aimed to help Ireland achieve its decarbonisation targets.

GHG projections published by the EPA for 2020 to 2040 (EPA, 2021b) project that 'with existing measures' emissions in the energy industries sector are projected to increase by 1.4% (to 8.6 $MtCO_2e$) over the period 2020 to 2030. This scenario projects that by 2030 renewable energy generation will represent an estimated 55% of electricity consumption, with renewable electricity generation capacity dominated by wind energy.

'With additional measures' emissions from the energy industries sector are projected to decrease by 24.8% (to 6.3 $MtCO_2e$) over the period 2020 to 2030. This scenario projects that by 2030 renewable energy generation will represent an estimated 70% of electricity consumption.

Implementation of 'with additional measures' (including those in the climate action plan) is projected to save 58 $MtCO_2e$ over the period 2021-2030 compared to the 'with additional measures' scenario.

9.11.3 Relevant Guidance

The following guidance will be utilised to assess the impacts of the proposed project on climate, and the project's vulnerability to climate change:

- IEMA EIA Guide to: Climate Change Resilience and Adaptation (IEMA, 2020)
- Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2017)
- Guidance of EIS and NIS Preparation for Offshore Renewable Projects (Barnes, 2017)
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EC, 2013).

9.11.4 Design Parameters

The project design parameters are set out below, taken from Section 5, and with their relevance to climate change and GHG emissions (with non-relevant parameters excluded). As the design is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Project design parameters relevant to climate change and GHG emissions are listed in Table 9-29. As the design of the project design envelope is still in progress, these parameters are subject to change. A worst-case scenario is considered.

Table 9-29: Project design parameters and their relevance to material assets

Design parameter	Technical details – worst case scenario	Relevance
Number of FOW devices.	5 single rotor FOW devices or 2 dual rotor FOW devices on site A, 1 single or dual rotor FOW on site B.	Scale of proposal will affect level of GHG emissions.

Design parameter	Technical details – worst case scenario	Relevance
Minimum deployment period FOW devices.	12 months minimum. Anchors may remain for the lifetime of the demonstration site (35 years) for use by subsequent technology developers.	Length of deployment will affect level of GHG emissions.
Vessel access for deployment and access.	Vessel access will be required during the construction and approximately once per month during operation of the project.	Increased vessel deployment will affect level of GHG emissions.

9.11.5 Embedded Mitigation

Embedded mitigation is likely to include:

- consideration of reuse of materials, or incorporation of recycled materials, into construction design.
- optimisation of vehicle and vessel usage during transportation of equipment to site and installation.

9.11.6 Scoping of EIA

According to Article (13) of Directive 2014/52/EU “climate change will continue to cause damage to the environment and compromise economic development. In this regard, it is appropriate to assess the impact of projects on climate (for example greenhouse gas emissions) and their vulnerability to climate change.”

The DCCAE and SEAI Guidance (Barnes, 2017) provides an indicative list of impacts that should be considered for climate when producing an EIAR. These are:

- CO_2 reduction
- sterilisation of future carbon storage areas
- sea level change, water salinity and temperature.

Based on experience of other climate change assessments, Table 9-30 sets out the impacts we propose to be scoped in and out of the EIA process for climate change.

Table 9-30: Potential impacts of project activities relating to climate change

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Deployment / installation		
Direct and indirect emissions of GHGs from vessels and equipment	In	Emissions will contribute to climate change

Activity and potential impact	Scoping in or out	Rationale for scoping in or out
Operation		
Direct and indirect emissions of GHGs from maintenance vessels and operation of equipment	In	Emissions will contribute to climate change
Indirect positive impacts in the reduction of emissions of GHG from the national grid	In	The testing of renewable technologies will help Ireland's transition from fossil fuels to net zero, helping to slow climate change.
Sterilisation of future carbon storage areas	Out	It is anticipated that potential carbon capture and storage sites will not be affected by the project as the Test Site areas are already licenced for renewable wind energy.
Decommissioning		
Direct and indirect emissions of GHGs from vessels and equipment	In	Emissions will contribute to climate change

The development of clean renewable energy such as floating offshore wind power is considered to be a key part of solutions to mitigate against climate change. The EIAR will focus on estimating the project's effect on GHG emissions, i.e., how much it will emit compared to how much it will save versus fossil fuelled generation, and how that fits into national commitments in Ireland's Climate Action Plan (aligned with the European Green Deal and the Paris Agreement).

