Offshore Renewable Energy Development Plan II: Strategic Environmental Assessment Report

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

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1 Introduction

Ireland has one of the best offshore renewable energy resources in the world and with a maritime area of approximately 490,000 square kilometres or, in the region of seven times the size of the country's landmass, the future opportunity for Ireland to develop this is immense. As a result of Ireland's location at the Atlantic edge of the European Union (EU), Ireland has more offshore energy potential than most other countries in Europe, with an early estimate of long-term potential of at least 70 GW of ocean energy opportunity (wind, wave and tidal) within 100 km of the coastline (DCENR, 2014).

The Department of the Environment, Climate and Communications (DECC) is preparing the Offshore Renewable Energy Development Plan II (OREDP II) for Ireland. OREDP II will update the original OREDP published in 2014. The purpose of the OREDP II is to provide strategic guidance for the enduring sustainable deployment of offshore renewable energy. It is a national, sectoral assessment that will guide, at a high-level, strategic planning and the sustainable development of Ireland's offshore renewable energy resource.

This supporting Strategic Environmental Assessment (SEA) is being carried out on behalf of the Sustainable Energy Authority of Ireland (SEAI) for the Department of the Environment, Climate and Communications (DECC).

1.1 Background to OREDP II

International and national bodies have set out broad principles of sustainable development. Resolution 42/187 of the United Nations General Assembly (UN, 1987) defined sustainable development as 'meeting the needs of the present without compromising the ability of future generations to meet their own needs'. The UN 2030 Agenda for Sustainability Development (UN, 2015) sets out a plan of action 'for people, planet and prosperity' which focuses on the 17 defined Sustainable Development Goals (SDGs) and their respective sub-targets. Ireland's current national Sustainable Development Strategy Our Sustainable Future (Govt of Ireland, 2018) sets out Ireland's eight National themes and principles to sustainable development and Ireland's Sustainable Development Goals National Implementation Plan (Govt of Ireland, 2018) integrates these national themes and principles to sustainable development with the UN SDGs, to deliver the 2030 Agenda for Ireland.

In 2020, the Programme for Government (Govt of Ireland, 2021) set ambitious targets to progress offshore energy in Ireland consistent with Ireland's Agenda 2030 discussed above including a target to achieve 5GW capacity in offshore wind by 2030. The target will be primarily met through

development of established fixed bottom offshore wind turbine technology in Ireland's eastern and southern coastal regions with shallow (<60 m) water depth.

The 2021 Climate Action Plan (CAP), also commits to increasing the proportion of renewable electricity to up to 80% by 2030, including the increased target of 5GW of offshore wind energy (Govt of Ireland, 2021). As part of the agreement on Sectoral Emissions Ceilings (Govt of Ireland, 2022) the 5GW target was increased by 2GW for the production of green hydrogen. It is anticipated that this initial target will be met in part by specific, defined projects which largely comprise fixed wind turbine arrays that are already in development and supported under the initial OREDP I[1] (DCENR, 2014).

In addition, the Programme for Government 2020 committed to the development of a longer-term strategy to take advantage of a potential of at least 30GW of Offshore Renewable Energy (ORE) including floating wind potential in Ireland's deeper waters in the Atlantic. The OREDP II national level spatial strategy will support movement towards achieving this aim, by setting out the pathway for the deployment of ORE through an enduring plan-led regime.

1.2 Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is a method of ensuring environmental considerations are broadly evaluated and integrated into a public plan, programme or strategy. The SEA Regulations aim at a high level of protection of the environment, and to integrate the consideration of the environment into the preparation and adoption of plans and with a view to promoting sustainable development. The European SEA Directive (Directive 2001/42/EC: Assessment of the Effects of Certain Plans and Programmes on the Environment) is transposed into Irish law through the Environmental Assessment of Plans and Programmes Regulations S.I. No. 435 of 2004 (the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004), as amended by S.I. No. 200 of 2011 (the European Communities (Environmental Assessment of Certain Plans and Programmes) (Amendment) Regulations 2011 ('the SEA Regulations'). The SEA Directive aims to achieve environmental

[1] In 2014, the Department of Communications, Energy and Natural Resources (DCENR) published the first Offshore Renewable Energy Development Plan (OREDP). The OREDP, as a policy document, sets out the key principles, actions and enablers needed to deliver upon Ireland's significant potential in this area. An interim review was carried out on the OREDP in 2017 and published in May 2018. It outlined progress in some areas and identified other areas that needed more focus. These activities were incorporated into the Climate Action Plan which was first published in 2019 superseded by the Climate Action Plan 2021. Action 116 of the Climate Action Plan 2021 sets out the requirement for an updated OREDP II.

protection at a strategic level, and to integrate the consideration of the environment into the preparation and adoption of applicable plans and programmes.

1.3 Appropriate Assessment

Under the Birds and Natural Habitats Regulations[2], where it appears to the public authority that the decision to undertake or give consent, permission or other authorisation for a relevant plan or project is likely to have a significant effect ("LSE") on a European site either alone or in combination with other plans or projects and is not directly connected with or necessary to the management of the site, then the public authority must make an Appropriate Assessment ("AA") of the implications of the plan or project for the European Site in view of that site's conservation objectives. In light of any such assessment, the public authority may agree to the plan or project only if it has ascertained that the proposal will not, either on its own or in combination with other plans and projects, adversely affect the integrity of a European Site, unless there is no alternative solution and the plan or project must be carried out for imperative reasons of overriding public interest.

The above requirement promotes a four stage process, as outlined in **Figure 1-1.**

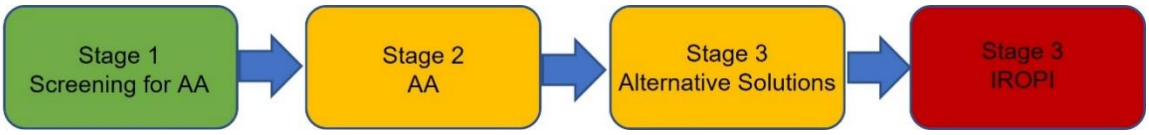


Figure 1-1: Appropriate Assessment Four Stage Assessment (EHLG, 2010)

1.4 Study Team

The study team for the SEA and AA comprises ClearLead Consulting Ltd. (part of SLR) an environmental and engineering consultancy together with sub-consultants NIRAS who are specialists in marine Appropriate Assessment.

In line with marine spatial planning best practice, DECC established a Steering Group, a Data and Scientific Group, and an Advisory Group to inform the development of the OREDP II and

[2] S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011 as amended, most recently 2021

engaged with a wide range of stakeholders for input. This consultant team has been working alongside and supporting this robust governance structure as described in **Figure 1-2** below.

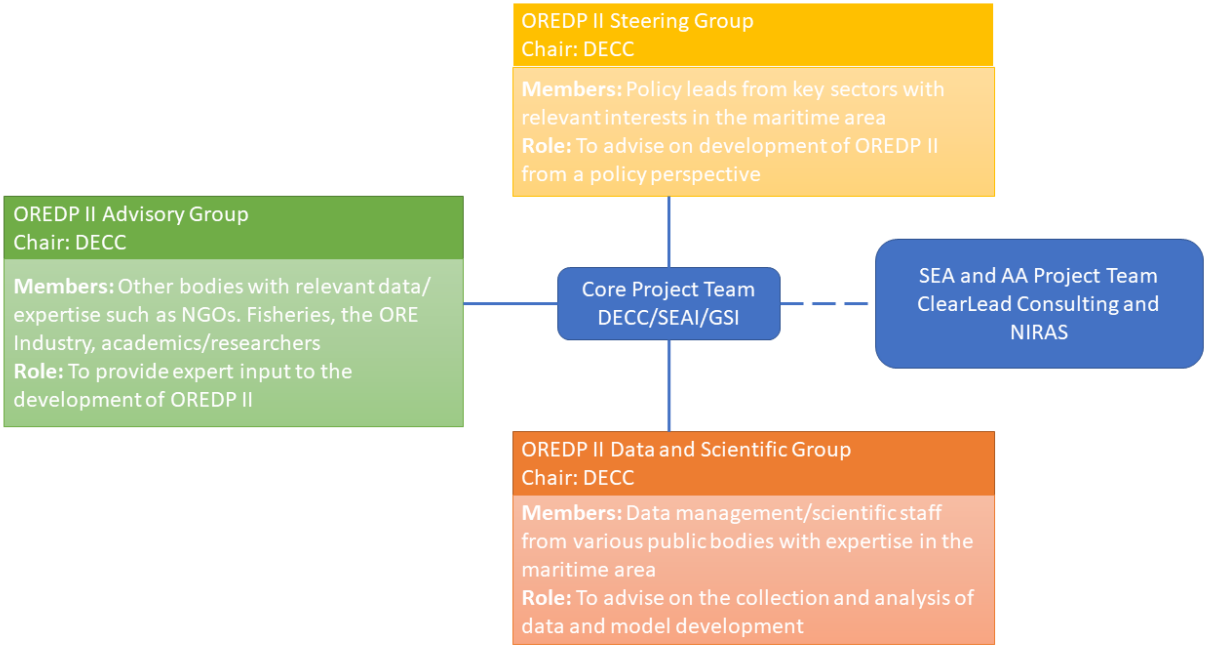


Figure 1-2: OREDP II Governance Structure

Membership of each of the groups identified in **Figure 1-2** is summarised in Table 1-1 below.

Table 1-1: Membership of OREDP II Governance Groups

OREDP II Steering Group	OREDP II Advisory Group	OREDP II Data and Scientific Group
Department of Transport Department of Rural and Community Development Department of Housing, Local Government and Heritage (DHLGH), including National Parks and Wildlife Service (NPWS) Department of Agriculture, Food and the Marine	Coastwatch Ireland County and City Management Associations (CCMA) IBEC iCRAG – SFI Research Centre in Applied Geosciences, University College Dublin. Irish Environmental Network Irish Fish Producers Organisation Irish Maritime Development Office Irish Marine Federation Irish Ports Association Irish South and West Fish Producers Association Irish Whale and Dolphin Group (IWDG) Killybegs Fishermen's Organisation MaREI – SFI Research Centre for Energy, Climate and Marine research and innovation coordinated by the Environmental Research Institute (ERI) at University College Cork Marine Renewables Industry Association (MRIA) National Offshore Wind Association of Ireland (NOW Ireland) NUI Galway – Ryan Institute National Inshore Fisheries Forum including representatives from the South East Regional IFF and the South West Regional IFF	Geological Survey of Ireland (GSI) Sustainable Energy Association of Ireland (SEAI) Department of Housing, Local Government and Heritage (DHLGH), including National Parks and Wildlife Service (NPWS) The Marine Institute Department of Transport EirGrid

OREDP II Steering Group	OREDP II Advisory Group	OREDP II Data and Scientific Group
	Sustainable Water Network (SWAN) Ireland Queen's University Belfast University College Cork University College Dublin Wind Energy Ireland	

2 Description of OREDP II

2.1 OREDP II Context

OREDP II is intended to update the first Offshore Renewable Energy Development Plan (OREDP I) which was published in 2014 and which set out key principles, actions and enablers needed to harness offshore renewable energy. OREDP II takes account of significant developments in policy legislation and regulation and additional marine data since OREDP I publication and its interim review in 2018.

OREDP II is a national level spatial strategy that will guide, at a high-level, strategic planning and the sustainable deployment of Ireland's offshore renewable energy resource through an enduring plan-led regime. OREDP II is being brought forward as part of the development and implementation of a new integrated hierarchical structure of Marine Planning for Ireland. The Marine Area Planning Act (MAPA) 2021 and the National Marine Planning Framework (NMPF) which is Ireland's first national marine spatial plan, established a new Forward Marine Planning framework in Ireland. The OREDP II is the first national level spatial strategy for offshore renewable energy to come forward under the newly established forward marine planning framework.

As recognised in the NMPF, the OREDP II underpins the move to a plan-led regime for the development of offshore renewable energy within the overarching marine planning framework. It will provide the evidence base for the identification of areas most suitable for the sustainable development of offshore renewable energy in Ireland's maritime area. This will facilitate the identification of areas for future designation for offshore renewable energy as part of the DMAP process. Under the plan-led regime, the majority of projects for offshore renewable energy will be developed through DMAPs which will include a detailed analysis and assessment of areas on a regional or local basis.

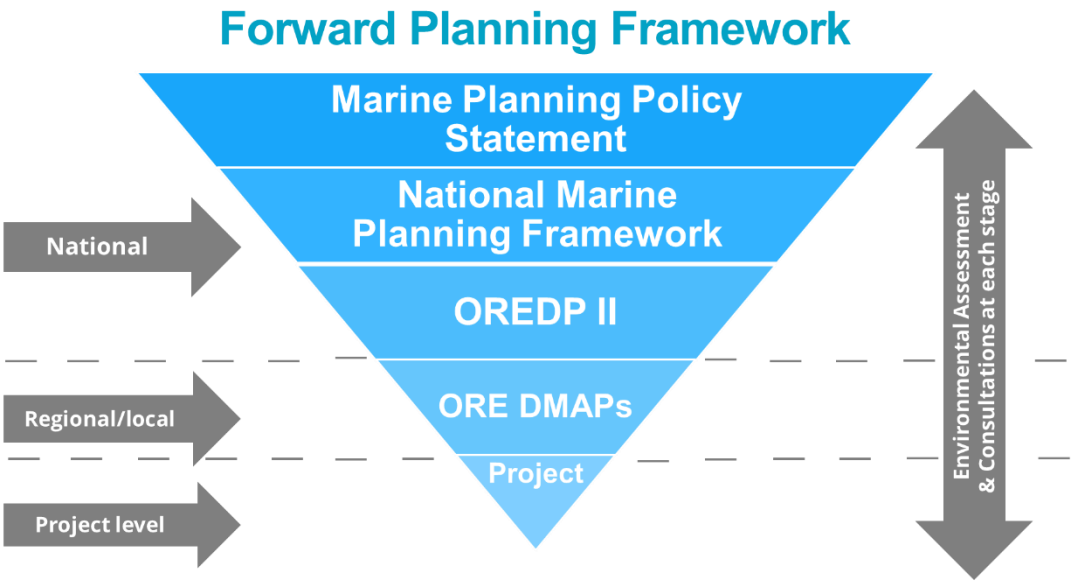


Figure 2-1: Forward Marine Planning Framework for Ireland

2.1.1 Planning and Environmental Assessment Tiering

'Tiering' is the organised transfer of information and issues from one planning level to another, supported by environmental assessments (Therivel & Gonzalez Del Campo, 2021). The tiered structure integrating supporting environmental assessments of Ireland's Forward Marine Planning Framework is summarised in Figure 2-2 below.