Discussion will also be provided on how the project has been made climate change resilient by showing that sea level rise projections, changes in wind speeds / storm tracks, etc have been considered in design.

9.11.7 Scoping of Cumulative Assessment

The cumulative impact assessment will follow the process set out in section 6. Table 6-1 within section 6.6 identifies those projects which may have cumulative impacts on Climate Change aspects of the AFLOWT project, and will be considered in the EIAR.

The cumulative assessment will present the project's contribution to global GHG emissions. Discussion on further deployment of floating wind technology (if results from the project Test Areas are favourable) and Ireland's potential wind power resource will be provided, with the associated positive impacts with respect to GHG emissions.

9.11.8 Approach to EIA

Emissions of GHG may arise from the following sources:

- embodied emissions in site materials (based on literature review)

- emissions from vehicles and vessels importing/exporting material and installing equipment at the Test Areas (estimate based on number of turbines that will be present on Test Areas).

Embodied emissions are the carbon footprint of a material (i.e., the total emissions released throughout the lifecycle of the material). These emissions will be estimated for a selection of the key project materials using appropriate databases.

Positive impact from FOW operation:

The annual reduction in GHG emissions from the national grid associated with the operational phase of the proposed project will be calculated using the following formula:

Avoided tonnes CO2e/year = (A x B x C x D) / 1000

Where:

A = The rated capacity of the wind energy generated from the Test Area (MW).

B = The capacity factor (dimensionless), which takes into account the intermittent nature of the wind, the availability of wind turbines, array losses, etc.

C = The number of hours in a year, 8760 hours.

D = Carbon intensity of electricity generated and distributed via the national grid under a defined baseline scenario (g/kWh).

This method is in line with UK advertising guidance on claiming emissions savings from wind power (Committee of Advertising Practice, 2013). It does not account for the emissions associated with operating and maintaining the installation, effectively deeming these as negligible.

9.11.9 Scoping Questions

A summary of scoping questions is included at Appendix C. Table E1 includes general questions covering all disciplines and E2 subject specific questions. A summary of the latter are included below and in the corresponding sections of each subject section.

- Are the proposed data sources and calculation methodologies proposed acceptable?

10 SUMMARY OF EIA SCOPING

10.1 Overview

The purpose of this Scoping Report is to provide stakeholders with information on the AFLOWT project and allow for engagement on the key topics to be addressed in the subsequent EIAR, as well as the baseline data sources and assessment methodologies to be used to inform the EIAR.

This Scoping Report and subsequent EIAR are only applicable to the marine elements of the AFLOWT project. Table 10-1 provides a summary of the environmental topics scoped in to, and out of, the EIAR. The potential impacts scoped in and out under each environmental topic are provided in chapters 7 to 9 (sections entitled 'scoping of EIA').

Table 10-1: Summary of environmental topics scoped into the EIAR

	Deployment / installation	Operation	Decommissioning
Coastal erosion, sedimentation processes and seabed geology & Wind	✓	✓	✓
Bathymetry and hydrography	✗	✓	✗
Water and sediment quality	✓	✓	✓
Protected sites and species	✓	✓	✓
Benthic ecology	✓	✓	✓
Fish and shellfish ecology	✓	✓	✓
Marine mammals, megafauna and reptiles	✓	✓	✓
Offshore ornithology	✓	✓	✓
Ports, shipping and navigation	✓	✓	✓
Aviation safety, military exercise and telecommunications	✓	✓	✓
Socio-economics, recreation and tourism	✓	✓	✓
Commercial fisheries, shellfish and aquaculture	✓	✓	✓
Airborne noise	✓	✗	✓

	Deployment / installation	Operation	Decommissioning
Risk of major accidents and disasters	✓	✓	✓
Human health	✗	✗	✗
Cultural and archaeological heritage	✓	✓	✓
Seascape, landscape and visual impact	✓	✓	✓
Material assets and activities	✓	✓	✓
Climate change	✓	✓	✓

10.2 EIAR Structure and Associated Documentation

The proposed structure of the EIAR will mirror the structure of the Scoping Report, with additional sections for cumulative impacts, transboundary effects and reasonable alternatives to the proposed project and associated Project Design Envelope (see Section 1.5). The final structure of the EIAR will be agreed in consultation with regulators and consultees.