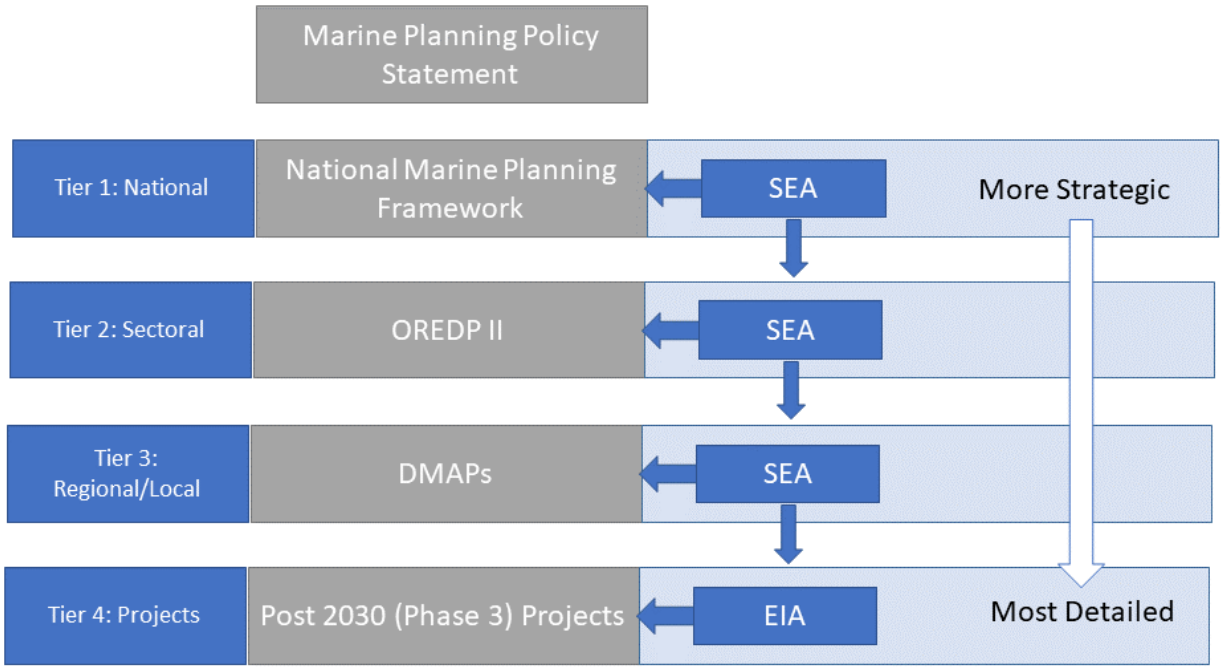


Figure 2-2: Planning and Environmental Assessment Tiering of the Marine Forward Planning Framework (adapted from (Therivel & Gonzalez Del Campo, 2021)

2.1.2 Regulation and Policy Context

To evaluate compliance, best practice and consistency with existing relevant plans, programmes and policies, key documents and core commitments potentially relevant to the OREDP II have been identified. A preliminary list of key legislation, policy, plans and programmes applicable to OREDP II was identified at the scoping stage. This has since been updated with specifically relevant objectives and commitments further reviewed during preparation of the SEA and additional refinement of the emerging OREDP II.

The key regulation and policy context is summarised in **Appendix 2: Summary of Regulation and Policy Review.**

2.2 OREDP II Objectives

The three key objectives of OREDP II have been preliminarily defined as:

Objective 1: *Assess the resource potential for offshore renewable energy in Ireland's maritime area.*

Objective 2*: Provide an evidence base to facilitate the future identification of Broad Areas most suitable for the sustainable deployment of ORE in Ireland's maritime area.*

Objective 3: *Identify critical gaps in marine data or knowledge and recommend prioritised actions to close these gaps*

2.3 Study Area

OREDP II is a national level spatial strategy covering a preliminary study area comprising Ireland's Exclusive Economic Zone (EEZ)[3] which extends up to 200 nautical miles (NM) (370 km) from Ireland's coastline. The EEZ defines the greatest potential extent of the study area and will be used to establish Ireland's overall resource potential. Within this, a number of spatially defined areas which are currently anticipated to have potential to accommodate each of the technology types considered as part of the OREDP II. These are set out as the 'technology opportunities model' within the OREDP II and are shown in Figure 2-4 to Figure 2-9 below.

In addition, a further four spatial input models were identified as part of the OREDP II, each documenting themed groups of spatial factors to be given due consideration in identifying potentially suitable spatial areas for ORE development. These comprise:

- Exclusions areas: representing activities and areas that were considered not compatible with offshore renewable energy at this time,
- Environmental factors: mapping environmental baseline datasets identified and available for use in this national level, spatial strategy,
- Economic factors: mapping areas of economic activity, and
- Heritage factors: mapping cultural heritage baseline data sets identified and available for use in this national level, spatial strategy.

[3] The EEZ is the area of water over which the country of Ireland has jurisdiction over living and non-living resources and therefore the theoretical greatest extent of the OREDP II maritime area. The unique position of Ireland means that its waters encompass several waterbodies. These include:

- The Irish Sea and St. Georges Channel run from County Wexford to Belfast, (approximately 200km as the crow flies).
- The Celtic Sea area runs across the Southern Coast of Ireland, from County Cork to County Waterford.
- The North Atlantic Ocean spans across the West Coast of Ireland between County Kerry and Derrybeg (County Donegal).

2.4 Time Period

OREDP II is intended to provide an evaluation of future resource potential and is expected to include a review programme a minimum of 5 years after OREDP II is first published. The reviews will allow for technological developments as well as evolution of baseline conditions, for example additional environmental protection designations which may come forward and availability of additional data to enhance understanding of Ireland's marine environment characteristics and sensitivities to be given due consideration as the national strategy matures.

2.5 Offshore Renewable Energy Technologies

2.5.1 Bottom-Fixed Offshore Wind

Offshore wind power refers to the generation of electricity through wind turbines, usually configured into wind farm arrays, in bodies of water usually at sea. Each turbine which makes up an array comprises a support tower supporting a rotor blade assembly installed onto a foundation structure.

Whilst the evaluation of this technology type within the OREDP II and the supporting SEA is technology 'neutral' i.e. the size of individual turbine or individual array is not pre-defined, it is acknowledged that tower height and rotor/blade dimensions can vary with offshore turbines, typically larger than their terrestrial equivalent. For context, a typical currently deployed offshore turbine could be expected to have a height to blade tip of between 80 – 120m, with tower height at about 60-80m and blades approximately 40m long.

This is consistent with the physical parameters previously assessed in OREDP I (AECOM and Metoc, 2010) however it should be noted that technology parameters continue to evolve, with the capacity and physical dimensions of turbines available to be deployed as part of the OREDP II enduring plan-led regime likely to be significantly larger than those assessed as part of OREDP I and/or currently deployed. For example, Vestas' 15MW 280m tall prototype offshore turbine (V236) currently in development is expected to be available for serial production in 2024 (IRENA, 2021). The size of array (i.e. number and configuration of turbines) that are feasible to deploy has also increased significantly since the publication of OREDP I in 2014.

Bottom-fixed offshore wind refers to wind turbines that are located offshore and assembled on fixed foundations in shallow waters. There are a range of fixed foundation types potentially available for example including: monopile, tripod, jacket, suction caisson, and gravity-based foundations. Specific foundation design and footprint is site-specific and is likely to depend on many parameters such as water depth, seabed geological conditions, and environmental factors. Deeper waters may be anticipated to result in wider seabed footprint. For example, Vestas' 10MW

turbines currently being installed at Scottish and Southern Energy's Seagreen site off the coast of Scotland are supported on jacket foundations each with a seabed footprint of 43m x 43m.

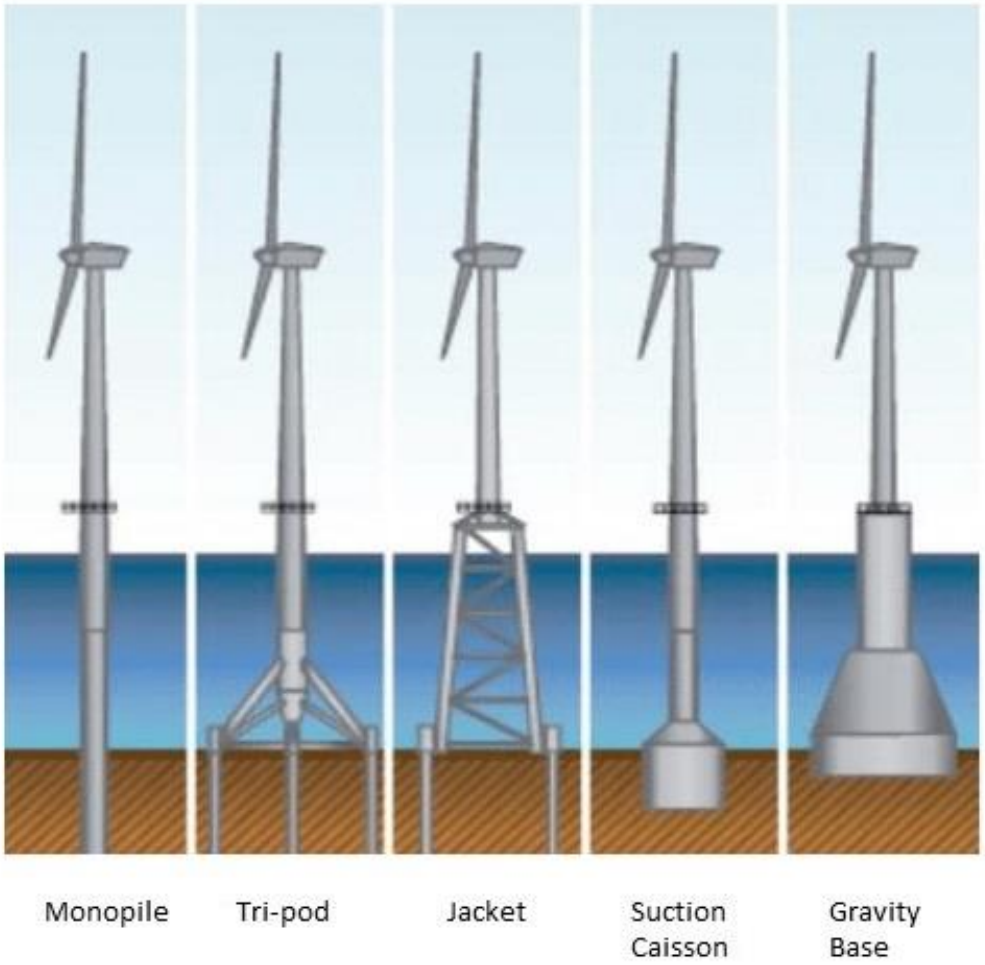


Figure 2-3: Examples of Fixed Bottom Foundation Types for Offshore Wind Turbines (Konstantinidis & Botsaris, 2016) [4]

OREDP II considers the offshore windfarm array only, which includes requirement for inter-array cabling and offshore substation infrastructure for stabilising electrical power before export. Export

[4] Image used under creative commons licence Creative Commons — Attribution 3.0 Unported — CC BY 3.0

cabling, terrestrial infrastructure and/or grid connection requirements are not directly covered by the OREDP II, although integration of the national strategy with these elements is given consideration within the Cumulative Assessment and linked to separate Plans and Policies covering the strategic upgrade and provision of these supporting facilities.

The technology model has applied the following essential parameters to Ireland's marine area in relation to the installation of Bottom-fixed offshore wind.

- >=7m per second mean annual wind speed at 100m above mean sea level (amsl),
- 10-60m water depth.

A total estimated area of 9247 km^2 within Ireland's marine area has been preliminarily identified as technologically suitable for the installation of fixed bottom wind turbines between 10 and 60m water depth. This area is shown in **Figure 2-4** below. A further estimated 5914 km^2 area between 60 and 70m water depth has also been identified within the OREDP II as potentially suitable for the deployment of either bottom fixed or floating wind technology. The estimated technical resource capacity for these as calculated is also set out within the OREDP II and is summarised in **Table 2-1** below:

Table 2-1: Available Technical Wind Resource Potential for Bottom Fixed Wind technology

Water Depth	Gross technical resource capacity (GW)	Gross technical resource energy potential [TWh/year]
10 -60m	42	170
60-70m	20	83
Total	62	253

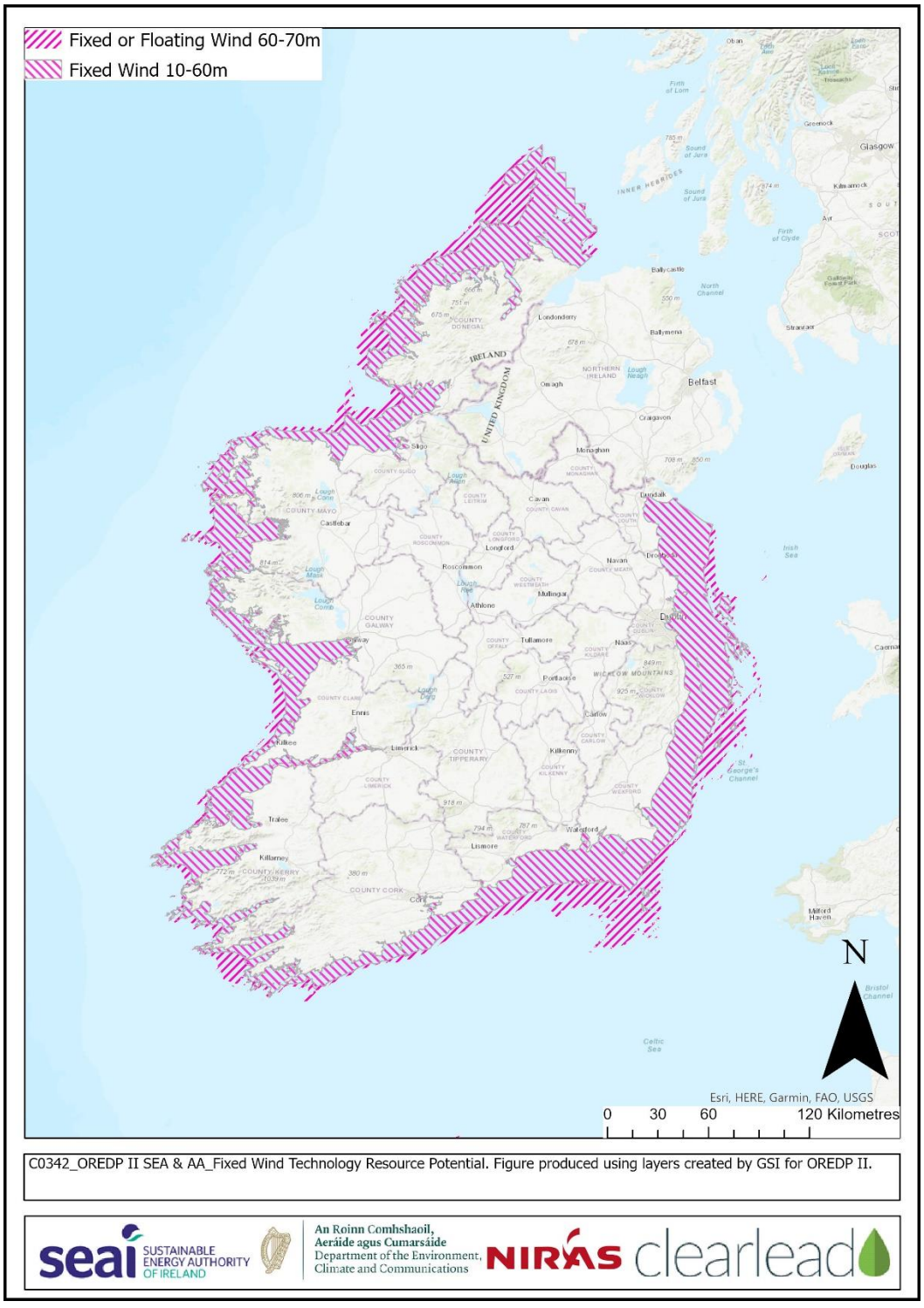


Figure 2-4: OREDP II Technology Opportunities, Spatial Model for Bottom-Fixed Offshore Wind

2.5.2 Floating Offshore Wind (FLOW)

A floating wind turbine is an offshore wind turbine mounted on a floating structure that allows the turbine to generate electricity in water depths where fixed-foundation turbines may not be technically or economically feasible.

There are a range of potential of floating wind foundation structures as shown in **Figure 2-5** below. These include:

- semi-submersible: A series of large columns providing hydrostatic stability, linked by connecting bracings/submerged pontoons providing additional buoyancy,
- spar-buoy: A cylinder structure, ballasted to keep the centre of gravity below the centre of buoyancy,
- tension leg: Highly buoyant with a central column and arms connecting to tensioned tendons which secure the foundations to the suction/piled anchors, and
- barge: buoyant and stablised by a square floating foundation, giving a large water plane area.

The floating foundation is stabilised and kept in position by catenary or taut spread mooring lines with drag anchors, suction caissons, or piles.

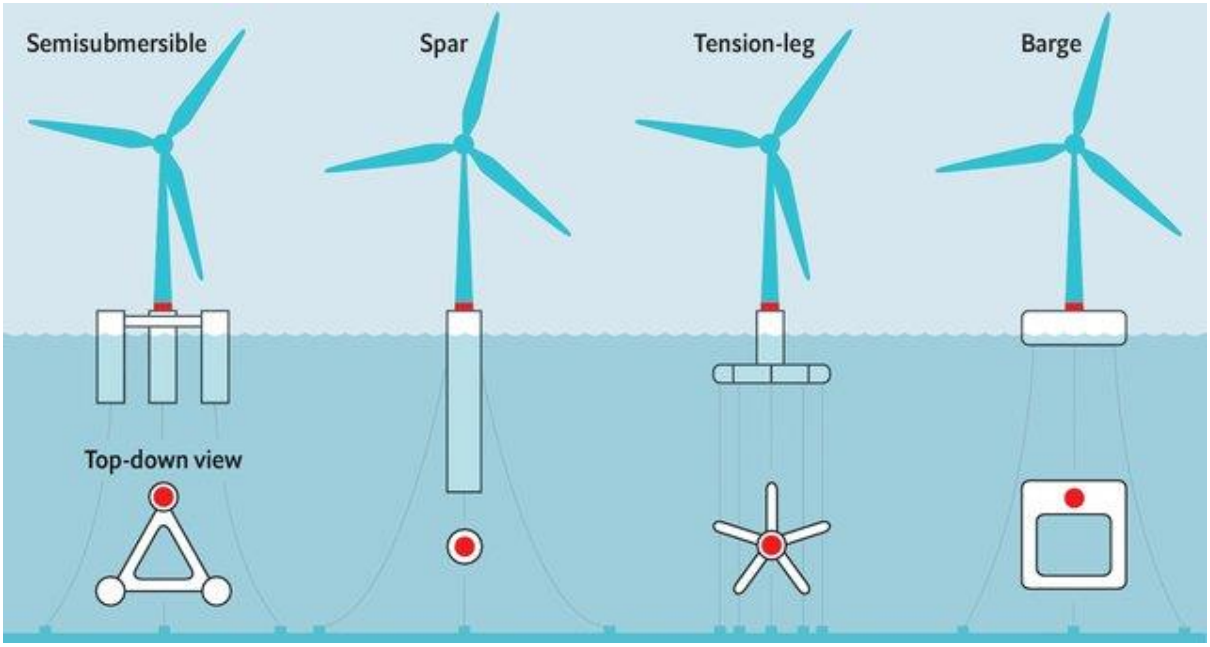


Figure 2-5: Floating Offshore Wind Turbine Foundation Concepts (Mei, 2021)[4,5]

Similar to the bottom-fixed offshore wind technology, OREDP II considers the offshore windfarm array only including a generic requirement for mooring systems, inter-array cabling and array substation requirements.

The OREDP II (technology opportunities model) has applied the following essential parameters to Ireland's marine area in relation to the installation of floating offshore wind technology.

- >=7m per second mean annual wind speed at 100m above mean sea level (amsl), and
- 60 -200m water depth.

A total estimated area of 115,253 km^2 within Ireland's marine area has been preliminarily identified within the OREDP II as technologically suitable for the installation of wind turbines with floating foundations between 60 and 200m water depth[6]. This area is shown in **Figure 2-6** below. A further estimated 50,166 km^2 area between 200 and 1000m water depth has also been identified within the OREDP II as potentially suitable for the deployment of floating wind technology. The estimated technical resource capacity for these areas has also been calculated and is summarised in Table 2 below:

Table 2-2: Available Technical Wind Resource Potential for Floating Wind Technology

Water Depth	Gross technical resource capacity (GW)	Gross technical resource energy potential [TWh/year]
60 - 70m	20	83
70 - 200m	331	1334
200 - 1000m	246	1065
Total	597	2482

[5] Image used under creative commons licence Creative Commons — Attribution 4.0.

[6] 7 494km^2 previously identified as potentially suitable for bottom fixed, or FLOW technology between 60m and 70m, water depth plus an additional 83 700 km^2 potentially suitable only for FLOW technology between 70m and 200m water depth.

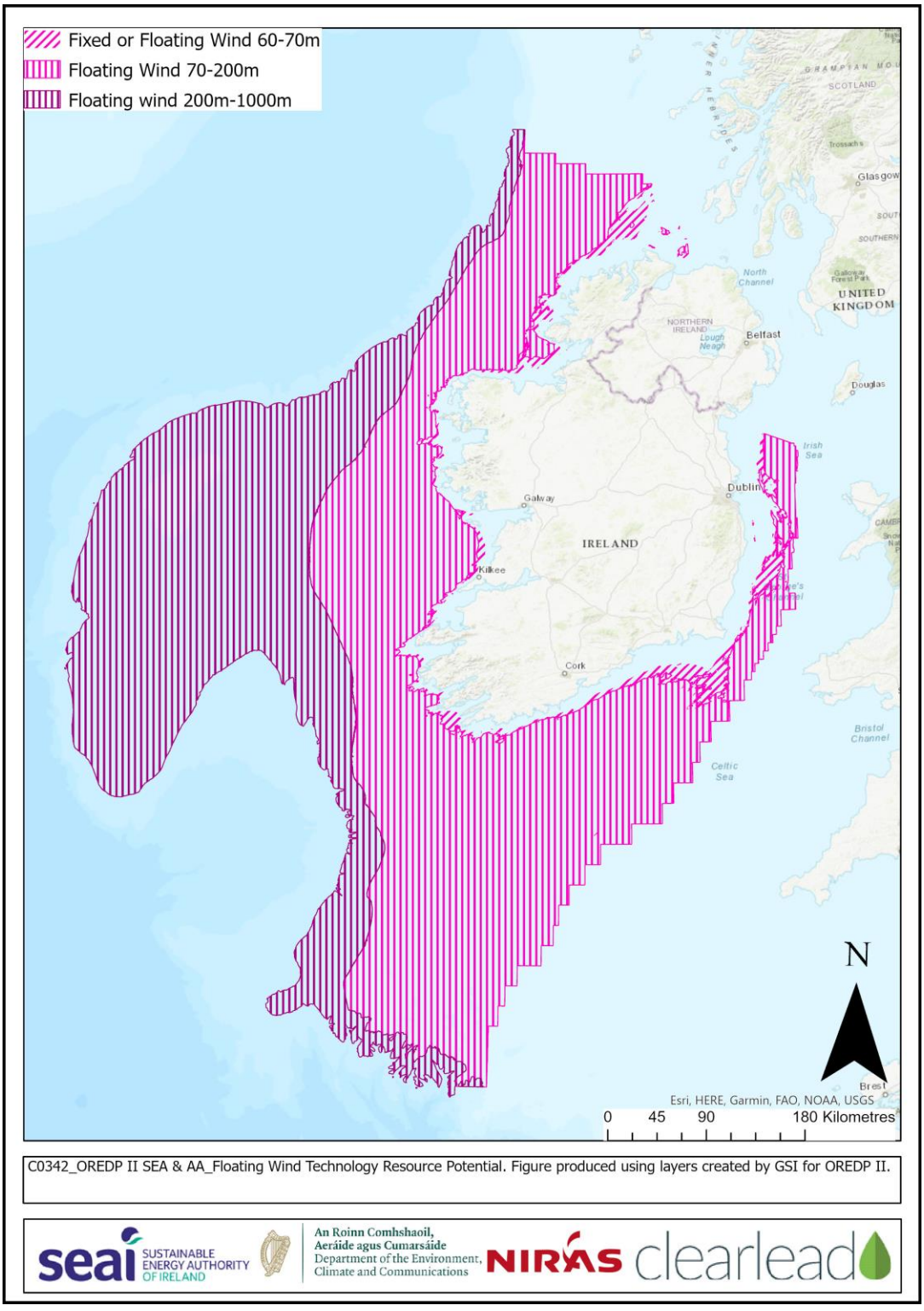


Figure 2-6: OREDP II Technology Opportunities Spatial Model for Floating Offshore Wind

2.5.3 Wave Energy Conversion (WEC)

Wave energy converters capture kinetic (wave motion) and potential energy (wave height) from ocean waves and swells to generate electricity. Wave energy converters are usually small (~1 MW) and are intended to be modular and deployed in multi-unit arrays. As an emerging technology, a range of infrastructure designs and prototypes are currently in development such as attenuator, overtopping, oscillating water column, point absorber and oscillating wave surge converter. In addition, the characteristics of wave energy to be captured are often highly location specific with characteristics such as wave period and height along with the monochromatic/polychromatic characteristics of the sea at the deployment site significantly affecting the most efficient technology design to deploy at any given location (Ungaro, 2021).

Figure 2-7 below, reproduced from (Aydingakko, Mukhaini, & Jassani, 2016) describes some typical wave energy converter design types currently under development.

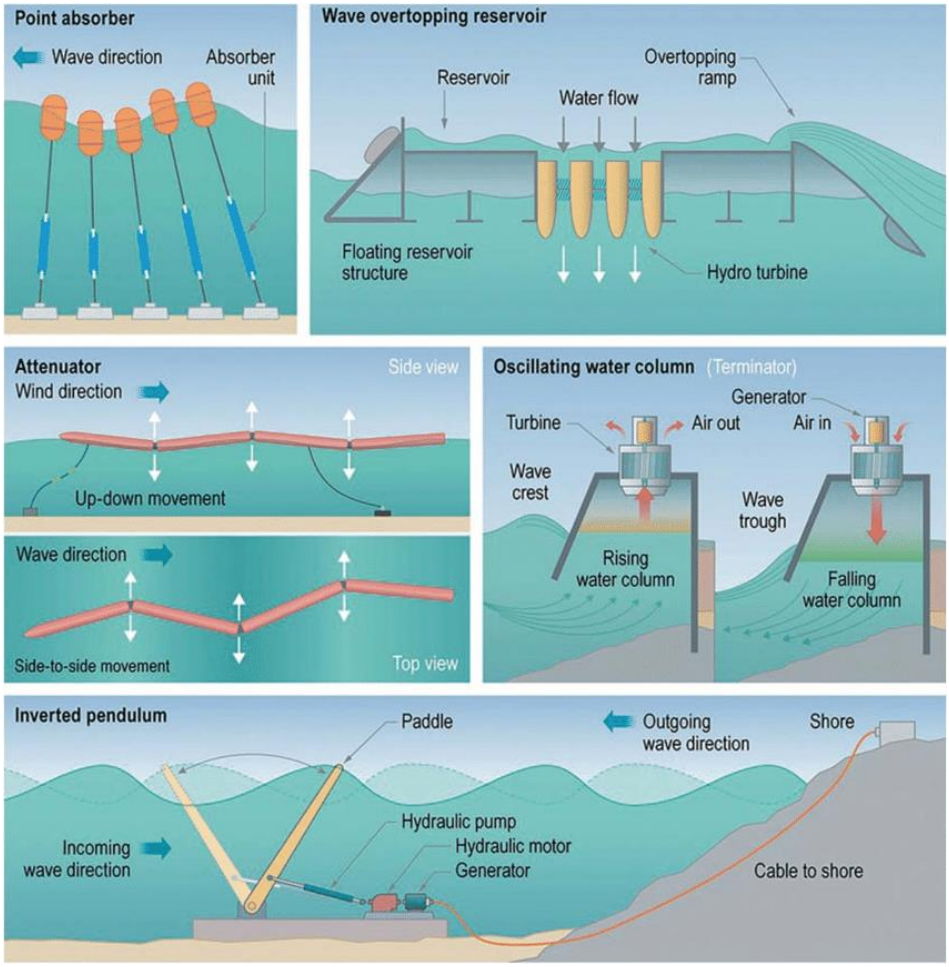


Figure 2-7: Typical Types of Wave Energy Converters (Aydingakko, et al., 2016)

Devices would also require inter-array cabling, anchoring/foundation installation, export cabling to landfall and grid connection infrastructure, however these are not currently considered as part of the OREDP II.