As per Article 6(3) and (4) of the Habitats Directive 92/43/EEC, a separate Appropriate Assessment (AA) Screening will be undertaken. In the event it is not possible to rule out impacts on the integrity of a European designated site, or its qualifying interests, then a Natura Impact Statement (NIS) may be required in order to support the Appropriate Assessment.

A separate desk-based Water Framework Directive (WFD) Assessment will also be carried out covering the marine area up to 1 nautical mile out to sea.

10.3 Consultation

The proposed approach to stakeholder engagement during the pre-application process is outlined in Section 4.2.

SEAI intend to hold a public meeting in Belmullet in the local area around the project site on 23 June 2022 associated with the submission of the request for a Scoping Opinion. This meeting will be carried out in person. A future event will be held prior to submission of the EIA report and marine consent application. This will either be in person or virtually, in line with COVID-19 restrictions in place at the time.

Further consultation with key stakeholders will be carried out throughout development of the EIAR, in line with the project Stakeholder Engagement Plan and associated Stakeholder Communications Strategy.

10.4 Next steps

Using this Scoping Report as the basis, the AFLOWT project is seeking feedback from key stakeholders on the following:

- key issues to be addressed in the EIAR
- proposed content of the EIAR and the potential impacts that have been scoped in/out
- proposed assessment methodologies to assess the potential impacts; and
- any other data that the environmental assessments should consider and address in the EIAR.

A more detailed list of scoping questions is provided in each environmental topic chapter (Chapters 7 to 9), these questions are summarised in Appendix C.

All feedback can be submitted to the following: Ocean.energy@seai.ie

All responses received during the scoping process will be considered and the EIAR scope updated as required. The EIAR will record all issues raised during the scoping process and how they have been addressed in the EIAR.

As indicated in section 1.2 it is the intention of SEAI, subject to the anticipated timescales associated with changes within marine planning and licensing activity in Ireland, to apply for a Marine Area Consent (MAC) covering the deployment of FOW turbine(s) at the site. Current grid capacity is 10 MW, however SEAI will seek to establish if grid connection can be upgraded to 20 MW.

11 REFERENCES

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APPENDIX A

A.1 LIST OF STAKEHOLDERS

	Stakeholder Group	Suggested Stakeholders
Group 1	Local Interest	• Residents within 15km of the development site (test site & substation) • Residents on Key transport routes during construction • Fishermen who frequent the cable route and test site. E.g. Erris Inshore Fisherman's Association, Erris Lobster Conservation and Restocking Association (ELCRA) Brown Crab & Lobster
Group 2	Local government and other organisations	• Mayo County Council • Sligo County Council • Northern & Western Regional Assembly • Western Development Commission • Local Emergency Services • ESB Networks
Group 3	Nearby businesses and community groups	• Project Partners • Local Supply Chain for the Project • Contracted companies to the Project • Erris Inshore Fisherman's Association • Erris Lobster Conservation and Restocking Association (ELCRA) Brown crab & Lobster Fishing • Local businesses, e.g. Food & Beverage, Local Accommodation, Chamber of Commerce, Local Hall • Primary & Secondary Schools • Belmullet Tourism Office • Community groups & associations
Group 4	• Government and other bodies	• Bord Gaís • Bord Iascaigh Mhara • An Bord Pleanála • Commission for Regulation of Utilities (CRU) • Commissioner of Irish Lights • Minister for Defence • Department of Enterprise, Trade and Employment • Minister for Finance • Minister for Further and Higher Education, Research, Innovation and Science • Minister for Justice • Minister for Transport