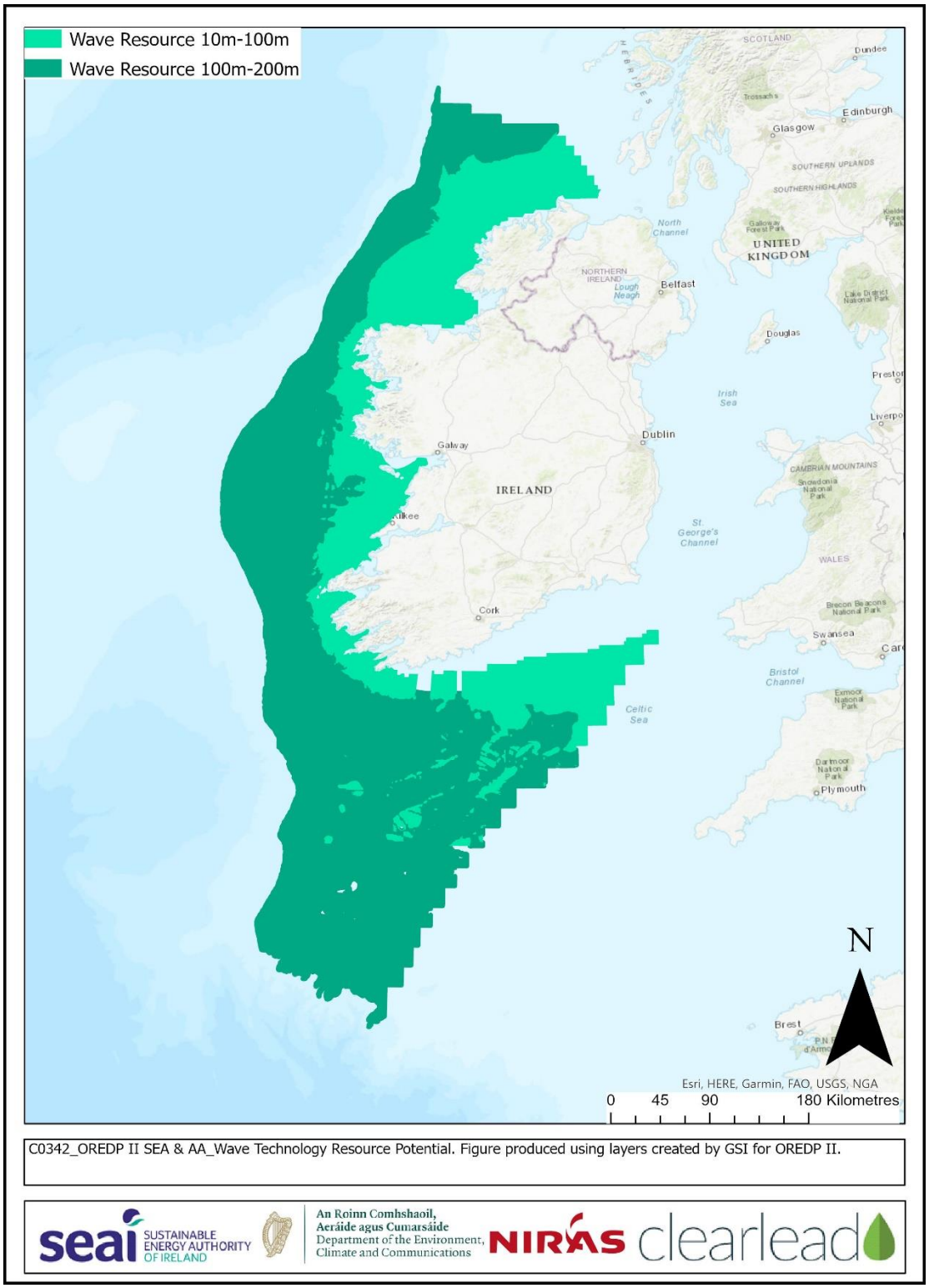


Figure 2-8: OREDP II Technology Opportunities Spatial Model for Wave Energy

2.5.4 Tidal Stream Device

Tidal currents are caused by the gravitational forces of the sun and the moon, and are particularly concentrated in narrow bodies of water, such as around islands or inlets (OEE, 2022). Tidal energy offers a predictable, long term clean energy source offering a valuable opportunity for electricity baseload and for balancing a renewable energy supplied grid (OEE, 2022).

Tidal stream devices convert the kinetic energy of a moving water current into electricity. Tidal stream devices are generally small (<1 MW), modular and intended for deployment in multi-unit arrays. Tidal stream devices use a similar basic premise for energy capture as wind turbines, although as water is significantly denser than air (OEE, 2022) the opportunity exists for tidal stream devices to capture significantly greater energy per unit than equivalent wind turbines, offering a corresponding opportunity for arrays to be smaller than a windfarm equivalent with individual devices deployed at greater density.

There are several different device technology concepts where the main differences between the device types are related to the method of securing the turbine in place, the number of blades and how the pitch of the blades is controlled. Devices may be seabed mounted or floating with associated mooring infrastructure.

Devices would also require inter-array cabling, export cabling to landfall and grid connection infrastructure however these are not currently considered as part of the OREDP II.

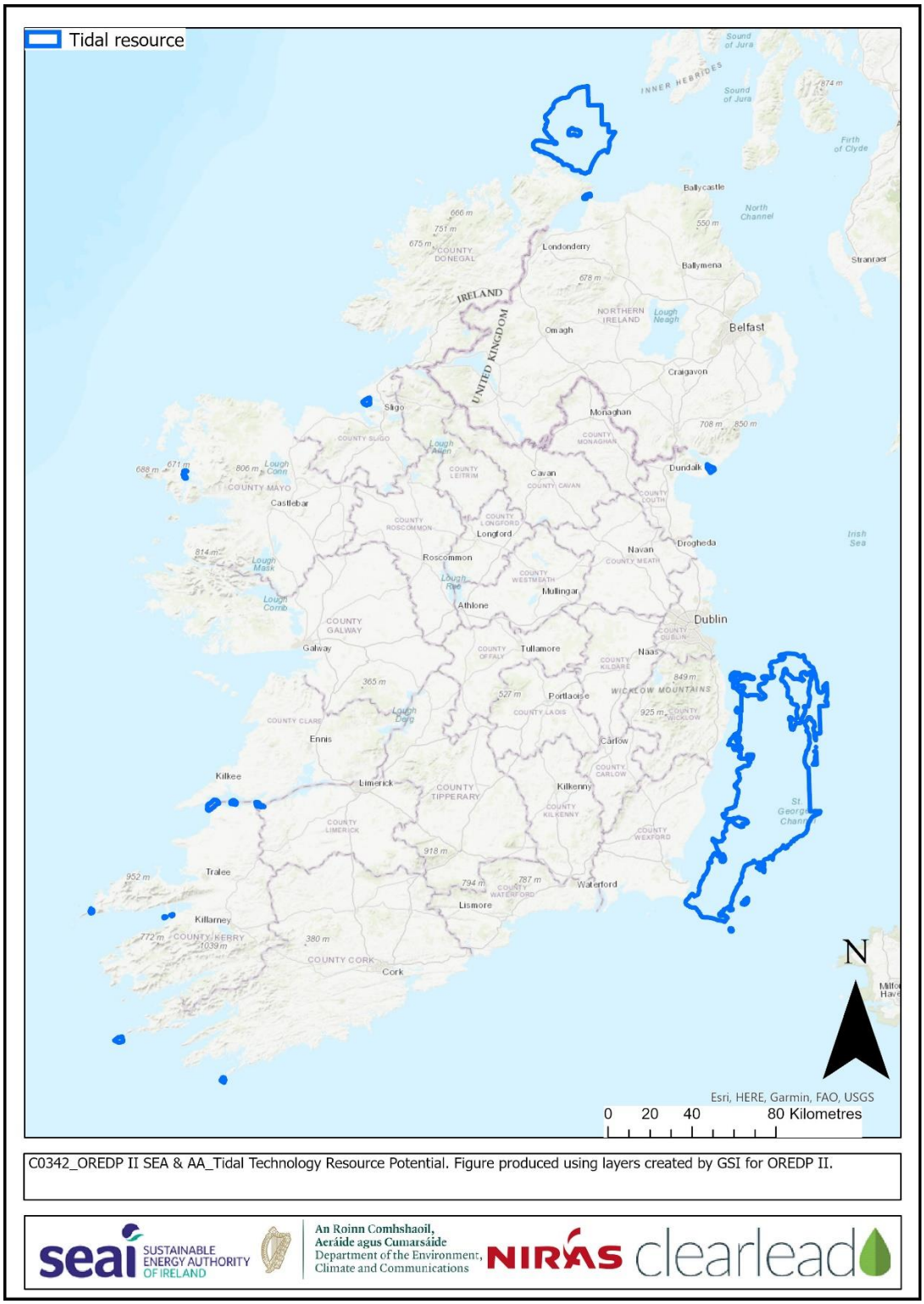


Figure 2-9: OREDP II Technology Opportunities Spatial Model for Tidal Energy

3 SEA Methodology

3.1 Introduction

Assessment under the SEA Regulations is a systematic process for evaluating the environmental consequences of proposed plans or programmes to ensure environmental issues are fully integrated and addressed at the earliest appropriate stage of decision-making, with the aim of achieving a high level of protection of the environment with a view to promoting sustainable development. An overview of the SEA process is set out within **Figure 3-1**.

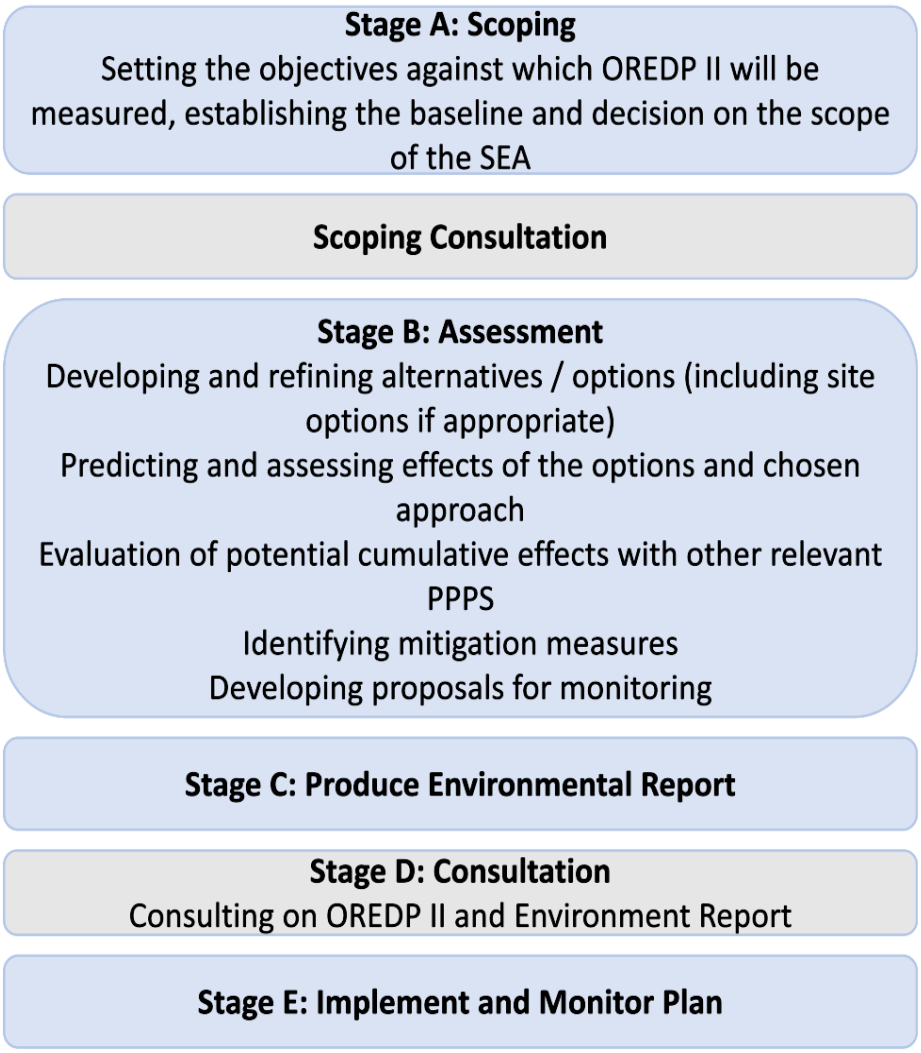


Figure 3-1: Summary of the SEA process

3.2 Stage A: Scoping

3.2.1 Preparation of Scoping Report

The SEA Regulations (Regulation 11 (1 and 2)) sets out the requirements for the Scoping of the environmental report and for agreement of scope with statutory environmental authorities.

Stage A of the SEA has therefore focused on collecting baseline information, identifying environmental issues and establishing the main scope and objectives of the SEA. Identification of other relevant plans and programmes is also undertaken to understand the plan's relationship with the policy and regulatory framework, including environmental considerations that need to be taken into account.

This report (and associated appendices) present existing baseline information on the environmental characteristics of the OREDP II marine area in accordance with the topics required by the SEA Regulations (see Table 3-3-1). An indication of the potential evolution of current baseline conditions was also included, where possible. The baseline collated then informed the assessment of the draft OREDP II in Stage B of the SEA.

Table 3-3-1: Environmental Topics covered by the SEA

SEA Directive Topics	OREDP II SEA Topics	OREDP II SEA Sub-topics
Soil and Water	Physical Environment	Geology and Sediments: Morphology and Shallow Geology Sediment characteristics Sediment transport/pathways and morphology (offshore and coastal)
Water	Water	Biological Characteristics: Nutrient enrichment Microbial pathogens
		Chemical characteristics: - Water chemistry - Turbidity
Air and Climatic Factors	Climate and Air Quality	Emissions to Air
		Climate Change
		Greenhouse gas emissions
		Ocean acidification
Not specified	Marine Pollution	Underwater sound
		Marine litter (inc. marine plastics)
		Electromagnetic Fields (EMF)
		Chemical inputs (contaminants, nutrients etc.)
Biodiversity	Biodiversity	Seabed habitats
		Pelagic habitats
		Designated sites, qualifying interests and species: Sites designated for habitats Sites designated for species
		Fish
		Marine Mammals
		Bats
		Reptiles

SEA Directive Topics	OREDP II SEA Topics	OREDP II SEA Sub-topics
		Non-indigenous species
		Birds
		Plankton
		Phytoplankton
		Pelagic Habitats
Archaeology and Cultural Heritage	Cultural Heritage	Protected wrecks
		Submerged landscapes
		Wrecks (ships, aircraft, others)
Landscape	Landscape and Seascape	Character areas
		Designations
Human Health Population	Population and Human Health	Employment
		Human Health
		Leisure and Tourism
Material Assets	Material Assets	Mineral exploitation and mining
		Defence
		Aquaculture
		Commercial fishing
		Recreational fishing
		Marine infrastructure / exploration
		Ports
		Shipping and Navigation
		Tourism
		Other marine industry

3.2.2 Consultation on Scoping Report

An SEA Scoping Report was produced as part of Stage A of the SEA Methodology and was issued to a wide range of stakeholders for consultation on 23 April 2022 to 27 May 2022. The scoping report was also made available for public access on the SEAI website[7] on 25 April 2022. A copy of the Scoping Report is available online at: OREDP-II-SEA-Scoping-Report.pdf (seai.ie).

A list of stakeholders who were consulted and a summary of consultation comments received and how they have subsequently been addressed is included in **Appendix 1: Consultation on Scoping Report.**

3.3 Stage B: Assessment Methodology

3.3.1 Summary of Assessment Methodology

The approach to assessment applied throughout this SEA has been developed to reflect best practice guidance (EPA, 2021) and to provide a bespoke environmental evaluation, working in parallel with, and integrated into the emerging OREDP II. An OREDP II-specific SEA Framework defining a series of SEA Objectives, Indicators and Targets has been developed and applied throughout this assessment (see section 3.3.2 below). This systematic application of the framework has provided opportunity for environmental input and feedback to be incorporated throughout and from an early stage in OREDP II development as summarised in **Figure 3-2** below.

[7] OREDP-II-SEA-Scoping-Report.pdf (seai.ie)

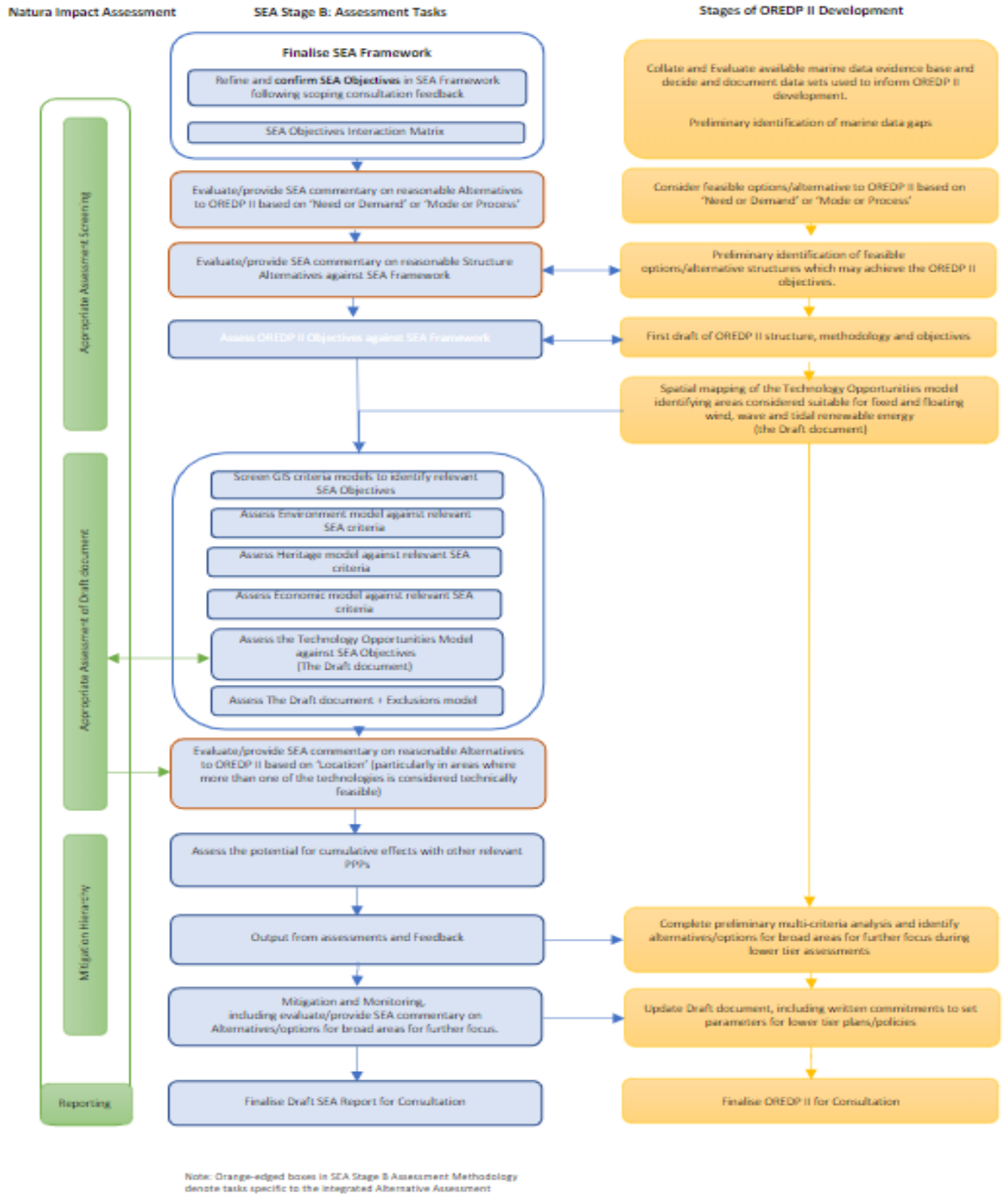


Figure 3-2: OREDP II and SEA Stage B: Assessment Methodology Summary Flowchart

3.3.2 SEA Framework and Assessment Criteria

The SEA Framework as set out in **Table 3-3-3** below has been developed taking account of previous relevant SEA reports, including (but not necessarily limited to) (SEAI, 2010), (Government of Ireland, 2018). Where possible these indicators and targets seek consistency with existing measures and targets for monitoring and maintaining the health of Ireland's marine environment, including GES descriptors as defined under the MSFD and as set out with Ireland's National Marine Planning Framework (Government of Ireland, 2018), and also objectives set out under the Water Framework Directive.

A qualitative approach was applied to the description and assessment of effects applying the criteria as set in **Table 3-3-2** below. A quantitative approach was not considered appropriate or feasible at this strategic level.

Table 3-3-2: SEA Criteria

Notation	Description
Degree to which baseline conditions may change (significance of effect) compared with the future baseline situation	
Significant positive	**Significant Positive Effect:** The OREDP II offers the potential to realise significant improvements in baseline conditions and/or physical opportunity to support achievement of defined SEA Objectives
Minor Positive	**Minor Positive Effect:** The OREDP II offers the potential for some improvements in baseline conditions.
Neutral	**Neutral Effect:** The implementation of OREDP II is unlikely to alter baseline conditions significantly. e.g. because no pathway to potential impact has been identified at this stage.
Uncertain	**Uncertain Effect:** It is not possible to establish whether the OREDP II would lead to potential for improvement or deterioration in the baseline conditions.[1]
Minor Negative	**Minor Negative Effect:** The OREDP II is likely to lead to a deterioration in baseline conditions.

[1] Please note that for the purposes of this SEA, uncertain effects have been treated as potentially significant and mitigation measures have been suggested.

Notation	Description
	or where the OREDP II does not consider a potentially relevant factor, by its omission a resultant risk of deterioration in baseline condition as a result of the OREDP II is identified.
Significant Negative	**Significant Negative Effect:** The implementation of OREDP II is likely to lead to a significant deterioration in baseline conditions and/or potential to significantly limit opportunity to support achievement of defined SEA Objectives.
Direct/Indirect	
Direct	Effects that are a direct result of the implementation of OREDP II.
Indirect	Effects that are secondary i.e. they occur away from the original effect or as a result of a complex pathway.
Permanence of effects	
Permanent	Effects could be lasting or intended to last or remaining unchanged indefinitely.
Temporary	Effects are not likely to be lasting or permanent.
Magnitude of effects	
High	Likely total loss of or major alteration to the receptor in question. The effects are predicted to be permanent and irreversible.
Medium	Partial loss of / alteration / improvement to one or more key elements / features / characteristics of the receptor in question. The effects are predicted to be medium-long term but reversible.
Low	Minor loss of / alteration / improvement to one or more key elements / features / characteristics of the receptor in question. The effects are predicted to be reversible and short term.

Table 3-3-3: SEA Framework: Objectives, Targets and indicators

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
Physical Environment				
SEA 1	Protect the quality and character of the seabed and its sediments and avoid significant effects on seabed morphology and sediment transport processes.	Will the OREDP II potentially result in physical damage or change to the seabed and subsurface: · from construction of fixed foundation structures? · from anchoring systems etc.? · from other infrastructure (e.g. subsea cable) installation?	GES Descriptor 6: Sea floor integrity. Particularly, extent and distribution of physical loss does not adversely affect structure and functions of the ecosystem.	OREDP II activities avoid the potential for significant adverse effects on designated geological and geomorphological sites of international and national importance.
				Evidence of the consideration of seabed geological characteristics including sediment and bedrock type and depth in the identification of development areas set out within the OREDP II. (Note: geological condition is a key determinant of technical viability for ORE deployment).
		Is there potential for indirect physical effects on seabed and subsurface as a result of the OREDP II: · from changes to sedimentation regime? · from changes to seabed morphology (scour)? · from dredge deposits etc.?	GES Descriptor 7. Good status is achieved when the nature and scale of any permanent changes (individual and cumulative) to the prevailing hydrographical conditions do not lead to significant long-term impacts on marine ecosystems.	No significant adverse change in quality of seabed sediments and seabed sediment transport.
		Is there potential for indirect effects on the water column · from mixing of water stratifications (pH, temperature,		Extent of the area potentially affected by the OREDP II activities.

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
		salinity etc.) · from sediment mobilisation (turbidity), · from resuspension of existing/historic contaminated sediments.		
SEA 2	Protect the integrity of coastal and estuarine processes.	Does the OREDP II have potential to result in changes to hydrodynamics and coastal processes?	Maintain conservation condition of designated sites, taking account of relevant targets and indicators as set out within each designations conservation objectives.	OREDP II activities do not result in permanent significant alteration of hydrographical conditions which adversely affect coastal and marine ecosystems.
				OREDP II activities do not result in permanent significant alteration of morphological conditions which adversely affect coastal and marine ecosystems.
				Evidence of consideration of known tidal range in identification of development areas within the OREDP II.
				Cross refer to OREDP II Appropriate Assessment.
Water				
SEA 3	Protect, maintain, and improve status of classified water bodies within the OREDP II marine area in line with	Could OREDP II activities result in the release of construction contaminants (chemical or biological) to marine waters?	GES Descriptor 5: Human induced eutrophication is minimised and nutrient levels do not cause an accelerated growth of algae or higher forms of plant life to produce an	Evidence of commitment to maintaining nutrient enrichment and microbial pathogen indicators within EQS levels as defined by WFD. (including inorganic nutrient and chlorophyl and dissolved oxygen concentrations, as well as abundance

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
	requirements of the WFD and MSFD.		undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned.	measures of indicator species groups including macroalgae and seagrasses).
		Could OREDP II activities result in the release of contaminants (chemical or biological) from construction / operational service vessels?	Compliance with relevant marine environment legislation including The Sea Pollution Act (1991) which ratify Irelands commitments to MARPOL 73/78 International Convention for the Prevention of Marine Pollution from Ships. See also PPP Review in SEA Report.	Commitments to minimise effects of unanticipated pollution events (e.g. avoidance of areas of particular sensitivity etc.).
			GES Descriptor 9 Concentrations of contaminants in fish and other seafood harvested for consumption do not exceed relevant maximum levels listed in EU Regulation 1881/2006 (as amended).	Evidence of commitment to improvements on existing water quality status (NMPF OMPP Water Quality Policy 2).
SEA 4	Avoid pollution of the coastal and marine environment.	Is there potential for OREDP II activities to: · disturb historic contamination in marine sediments? · disturb natural sediments resulting in potential mobilisation and effects on turbidity?	GES Descriptor 8: Concentration of contaminants within marine environment are within agreed levels and adverse effects on marine receptors do not occur.	Evidence of commitment to maintain concentrations of marine contaminants within agreed levels as defined by WFD Environmental Quality Standards (EQS) and by relevant OSPAR criteria.

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
Climate and Air Quality				
SEA 5	Avoid, prevent or reduce harmful emissions to air, promoting air quality improvements through reduction of emissions As Low as Reasonably Practical (ALARP).	Are effects on local air quality as a result of installation and operational support vessel activity anticipated?	Targets relating to airborne emissions at a regional and national level are not exceeded.	Commitment to review data reported to OSPAR Comprehensive Atmospheric Monitoring Programme (CAMP) for both airbourne and precipitation-based air pollutants to evidence minimal GHG emissions.
			Emissions from OREDP II activities do not contribute to, or result in, air quality issues which adversely affect human health or the wider environment.	Monitoring of local air quality including at ports and harbours and other coastal locations likely to support ORE development shows no significant adverse impact.
SEA 6	Minimise emissions of Green House Gases.	Is the OREDP II expected to make contribution to net Green House Gas reductions?	Targets relating to GHG emissions at a sector regional and National level are not exceeded.	Sector compliance with Ireland's EU Effort Sharing Decision target, based on EPA HGH emissions and projects data collation programme.
SEA 7	Promote and prioritise use of renewable energy and energy efficiency measures.	Carbon reduction and energy security measures (see below).	Promote renewables in line with relevant government targets	Promote renewables in line with relevant government targets. Evidence of consideration of minimum viability parameters.
SEA 8	Promote resilience to Climate Change.	Will the OREDP II result in permanent loss of areas of seabed sediments and/or shallow geology	There are no current specific targets for the management of	Evidence of consideration of emerging research into 'Blue Carbon and Marine Carbon Sequestration in Irish Waters and Coastal Habitats' and cognisance of

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
		identified as natural carbon sequestration\storage areas?	Blue Carbon in Ireland's Marine Area.	emerging research in this area. Evidence of consideration and correlation of OREDP II activities with National Ecosystem and Ecosystem Services mapping of marine sediments that store carbon.
		Will the OREDP II contribute to Climate Resilient Development (e.g. macro-contributions to GHG emissions, but also local contributions such as local hydrodynamics and coastal erosion (see physical environment), or local/regional effects on biological health indicator habitats/species such as seaweeds and seagrasses?	Evidence of incorporation of climate adaptation measures within the OREDP II.	Evidence of integration with National [Climate Change] Adaptation Framework for Coastal Areas, Biodiversity and Critical Infrastructure, Marine and Fisheries and Water Management. Specifically, integration with identified areas of vulnerability.
			Achieve transition to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050.	
			Recognition of the potential impact of and on climate change during the period of OREDP II (coastal change, flood risk, or other climate change adaptation).	Range and integration of climate resilience measures proposed.

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
Marine Pollution				
SEA 9	Reduce/prohibit release of marine litter to the marine environment.	Contribution to release of plastics waste either as microplastics, or as larger plastics which may be broken down by physical or chemical processes within the marine environment? Release of contaminants to marine waters (see Water section of baseline information)	GES Descriptor 10: The amount of litter, and its degradation products (including small plastic particles and micro plastic particles), on coastlines and in the marine environment is reducing over time and are at levels which do not result in harmful effects to the coastal or marine environment.	Evidence of commitment at construction, operation and decommission stages to minimise waste generation and to ensure waste reduction, reuse, recycling through Waste Management Planning System.
SEA 10	Minimise generation and propagation of manmade noise within the marine environment.	Temporary (short-term) introduction of sound sources, not naturally present in the marine environment (Sound profile will vary by noise type and intensity)?	GES Descriptor 11: Human introduced loud low and mid frequency impulsive sounds and continuous low frequency sounds do not have adverse effects on marine ecosystems and sensitive receptors (e.g. marine mammals).	OREDP II activities do not lead to the introduction of noise at levels which significantly adversely affect the marine environment.
		Permanent (long-term) introduction of sound sources, not naturally present in the marine environment?		
		Temporary or Permanent introduction of airborne noise sources affecting human population receptors.	Average noise exposure from wind turbines in the exposed population to be kept below 45 dB Lden Traffic noise should be below 54 dB Lden.	Evidence of commitment to comply with National and International policy requirements in relation to noise affecting human receptors.