		• Minister for Agriculture, Food and Marine • Minister for Environment, Climate and Communications • Minister for Housing, Local Government and Heritage • Minister for Rural and Community Development • Minister for Tourism, Culture, Arts, Gaeltacht, Spot and Media • EIRGRID • Enterprise Ireland • Environmental Protection Agency • ESB, ESBI, ESB Networks • Failte Ireland • Foreshore Licencing Unit • Gas Networks Ireland • Geological Survey Ireland • Health and Safety Authority of Ireland • Health Service Executive • Heritage Council of Ireland • IDA • Inland Fisheries Ireland/ Regional Fisheries Office • Irish Aviation Authority • Irish Coast Guard • Irish Water • Marine Institute • Marine Survey Office • Met Eireann- Climate and Observation Division • National Parks and Wildlife Service • National Roads Authority • Office of Public Works (OPW) • Sea Fisheries Protection Authority • The Arts Council of Ireland • The Irish Naval Service • The Irish Tourist Industry Confederation • The National Transport Authority • The Port and Harbour Company/Authority (in affected areas) • Tourism Ireland • Transport Infrastructure Ireland
Group 5	Politicians and other political entities	• Mayo TDs • County Councillors for the Belmullet District • Mayo Senators

Group 6	Key interest groups and organisations	**Local:** Erris Inshore Fisherman's Association; Erris Lobster Conservation and Restocking Association (ELCRA) Brown crab & Lobster Fishing **National:** e.g. Bird Watch Ireland, An Taisce. IWDG, Seal Sanctuary, IWDG as an environmental NGO.
Group 7	Other energy organisations and individuals	• ESB • RWE Test Site- MegaAWE project • Floating offshore wind technology developers • MRE technology developers
Group 8	Media- Print, Radio, Online	E.g. local media outlets and newspapers

A2 AMETS SUMMARY OF QUESTIONNAIRE RESPONSES

Developer	A	B	E	F	G	H
Parameter	**Turbine developer**	**Turbine developer**	**Turbine developer**	**Turbine developer**	**Turbine developer**	**Turbine developer**
Overall power generation MW	10MW	10MW	10MW	2MW	100MW	
Maximum number of turbines	2	1	1	1	4	
Maximum tip height (m)	200	250	210	107	300	252
Maximum speed of turbine rotation (tip speed) (kph)			288	288		88.6
Number of blades per turbine	3	3	3	3	3	3
Colour of turbine	white/grey	grey		grey		
Number of turbines per floater	1-2	1	1	1	2	
Number of floaters	1	1	1	1	1	1
Floater size – height, width, length (m)	50*70*70	45*45*45	30*90*70	18*40*70	300*300*150	31*61*61
Anchoring system name	anchors	anchor	drag, suction or piled	drag anchor		
Number anchors	3	1	3-6	3	9	
Area covered by spread of anchors/anchor system (km2)	0.00385km		1	0.38		0.5

Anchor weight (tons)				15	150	
Anchor connections	chain/cable/rope		chain			
Max depth of water for anchoring system						
Subsea electrical cable (static) (kv)		66 or 33	33	10	66	33+

Developer	I	J	K	L	M
Parameter	Turbine developer	Monopiles	cables, anchor systems, ROVs, installation support services	Cable	DAVIT CRANE
Overall power generation MW	8MW		15MW	10MW	5MW
Maximum number of turbines	2				
Maximum tip height (m)	170				
Maximum speed of turbine rotation (tip speed) (kph)					
Number of blades per turbine	3				
Colour of turbine	grey				
Number of turbines per floater	1				
Number of floaters	1-2				