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
SEA 11	Promote energy transmission technologies and configurations which seek to minimise EMF within the marine environment.	Introduction of EMF profiles individually or cumulatively, not naturally present in marine environment?	There are no specific targets set for EMF within the marine environment.	OREDP II activities seek to minimise risk of cumulative operating EMF profiles at seabed, water column or sea surface.
Biodiversity				
SEA 12	Preserve, protect, maintain and, where appropriate, enhance biodiversity and ecosystems within the OREDP II marine area.	Either permanent or temporary habitat loss and/or deterioration as a result of OREDP II activities.	MSFD Descriptor 1 - Biodiversity: Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.	No significant deterioration in the environmental status of marine area for MSFD Descriptor 1 – Biodiversity.
		Localised changes in temperature from operating cables?		No significant deterioration expected in the ecological status of WFD transitional waters and the attainment of good status/potential (See also SEA Objective 3).
		Barrier effects from physical presence of infrastructure, including inter-array cabling in water column for dynamic cabling suspended in water column?		
		Disruption to foraging and migration patterns in electrosensitive fish from transmission cable EMF profile?	See Objective 11 above.	See Objective 11 above.
		Disturbance effects, particularly to marine mammals, fish and seabirds from underwater sound profile (during both installation and	See Objective 11 above.	See Objective 11 above.

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
		operation). (Sound profile will vary by noise type and intensity)?		
		Opportunities for habitat restoration/enhancement (e.g. artificial reefing /artificial roosts for seabirds)?	MSFD Descriptor 4 - Food Webs All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.	Evidence of consideration and correlation of OREDP II activities with National Ecosystem and Ecosystem Services mapping Marine Biodiversity 'Spatial Indicator of 'Naturalness, support of systems, and species and resilience'. Safeguarding provision of ecosystem goods and services.
		Fish aggregation and effects on trophic food webs e.g. increases in fish recruitment improving resilience of species population but also increasing prey availability leading to increased CRA for higher trophic species?		
		Introduction of non-indigenous species?	GES 2: Minimise risk to movement / introduction or establishment of non-native species.	No significant deterioration in the environmental status of marine area for MSFD Descriptor 2 Non-indigenous species).
		Visual disturbance of infrastructure displacing marine birds from development sites.	See Objective 13 below.	See Objective 13 below IUCN Red-list status to be reviewed - if available -as an indicator for other biodiversity interests that are not monitored as part of reporting obligations under Nature Directives,
		Collision risk marine mammals and fish with moving parts of infrastructure (particularly where aggregations of prey species may		

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
		occur as a result of infrastructure presence)?		
		Collision risk to birds (above and below sea surface)?		
		Collision risk for other marine fauna (e.g. sea turtles) (likely low risk given their slow swimming speed)?		
SEA 13	Avoid significant impact to EU and National level designated sites, Qualifying Interests and protected species.	See Appropriate Assessment for Details and cross refer.	Maintain and protect designated sites and species.	Species and habitats identified as needing protection under national or international agreements are effectively protected or conserved.
		See Appropriate Assessment for Details and cross refer.	Maintain and protect Marine Protected Areas.	See Appropriate Assessment for Details and cross refer.
Cultural Heritage				
SEA 14	Protect known wrecks and historic and cultural features of the OREDP II marine area.	Seabed disturbance leading to damage or loss of maritime heritage features?	Maintain and protect designated sites and features.	No significant effect on condition of designated sites and features or their setting.
	Incorporate opportunities to		OREDP II activities contribute to the archaeological and	Evidence of consideration and integration with 'Heritage Ireland 2030'.

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
SEA 15	enhance cultural/historic knowledge and understanding.		cultural knowledge of the marine and coastal environment through survey and discovery.	Provides evidence of commitment to protocol for management and recording of future archaeological finds etc.
Landscape and Seascape				
SEA 16	Implement the requirements of the European Landscape Convention through high quality design for the sustainable stewardship of Ireland's landscape and by integrating landscape into Ireland's approach to sustainable development.	Visibility of infrastructure from human receptors (coastal communities, shipping routes (commercial and leisure).	Maintain and preserve landscape / seascape character of the OREDP II marine area.	OREDP II avoids likely significant impact on nationally-designated landscape areas.
		Compatibility of infrastructure with receiving landscape character.		Extent of areas considered to be of landscape sensitivity potentially affected by OREDP II proposals.
		Visibility of onshore support infrastructure e.g. substations etc.	Protect visual resource associated with the OREDP II marine area.	Evidence of consideration of the ambient lighting conditions within the OREDP II marine area.
		Introduction of light sources (temporary during installation and/or permanent during operation).	There are no specific targets set for light pollution within the coastal or marine environment.	Evidence of consideration of influence of existing offshore and coastal activities on landscape character and visual amenity.
Population and Human Health				
SEA 17	Avoid significant impact on human health and wellbeing.	Marine space conflicts (e.g., fishing activity; reduced wave resources for leisure activities as a result of changes to hydrodynamics (see	Potential for significant adverse effects on the quality or access to areas used for other marine activities including recreation	Extent, range and intensity of interactions with other marine users.

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
		physical environment); and effects on tourism (see seascape and landscape).	(e.g. amenity, sailing, surfing), are minimised or avoided.	
		Changes to wave resources for tourism/leisure activities (e.g., surfing, sailing, windsurfing, other water sports) as a result of changes to hydrodynamics (see physical environment).		See also landscape/seascape and indicators for material assets.
		Effects of visibility of ORE on coastal tourism?	(see SEA Objective 16 on seascape and landscape).	(see SEA Objective 16 on seascape and landscape).
		Changes to availability of employment for skilled technical workers?		Evidence of consideration of opportunities to promote sectoral coexistence
SEA 18	Avoid disruption, disturbance or nuisance to local communities.	Construction/Operational noise, air quality traffic etc.	Minimise significant adverse nuisance to communities, for instance through noise or vibration or through effects on local air quality.	Monitoring of local air quality and noise shows no adverse impact.
		Changes to availability of employment for local communities?		Evidence of consideration of ability to maximise the economic potential and supply chain benefits.

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
Material Assets				
SEA 19	Protect marine material assets (including fisheries, shellfish, military activity and infrastructure) and resources.	Physical presence of construction vessels and activities affecting other sea users (shipping channels, fishing grounds, access to ports/harbours or other marine infrastructure etc)?	Repurpose and optimise reuse of existing infrastructure where at all possible.	
		Direct or indirect disturbance to fishing grounds and/or fish stocks?	GES Descriptor 3: Populations of commercially exploited fish and shellfish are within safe biological limits.	Spatial and temporal distribution of fishing effort for Irish commercial fishing vessels in the OREDP II area.
		Direct or Indirect disturbance to Aquaculture activities.		Evidence of consideration of distribution of aquaculture activities in the OREDP marine area.
		Temporary ***or permanent*** disruption to military activities and exercise, during installation activities?		Proximity to designated military activity zones.
		Interference with radar, communications from operating devices?		Evidence of consideration of location of critical radar and communications infrastructure.
		Temporary disruption to transit routes to and from marine aggregates and/or disposal areas?		Proximity to designated marine aggregates sites.
		Temporary or Permanent loss of areas or access to areas of suitable		

Ref	SEA Objectives	Indicative Impact pathways (list not exhaustive)	Targets	Potential Indicators
		for aggregate and/or other mineral extraction?		
		Displacement of shipping activity and/or density, or increased journey times and distances?		Evidence of consideration of shipping densities, identification of key transit routes, vessel traffic management areas etc.
		Reduction in access to ports/harbours either temporarily during construction or permanently?		
SEA 20	Ensure continuity and safety of navigation.	Will the OREDP II proposals increase the risk of navigational collision in Ireland's waters?		Evidence of consideration potential for collision risk, accidental events etc.
		Effects on visibility for safe navigation?		

3.3.3 Assessment of Alternatives

Alternatives have been given specific consideration through the development of OREDP II and the parallel SEA Process and are identified in Chapter 4. The key stages of the SEA process at which Alternatives have been given specific consideration are shown in **Figure 3-2** and have included:

- **Need or Demand** – including an assessment of the OREDP II objectives,
- **Mode or Process** – bottom-fixed offshore wind, floating offshore wind, wave energy converters and tidal stream devices) and areas where technology opportunities overlap. Alternatives to the structure of the OREDP II,
- **Location** – consideration of 'broad areas' for future identification of areas at lower tier DMAP stage, and
- **Timing and implementation** – No alternatives identified at the OREDP II stage.

3.3.4 Assessment of OREDP II Objectives

OREDP II provides a framework for the sustainable deployment of Ireland's offshore renewable energy resources. Specifically, the OREDP II seeks to:

- Assess the resource potential for offshore renewable energy in Ireland's Exclusive Economic Zone,
- Provide an evidence base for the identification of areas most suitable for the sustainable development of offshore renewable energy in Ireland's maritime area, and
- Identify gaps in marine data or knowledge and recommend prioritise action to close these gaps.

Each of these OREDP II objectives has been considered against the SEA Objectives, indicators and targets as identified within the SEA framework (**Table 3-3-3**) applying the assessment criteria as set out within **Table 3-3-2**. Relevant baseline data identified at the scoping stage (Stage A) of the SEA was used to inform these assessments.

3.3.5 Assessment of OREDP II and Supporting GIS Models

To achieve the objectives identified above, the OREDP II has developed a series of input GIS models, which consider a range of criteria in order to identify potential for ORE development across the EEZ, as set out in **Table 3-4.**

Table 3-4: OREDP II component models

Plan Model	Description
Technical Opportunities model (the Draft OREDP II)	Identifies areas of Ireland's EEZ where're characteristics are most favourable to offshore renewable energy development. Based on a series of technical parameters including water depth, wind and wave climate.
Exclusion model	Removes areas within the EEZ where activities or receptors are considered to be incompatible with offshore renewable energy development at this time. Parameters include cables and pipelines, internal shipping routes, existing offshore infrastructure etc.
Environment model	Identifies areas of Ireland's EEZ where environmental factors which may affect the ability to develop offshore renewable energy have been identified
Economic model	Identifies areas of Ireland's EEZ where economic factors of relevance to develop offshore renewable energy have been identified
Heritage model	Identifies areas of Ireland's EEZ where heritage factors of relevance the development of offshore renewable energy have been identified

Each of these models and the SEA Objectives, indicators and targets as identified within the SEA Framework have been assessed, with detailed results set out in **Appendix 4** (Workbooks 1 to 4) and a summary of potential effects identified within Section 6 of this report.

3.3.6 Consideration of Potential Cumulative Effects with other PPPs

The emerging OREDP II represents one of a number of inter-related strategies, plans and policies supported by tiers of evaluation and assessment which are currently being carried out by the Irish Government to ensure an integrated, plan-led enduring regime to govern decision-making and deployment of Ireland's offshore renewable energy resource.

A long list of other PPPs with potential to influence and/or interact with OREDP II was developed as part of scoping of the SEA (see **Appendix 2**: Summary of Regulation and Policy Review of this report). This long list was then reviewed in order to identify a short-list of other PPPs where potential for cumulative effect on key receptors may occur and which it was considered required further consideration.

Evaluation of the potential for OREDP II to result in cumulative effect with other relevant PPPs when considered against the SEA Framework described in **Chapter 3: SEA Methodology** is considered within **Chapter 0.**

3.4 Stage C: Environment Report

The SEA Regulations require a description of the following to be presented in the SEA Report (Regulation12 (1)):

(a) An outline of the contents and main objectives of the plan or programme, or modification to a plan or programme, and relationship with other relevant plans or programmes;

(b) the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme, or modification to a plan or programme,

(c) the environmental characteristics of areas likely to be significantly affected;

(d) any existing environmental problems which are relevant to the plan or programme, or modification to a plan or programme, including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to the Birds Directive or the Habitats Directive;

(e) the environmental protection objectives, established at international, European Union or national level, which are relevant to the plan or programme, or modification to a plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation;

(f) the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors;

(g) the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme, or modification to a plan or programme;

(h) an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;

(i) a description of the measures envisaged concerning monitoring of the significant environmental effects of implementation of the plan or programme, or modification to a plan or programme;

(j) a non-technical summary of the information provided under the above headings.

This report constitutes the SEA Environment report for the draft OREDP II.

A considerable amount of material has been generated as part of the SEA process and relevant documents are available at the following website: gov.ie/OffshoreEnergyPlan . In addition, a digital report will be produced to support consultation.

3.5 Stage D: Consultation on Draft OREDP II and Environment Report

This Environment report has been produced for comment alongside the draft OREDP II and both the OREDP II and this related Environment report will be put out for consultation in February 2023.

Following this consultation, the authors will review all responses received and consider any amendments to the draft OREDP II as appropriate with some engagement with those that have commented as required.

It is anticipated that OREDP II will be published along with finalised SEA and AA Reports in mid-2023.

3.6 Stage E: Implementation/Monitoring of the OREDP II

Stage E of the SEA process refers to implementation and monitoring. Monitoring the effects of the OREDP II will be the responsibility of the DECC guided by a monitoring programme to be included in the SEA Adoption Statement.

A preliminary draft monitoring programme has been included in **Section 7** of this Environmental Report.

3.7 Stakeholder Engagement

DECC is working closely with other Departments, agencies and stakeholders to adopt a collaborative and inclusive approach to the development of the ORE sector. In line with marine spatial planning best practice, the OREDP II involves engagement and input from a wide range of stakeholders across the public sector, academia, industry, coastal and marine communities, and environmental groups, participating through a Steering Group, a Data and Scientific Group, and an Advisory Group established by DECC to inform the development of the OREDP II (see **section 1.4** for further details). The approach to OREDP II seeks to engage with these sections throughout to ensure as broad an evidence base as possible is adopted to inform the decision-making and marine plan-making process.

Development of OREDP II is being completed in parallel and with full cognisance of other relevant workstreams, for example including work led by the National Parks and Wildlife Service (NPWS)

(SPAs and SACs only) and the Marine Environment, Water Division at the Department of Housing (MPAs), Local Government and Heritage to deliver the Government commitment to designate 30% of marine protected areas by 2030. The Stakeholder engagement strategy for OREDP II has been developed to ensure representation of these other workstreams where necessary and appropriate and in this example, ensuring NPWS and the Marine Environment, Water Division is represented on the Data and Scientific Group and Steering Group for the OREDP II.

3.7.1 Consultation during Scoping and OREDP II preparation

An SEA Scoping Report was produced as part of Stage A of the SEA Methodology and was issued to a wide range of stakeholders for consultation on 23 April 2022 to 27 May 2022. A list of stakeholders who were consulted and a summary of consultation comments received is included in **Appendix 1: Consultation on Scoping Report.**

The EPA Guidance (EPA, 2021) notes that public and stakeholder input can contribute to identify and assessing alternatives, may identify further alternatives and allow identified alternatives to be refined. In addition to the environmental assessments, consultation with stakeholders and public interest groups will inform the identification of areas with opportunities and constraints for ORE. Public Consultation.

The Draft OREDP II along with this SEA Report and associated AA reports, will be the subject of an 8-week consultation programme in early 2023. The purpose of the consultation is to present the Draft OREDP II and associated environmental assessments to coastal, marine and island communities and specific stakeholder groups, and to the public in general. The consultation will use a hybrid in-person and digital approach following the “inquiry by design” format outlined in DPER’s Consultation Principles & Guidance (DPER, 2016). The approach to OREDP II seeks to engage with these sections throughout to ensure as broad an evidence base as possible is adopted to inform the decision-making and marine plan-making process[8]. Key stakeholders from the economic, environmental and social pillars are regularly engaging in the OREDP II Advisory Group to share expertise, knowledge and local perspectives.

3.7.2 Consultation on the Draft OREDP II

The public, in particular coastal and marine communities will be consulted on the draft OREDP II and the reports for the environmental assessments. A detailed Communications and Consultation Plan for this consultation has been developed and is set out in a separate document (Please follow this link for further information: gov.ie/OffshoreEnergyPlan).

[8] OREDP II Project Initiation document

The Draft OREDP II and the associated SEA and AA environmental reports will be the subject of an 8-week consultation programme, commencing in early 2023. The purpose of this consultation is to present the Draft OREDP II and associated environmental assessments to coastal, marine and island communities and specific stakeholder groups, and to the public in general.

Responses to the public consultation will be assessed and used to inform the finalisation of the report and associated environmental assessments.

3.8 Challenges and Limitations

SEA Regulations require that the SEA report should include information that may reasonably be required taking into account current knowledge and methods of assessment, the contents and level of detail in the plan, programme or strategy, the stage in the decision-making and plan, programme or strategy development. It should also consider the extent to which certain matters are more appropriately assessed at different levels in that process to avoid duplication of the assessment.

The OREDP II is a high level, national level strategy which seeks to provide a framework within which lower tier assessments may subsequently address site or project-specific details.

The OREDP II is expected to guide a series of lower tier assessments, specifically DMAP planning under MAPA 2021. The OREDP II provides initial, strategic guidance for decision-makers and marine plan-makers to assist in consenting (or otherwise) activities in Ireland's marine area. As such, the exact location and nature of new activities will also depend upon market forces and development applications being received. This results in uncertainty when predicting the effects of activities and consequently strategic impacts can be identified with the most certainty, together with the extent to which the OREDP II seeks to avoid or offset these impacts. Correspondingly, this SEAs predictions and proposed mitigation measures are at a strategic level.

It is anticipated that decision-makers and marine plan-makers will follow the guidance set out within the OREDP II and the overarching NMPF within who's auspices it sits, when considering the potential impacts at lower tier assessment including when taking decisions about whether to consent any particular project brought forward within it.

Whilst it is assumed that decision-makers and marine plan-makers will make decisions based upon the most sustainable outcomes, this reliance on judgement results in a further level of uncertainty in the assessment. This is in part mitigated by the requirement in law for statutory consultation bodies including Department of the Environment, Climate and Communications including Geological Survey Ireland (GSI), Department of Agriculture, Food and the Marine and Environmental Protection Agency Department of the Housing, Local Government and Heritage for example, to be consulted upon applications which require Environmental Impact Assessments

(EIAs).The draft OREDPII Plan does not currently contain resource capacity calculations for either wave or tidal power, therefore comments and analysis of the potential for impact from these technologies correspondingly gives limited consideration to potential interactions with a focus on basic principles of interaction only.

Where the draft OREDP II recognises key constraints and identifies clearly how these constraints should be managed, this has allowed corresponding clarity within the SEA. However, certain sections of the draft OREDP II are less prescriptive on how identified constraints will be managed. This is particularly true of the environmental constraints identified within the Environment model element of the document. Within the Environment model, the factors mapped do not pre-empt decisions on licence or consent applications for offshore renewable energy. Rather, the intention is to provide information on relevant factors for further consideration in the lower-tier assessments, and as part of decision-making and marine plan-making for the DMAP and project levels. Within this model the potential for environmental impact is highly dependent on the decision-making, marine plan-making and management regime that is defined for these environmental constraints and consequently this SEA has been limited in the evaluation it has been able to provide.

3.9 How the SEA Directive Requirements have been met

What the regulations say[9]	How this is addressed
An outline of the contents, main objectives of the plan or programme.	Set out in Section 2 of this document.
An outline of the relationship with other relevant plans and programmes.	Set out in Appendix 2 to this document.
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme.	Set out in Section 5 of this document and in Appendix 3.
The environmental characteristics of areas likely to be significantly affected.	Section 2 of this document outlines the characteristics of the plan area in general and Section 5 and Appendix 3 outline those areas likely to be significantly affected. These characteristics and

[9] Please see Schedule 2 of the SEA regulations: *Information for Environmental Reports*.

What the regulations say[9]	How this is addressed
	potential interactions have been informed by information contained within the SEA baseline data (Section 5/Appendix 3).
Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC.	Appendix 3 to this document outlines key sustainability issues related to each SEA topic. This includes sites designated pursuant to Directives 79/409/EEC and 92/43/EEC. Further information will also be available in the separate Appropriate Assessment (AA) Report.
The environmental protection objectives, established at international, Community or national level, which are relevant to the plan or programme and the way those objectives and any environmental, considerations have been taken into account during its preparation.	Appendix 2 outlines relevant environmental protection objectives. The way that those environmental objectives have been taken into account has been through integrating them into the SA Framework.
The likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors. The identification of the above effects should consider secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects.	Section 6 sets out the significant effects of the draft OREDP II and Section 4 discusses the significant effects of reasonable alternatives. Details of the nature of effects are provided within Appendix 4. This includes indirect (secondary), cumulative (cumulative and synergistic), duration (short/medium/long term), permanent or temporary and negative or positive effects. Definitions are provided within Table 3-3-2 in Section 3.3.2.
The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme.	Section 7 sets out mitigation measures for significant negative effects and uncertain effects.
An outline of the reasons for selecting the alternatives dealt with	Section 4 outlines the reasons for selecting the alternatives dealt with.

What the regulations say[9]	How this is addressed
A description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	Section 3 outlines the methodology for all stages of the SEA and Section 3.8 specifically describes any technical difficulties that were encountered.
A description of measures envisaged concerning monitoring.	Set out in Section 7 of this document.
A non-technical summary of the information provided under the above headings.	See non-technical summary.
The report must include the information that may reasonably be required taking into account current knowledge and methods of assessment, the contents and level of detail in the plan or programme, its stage in the decision-making and marine plan-making process and the extent to which certain matters are more appropriately assessed at different levels in that process to avoid duplication of the assessment.	The whole SEA Environmental Report addresses this.
Consultation: Authorities with environmental responsibility, when deciding on the scope and level of detail of the information which must be included in the environmental report (Art. 5.4).	The Scoping Report was consulted on with key stakeholders[10] and the public for a six week period from 19th April and 27th May, 2022.
Authorities with environmental responsibility and the public, shall be given an early and effective opportunity within appropriate time frames to express their opinion on the draft plan or	This SEA Environmental Report will be consulted on between 24th February and 21st April 2023 and amended following consultation where appropriate.

[10] Department of the Environment, Climate, Communications, Department of the Housing, Local Government and Heritage, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Department of Agriculture, Food and the Marine and the Environmental Protection Agency are the SEA statutory consultees.

What the regulations say[9]	How this is addressed
programme and the accompanying environmental report before the adoption of the plan or programme.	
EU Member States, where the implementation of the plan or programme is likely to have significant effects on the environment of that country.	Section 6 presents the potential significant effects of OREDP II. The assessment has not identified any potential effects on other EU member states.
Taking the environmental report and the results of the consultations into account in decision-making (Art. 8). Provision of information on the decision: When the plan or programme is adopted, the public and any countries consulted under Art.7 must be informed and the following made available to those so informed: The plan or programme as adopted. A statement summarising how environmental considerations have been integrated into the plan or programme and how the environmental report of Article 5, the opinions expressed pursuant to Article 6 and the results of consultations entered into pursuant to Art. 7 have been taken into account in accordance with Art. 8, and the reasons for choosing the plan or programme as adopted, in the light of the other reasonable alternatives dealt with. The measures decided concerning monitoring.	This will be set out in the SEA Statement.
Monitoring of the significant environmental effects of the plan's or programme's implementation.	The proposed monitoring arrangements are discussed in Section 7.

4 Identification of the OREDP II Alternatives

The SEA Directive and Ireland's enacting regulations requires the assessment of alternatives, including an outline of the reasons for selecting the alternatives that have been considered.

"An environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme are identified, described and evaluated" (Article 5 (1) Directive 2001/42/EC).

The EPA Guidance (EPA, 2021) summarises that in practice this comprises a three-part process:

- Identifying Reasonable Alternatives,
- Assessing and comparing those alternatives on a consistent basis, and
- Explaining the choice of the preferred alternatives and setting out an alternative hierarchy.

The guidance refers to the consideration of alternatives as being at the heart of the SEA process and the need to set out the 'storyline' through an alternatives hierarchy as summarised in Figure 4-1 below.

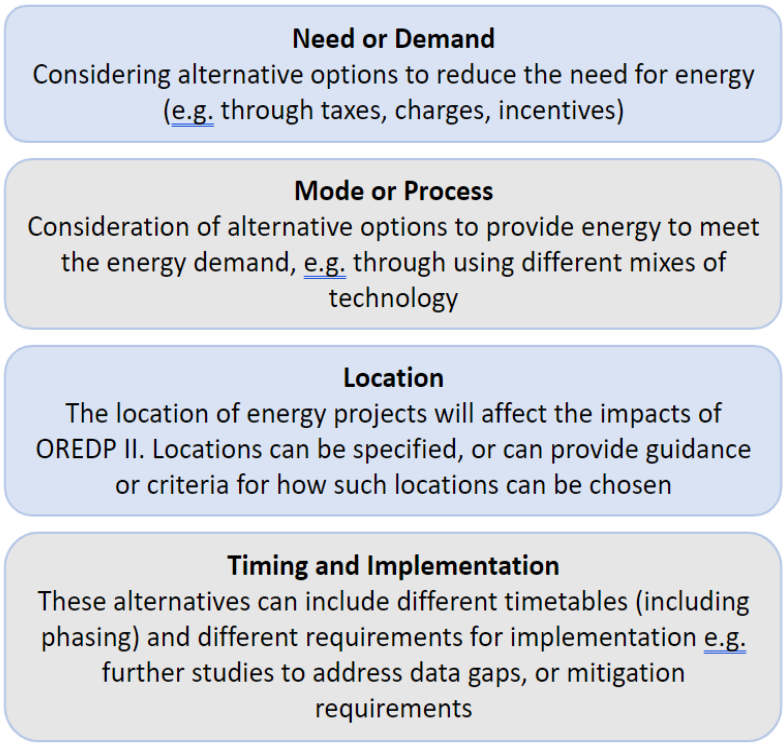


Figure 4-1: Alternative Assessment Hierarchy

This section identifies reasonable alternatives for assessment according to the hierarchy in Figure 4-1. The assessment of the OREDP II and alternatives is set out in Section 6.

4.1 Need or Demand

Under the Paris Agreement, Ireland has committed to reducing greenhouse gas emissions (GHG) by 7% per annum to 2030 (a 51% reduction on 2018 levels) and in 2022 introduced the first of its multi-annual carbon budgets in which renewable energy is key to achieving sectoral GHG reductions.

At a European level there is also increased emphasis on the potential for ORE to make a significant contribution in the drive to net zero by 2050. The EU Strategy on Offshore Renewable Energy sets out an ambition to achieve 60GW of installed offshore wind by 2030 and 300GW by 2050, with additional targets of 1GW of ocean energy and other emerging technologies such as wave and tidal by 2030 and 40GW by 2050.

The Russian invasion of Ukraine has dramatically concentrated EU efforts to address European dependence on Russian oil and gas. On 8 March 2022, the European Commission published REPowerEU Communication which highlights the need to drastically accelerate the clean energy transition and thereby increase Europe's energy independence.

The Climate Action and Low Carbon Development (Amendment) Act 2021 establishes a legally binding framework with clear targets and commitments set in law to support Ireland's transition to net zero and achieve a climate neutral economy by no later than 2050. The Climate Action Plan 2021 (CAP 2021) sets the 5GW for Offshore Renewables target and up to 80% renewable electricity by 2030. This is expected to be delivered through OREDP I and the Transition Protocol set out within MAPA 2021. This target has recently increased again to 7 GW, with the additional 2 GW hypothecated for the production of green hydrogen, as part of the agreement on Sectoral Emissions Ceilings (Govt of Ireland, 2022).

4.1.1 The Need for OREDP II

The CAP 2021 also commits to the development of OREDP II to quantify the offshore renewable energy potential in Ireland's maritime area. The Programme for Government commits to developing a longer-term plan to utilize the potential of at least 30GW of offshore floating wind power in Atlantic waters. While this is not a target of the OREDP II, the national level spatial strategy provides a basis for working towards this ambition. Additionally, OREDP II determines Ireland's potential contribution to offshore renewables targets set in the EU Strategy and contributes to accelerated delivery of these targets.

Alternative energy sources would not be able to meet legislative requirements or objectives of the OREDP II for the following reasons:

Oil and Gas: Exploration of oil and gas do not support targets of the Paris Agreement and the Programme for Government committed to end the issuing of new licences for the exploration and extraction of gas, on the same basis as the 2019 decision in relation to oil exploration and extraction. The Climate Action and Low Carbon (Amendment) Act 2021 gives statutory effect to this commitment.

Coal and Peat: For similar reasons to oil and gas, CAP 21 commits to complete the phase-out of coal and peat-fired electricity generation.

Nuclear: The production of electricity by nuclear fission is prohibited in Ireland by the Electricity Regulation Act 1999 (Section 18).

Hydrogen: CAP 2021 identifies green hydrogen as having the potential to support decarbonisation across several sectors and, in particular, as a source for high-temperature heat in industry and flexible generation in electricity. While DECC is working with European and national stakeholders including Gas Networks Ireland (the transmission system operator) to develop a pathway for the use of hydrogen in Ireland[11], implementation is still some years away.