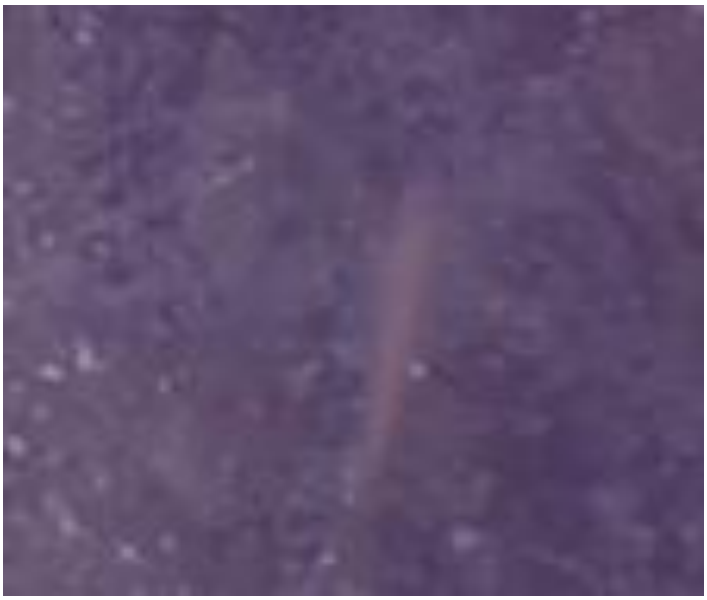
Floater size – height, width, length (m)	120*78*78				
Anchoring system name	spar	drilled			
Number anchors	1	1-3	1-3 per floater		
Area covered by spread of anchors/anchor system (km2)		5m per pile	2-2.5		
Anchor weight (tons)	2000				
Anchor connections			chain/rope/cable		
Max depth of water for anchoring system	120				
Subsea electrical cable (static) (kv)			66		10

*Note suppliers names are removed for confidentiality. Questions that did not receive an answer are not included.

APPENDIX B – FISH SPECIES, AMETS SITE SURVEY 2020

Table D1: Fish species identified during the analysis of drop-down video footage and diver stills from survey undertaken at the AMETS site in 2010

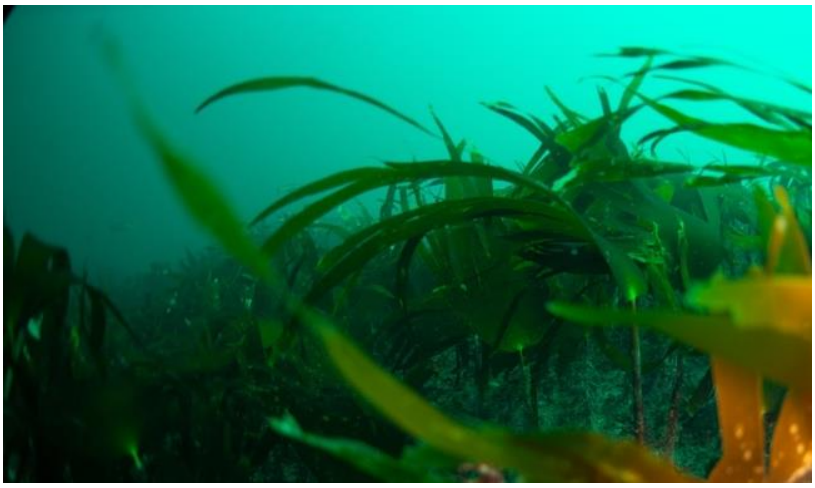
Image / screenshot	Video number / diver still number	Possible species identified
	VTS_07 (00:30)	3 x *Pollachius* sp. (possibly *Pollachius pollachius*)
	12_geoDVR (00:22)	Gurnard *Triglidae* (possibly Grey gurnard *Eutrigla gurnardus*)

	15_geoDVR (15:50)	Hooknose *Agonus cataphractus*
	15_geoDVR (16:57)	Unidentified teleost

	16_geoDVR (08:37)	Possible flatfish *Pleuronectiforme*
	18_geoDVR (05:39)	Dragonet *Callionymidae*

	18_geoDVR (24:01)	Unidentified teleost
	26_geoDVR (01:08)	Unidentified teleost
	26_geoDVR (01:18)	Unidentified teleost

	26_geoDVR (03:32)	Unidentified teleost
	ADS_6154	Blenny Blennidae

	ADS_6161	Gadoids (possibly Pollack *Pollachius pollachius*)
	ADS_6168	Wrasse *Labridae* (Possibly ballan wrasse *Labrus bergylta)*
	ADS_6189	Unidentified teleost

	ADS_6201	Wrasse *Labridae* (possibly Rock cook *Centrolabrus exoletus*)
	ADS_6219	Wrasse *Labridae* (Possibly ballan wrasse *Labrus bergylta)*

APPENDIX C – SUMMARY OF SCOPING QUESTIONS

Table E1: Summary of generic scoping questions across all disciplines included in chapters 7-9.

Scoping question	Regulator response (Yes/No)	Regulator comments
Are there any other key data sources you are aware of that you wish to see included?		
Are you content with the scope of the assessment?		
Are there any additional impacts that you believe could be significant and that you wish to see assessed?		
Are there any unidentified projects that may result in cumulative impacts, and need to be assessed?		
In Section 5.5. 1 the Anticipated Programme for individual technology deployment is considered. What further site assessment and approval steps should be taken once the Project Design Envelope is agreed through the EIA and MAC, process prior to individual developers deploying to the site?		
As part of the Scoping process, the Developer seeks confirmation from the Foreshore Licence Unit and in due course the Maritime Area Regulatory Authority (MARA) regarding likely implementation timescales and the form the licence application should take.		

Table E2: Summary of specific scoping questions

Scoping question	Regulator response (Yes/No)	Regulator comments
Topic: Coastal Erosion, Sedimentation Processes and Seabed Geology (Section 7.1.8)		

Scoping question	Regulator response (Yes/No)	Regulator comments
Do you consider that the baseline data gathering meet the requirements for scoping.		
Given the extremely localised nature of likely impact and extreme mobility of the substrate in Test Area A and B are you content that numerical modelling is not required at scoping stage?		

Topic: Bathymetry and Hydrography (Section 7.2.9)		
Do you consider that the baseline data gathering meet the requirements for scoping?		•
Topic: Water and Sediment Quality (Section 7.3.9)		
Are there any other guidance documents covering how to address water quality impacts, including how to consider WFD and MSFD requirements you would wish us to apply?		
Topic: Protected sites and species (Section 8.1.10)		
Have all relevant protected sites and species been identified, or are there any additional protected sites and species that you would like to see considered?		
Is the approach to Appropriate Assessment satisfactory?		
Topic: Benthic (Subtidal and Intertidal) Ecology (Section 8.2.10)		
Are there any further habitats or species that should be considered?		
Under the heading “Biodiversity” at the EIAR Screening stage: The proposed project has the potential to impact the biodiversity of subtidal reef habitat which is present along the cable corridor and within Test Areas A and B. The reef habitat is of high quality and contains features (circalittoral stable cobble reef) and notable marine communities (Celtic feather star:		

Leptometra celtica communities). This needs to be addressed at the EIA stage. Do you agree with this?		
Under the heading “soils and geology” at the EIA screening stage: Temporary disturbance of sediment in the subtidal area will occur. In the subtidal area, reef habitat (rock/cobble) may be impacted. Do you agree with this?		
The delay to the gathering of the benthic samples from the Site investigation surveys will delay the finalisation of the EIAR. Are you happy that an addendum to the EIAR is submitted following application for a MAC?		
Topic: Fish and Shellfish Ecology (Section 8.3.10)		
Are you satisfied with the scope of the data sources used for the fish and shellfish ecology baseline?		
Are there any missing impacts on fish or shellfish that you have identified, and believe need assessment?		
Are there any unidentified projects that may result in cumulative impacts, and need to be assessed?		
Do you agree that no specific fish / shellfish surveys are required?		
Topic: Marine Mammals, Megafauna and Reptiles (Section 8.4.10)		
Are you content with the data sources utilised for collation of marine mammal and reptile data in the study area?		
Are you content with the approach taken to the design of the baseline surveys, including duration of surveys?		
Do you identify any further SACs that should be considered for marine mammals and/or reptiles?		
Do you identify any further impacts to marine mammals and/or reptiles from the proposed project?		

Do you identify any further mitigation measures that should be implemented?		
Topic: Offshore Ornithology (Section 8.5.10)		
The study area has been subject to a range of surveys using boat-based and shore-based platforms between 2009 – 2013. A gap analysis completed identified that while survey data is available over a number of years, some gaps in survey information are present. Notably gaps or limited data is available during the winter period. Following the identification of data limitations, a series of surveys were commenced from August 2020 - July 2021. Through careful planning a full 12 months of data from a boat-based platform has been collected across the period, with no data gaps. This data has been augmented in months where data gaps were previously identified through the application of digital aerial survey. In addition to the application of boat and aerial survey, vantage point surveys have been undertaken from Annagh Head in a range of conditions to attempt to close potential data gaps relating to seabird movements under conditions which are not suited to the completion of either boat based or aerial survey effort. Considering these points, do you consider that the data is suitable to inform both the EIA and AA processes?		
Topic: Ports, Shipping and Navigation (Section 9.1.9)		
Is the use of updated AIS data and limited stakeholder engagement sufficient for the purposes of the NRA and EIA noting that it will be building upon the NRA conducted for the same Test Areas in 2011 which incorporated survey data, AIS data and stakeholder consultation?		
Are there any impacts proposed to be scoped out of the NRA, or that have not been identified at this stage, that are considered as requiring further assessment (both for the in isolation and cumulative scenarios)?		

Are there any mitigation measures not listed in Section 9.1.5 that should be considered embedded?		
Topic: Aviation Safety, Military Exercise and Telecommunications (Section 9.2.9)		
Have all relevant statutory aviation consultees been identified and are you in agreement with the approach?		
Are there any missing impacts that you have identified and believe need assessment?		
Are there any unidentified projects that may result in cumulative impacts, and need to be assessed?		
Topic: Socio-Economics, Recreation and Tourism (Section 9.3.9)		
Are you satisfied with the scope of the data sources used for the socio-economics, recreation and tourism baseline?		
Are there any missing impacts on socio-economic, recreation and tourism factors that you have identified, and believe need assessment?		
Topic: Commercial Fisheries, Shellfish and Aquaculture (Section 9.4.9)		
Are you content with the scope of data proposed to be reviewed and gathered during consultation with the fishing industry, for the preparation of the baseline?		
Are there any missing impacts to commercial fisheries that you believe to be significant and should be assessed?		
Topic: Airborne Noise (Section 9.5.9)		
Are you content with the data sources utilised for airborne noise description?		
Are you content with scoping out airborne noise from the full EIAR?		
Risk of Major Accidents and Disasters (Section 9.6.9)		

Do you identify any additional risks from major accidents and disasters?		
Do you agree with the proposed embedded mitigation measures?		
Topic: Human Health (Section 9.7)		
Are you content with the data sources utilised for air emissions and EMFs?		
Are you content with the scoping out of air emissions offshore and EMFs?		
Topic: CULTURAL AND ARCHAEOLOGICAL HERITAGE (Section 9.8.9)		
Are you content with the sources utilised to gather data on archaeological and heritage features in the area?		
Do you agree that the mitigation measures proposed are sufficient to protect any archaeological and/or heritage features in the area? Do you propose any additional measures?		
Do you agree on the approach to the EIAR, utilising data collected in geophysical and geotechnical surveys to undertake a desk-based assessment? (It is noted that the results may be delayed).		
Topic: SEASCAPE, LANDSCAPE AND VISUAL IMPACT (Section 9.9.9)		
Are you satisfied with proposed 45 km radius for the study area with a smaller, refined study area?		
Are you satisfied with the guidance set out for completion of the EIA chapter		
Do you agree with our proposed approach to identifying seascape character areas?		
Do you agree with the number and initial list of viewpoints proposed and the approach to selecting these?		
Are you satisfied with the overall approach to the SLVIA given the potential dimensions of the proposed FOW devices and PDE?		

Topic: MATERIAL ASSETS (Section 9.10.9)		
Do you identify any additional marine users in the project area? (Please refer to Appendix A1 for a list of stakeholders).		
Topic: CLIMATE CHANGE (Section 9.11.9)		
Are the proposed data sources and calculation methodologies proposed acceptable?		