4.1.2 Do Nothing / Business as Usual

There is not a legal obligation to review the OREDP I or prepare the OREDP II however, OREDP I only covers the time period up to 2030 and does not provide for delivery of the long-term ORE capacity to which the Irish government has committed, since the publication of OREDP I in 2014. A business-as-usual approach for ORE development to proceed under the framework of the OREDP I without an update to produce OREDP II may be feasible in the short term (to 2030) but is not considered to be a feasible alternative in the time period beyond 2030.

4.1.3 Alternative OREDP II Objectives

As described in section 2.2 three clear Objectives of the OREDP II are defined. In addition to these, this part of the SEA provides commentary as to whether the OREDP II should include a fourth objective ‘to identify specific Candidate Areas for potential development’.

Identification of spatially defined ‘Candidate Areas’ for offshore energy development, under the Designated Maritime Area Plan (DMAPs) process set out in the Maritime Area Planning Act 2021 can underpin a plan-led approach to consenting. OREDP II is being developed to set the framework by which DMAPs for the ORE sector will subsequently be established (see Figure 2-1). As part of the development of the OREDP II, consideration has been given to whether it is yet

[11] https://www.gov.ie/en/policy-information/f1ecf1-gas/

feasible at this strategic plan level of the Planning hierarchy to establishing Candidate Areas to guide subsequent stages. Potential difficulties have been identified with both the spatial coverage and resolution of possible input datasets, which could lead to incomplete/inaccurate input data being used, consequently skewing the consideration of Candidate Areas and result in challenged and or inaccurate decision-making / and marine plan-making. As part of early OREDP II development it was identified that the SEA process may offer valuable insight into decision-making and marine plan-making with relation to the alternatives around the approach to be taken.

For the purpose of the SEA three alternative options have been considered:

- Option 1: No candidate areas identified and no exclusions identified,
- Option 2: No candidate areas identified, identification of operational exclusions only, and
- Option 3: Candidate areas are identified based on operational exclusions and environmental designations.

Potential areas of interest for technologies considered within OREDP II are most extensive under **Option 1** allowing the OREDP II to support the greatest theoretical capacity for offshore energy. However, a strategy based on Option 1, i.e. (without defined candidate areas nor exclusions) would provide only a 'light touch' level of strategic guidance to integrate ORE development in Ireland's marine area leaving an extensive range of consenting challenges and environment issues to be address at lower tier assessments and consequently could potentially be expected to take significantly longer to deliver.

Option 2 includes the identification and application of the following Operational Exclusions (as set out within the Appendix D of the draft OREDP II):

- Maritime traffic,
- Renewable energy test sites,
- Cables and pipelines, including interconnectors,
- Fixed Aids to navigation,
- Dumping at sea,
- Protection of installation orders, and
- Aquaculture sites.

Option 2 could be expected to reduce the significance of some impacts when compared with Option 1, specifically on material assets and navigation. However, the identified exclusions do not

make significant contributions to protection of environmental features relating to many of the Environmental topics covered by the SEA. The potential for significant impacts on these other topics particularly including biodiversity and designated sites remains. While it is possible to apply mitigation at a project level through EIA and AA processes, consenting is likely to be more complex if ORE is proposed for designated sites. This may affect wider renewable energy targets, including Climate Change Action Plan target of up to 80% by 2030. **Option 3** therefore performs better, both in terms of impacts on biodiversity/ designated sites and delivery of renewable energy/ minimising greenhouse gases.

It is possible that avoiding designated sites could also affect delivery of targets, if there was insufficient offshore resource available for development, but more information would be needed to support this conclusion. There is also potential for a combined approach of identifying Candidate Areas in the short-medium term and relying on the Operational Exclusions only for longer-term development.

Option 3 would allow for the identification of Candidate Areas which reflect both Operational Exclusions and environmental designations and would take into account key constraints at a strategic level. This in turn would facilitate the DMAP process and the environmental assessments required at lower tier assessments.

Since early consideration of the above options where initial evaluation provided support for Option 3, identification of Candidate Options, it became increasingly evident that at this strategic level, constraints can only be identified and given due consideration within the existing legislative framework and existing data availability. This means that further project level surveys and mitigation would always need to be taken into account in site identification and lower tier development for ORE as, with increasing resolution, there will be additional constraints outside of the strategically identified designated areas and other environmental factors which will be of importance for ORE development. Conversely, ORE is possible outside candidate areas and within environmental designations, but consenting is likely to be more complex due to higher potential for significant effects and need to develop acceptable mitigation, so if consent is achieved, timescales are likely to be longer. It was therefore concluded that identifying candidate areas within the OREDP II would be complex and limited by available data and therefore not feasible at this level. OREDP II has subsequently evolved to preliminarily identify a mechanism [12]by which 'Broad Areas' may be identified, to be subsequently refined as part of the DMAP

[12] Note: the indicative framework/criteria within this preliminary mechanism will not be finalised until after the public consultation on the OREDP II and supporting SEA.

process. It includes a model for exclusions, in addition to environmental, economic and heritage models. These are discussed further below in Section 4.2.

4.2 Mode or Process

Offshore energy can be extracted and converted into electrical energy by a variety of devices that make use of different sources of ocean energy. These alternative technologies considered within the OREDP II fall into four technology types:

- bottom-fixed offshore wind,
- floating offshore wind,
- wave energy converters, and
- tidal stream devices.

OREDP II identifies parts of Ireland's marine area, defined by a series of technical parameters (e.g. water depth, technical wind and/or wave resource parameters) which are considered potentially technologically suitable for each of these technology types. In certain areas, these parameters overlap resulting in some parts of Ireland's marine area having been identified as potentially technologically suitable for the successful installation and operation of more than one technology type. Areas identified as potentially suitable for more than one technology type are shown in Figure 4-2 and Figure 4-3**.**

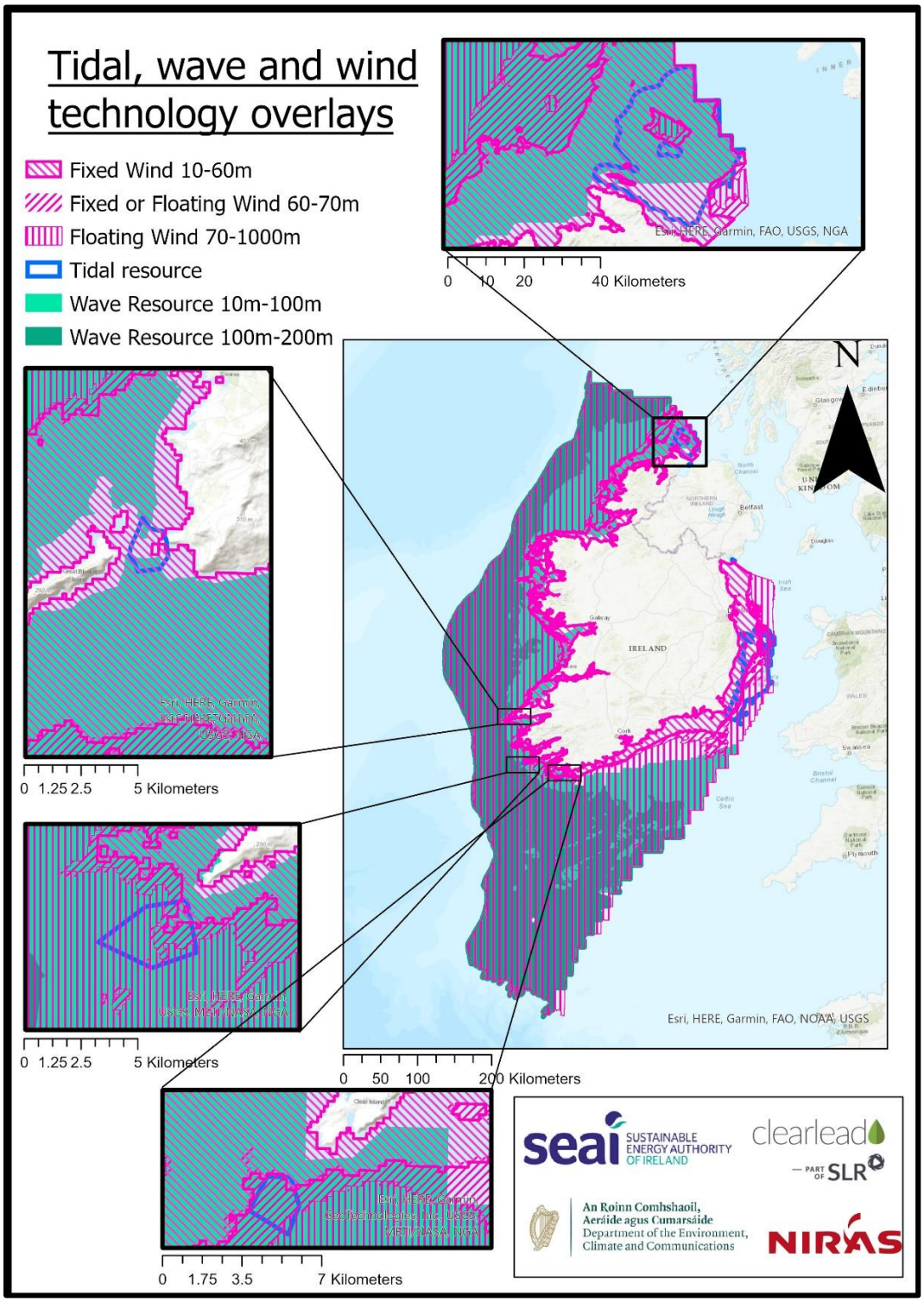


Figure 4-2: Part of Ireland's marine area identified as potentially technologically suitable for tidal, wave and wind technology

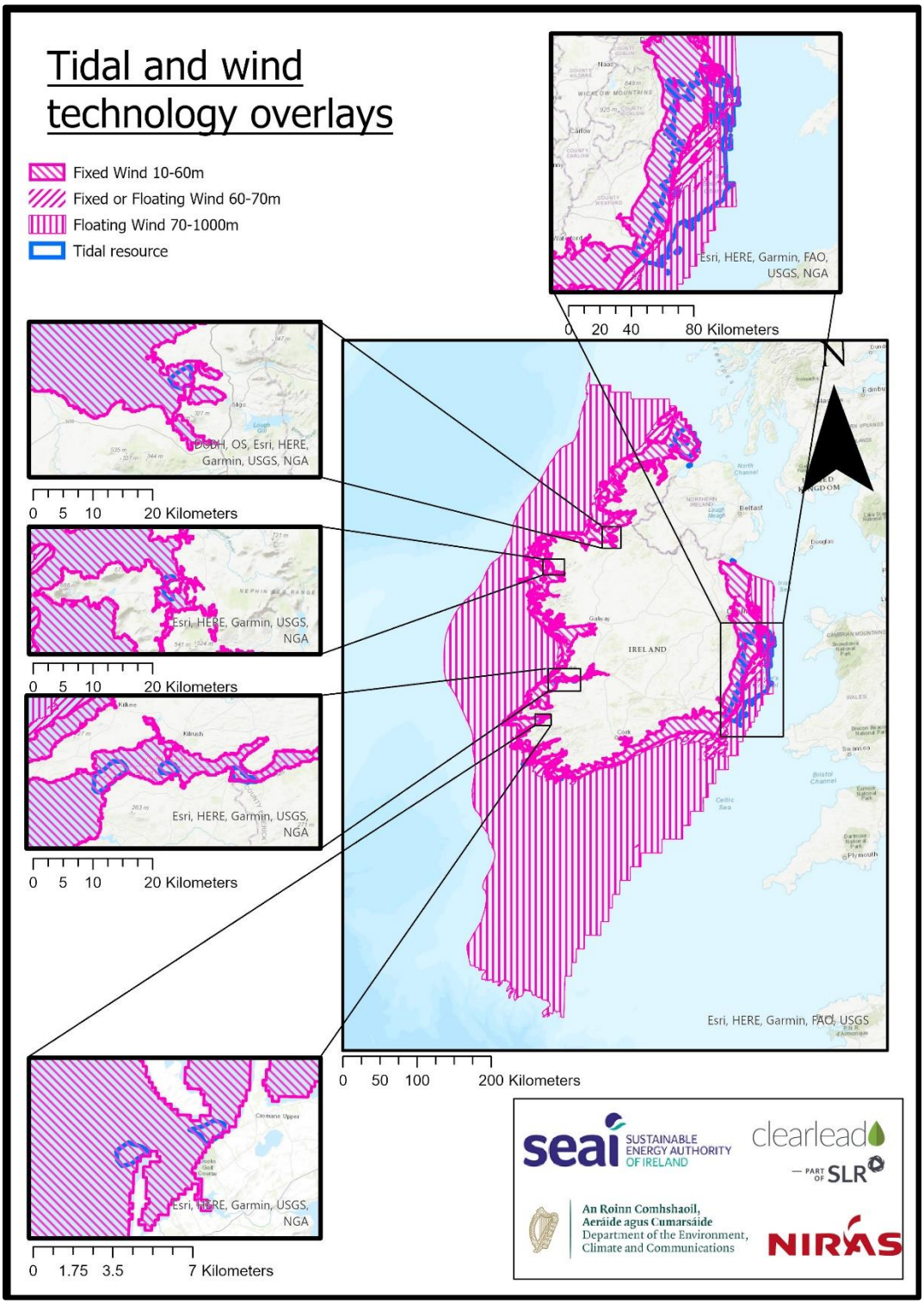


Figure 4-3: Part of Ireland's marine area identified as potentially technologically suitable for tidal and wind technology

Alternative technology types are assessed as part of the SEA (Appendix 4 and summarised in Section 6). An evaluation of areas where more than one alternative technology is suitable is also provided in Section 6.

4.3 Location

A technical opportunities model has been used to identify the areas of interest for different types of ORE resource (offshore wind (fixed and floating), wave and tidal). (see **Figure 2-4**, **Figure 2-6**, **Figure 2-8**, and **Figure 2-9**): Overlaid on these areas of resource potential, the OREDP II also includes an Exclusions model which identifies parts of Ireland's marine area in which activities or receptors which are considered incompatible with offshore renewable energy development at this time have been identified to occur. These include traffic separate schemes, nearshore anchorage areas, high density shipping routes, offshore cables and pipelines, early-stage interconnector projects, renewable energy test-sites, dumping at sea sites, lighthouses, suspended wells, and aquaculture. Other spatial environmental, economic and heritage factors considered for ORE development are also identified in the OREDP II and provide context for further refinement of the identified areas of interest.

Following initial identification of areas of interest as discussed above, the OREDP II also indicates three provisional broad areas, as well as further likely areas for future focus within the broad areas. The broad areas are to be considered as options to be taken forward for further consideration during the subsequent DMAP process. These are specifically for the potential deployment of Floating Offshore Wind (FLOW) technology (as explained in Chapter 2.1.1).

The broad areas and likely areas for future focus are summarised below and shown on

Figure 4-4**.** The SEA assessment considered the entire broad area footprint, as likely areas for future focus could alter.

4.3.1 North-West

The area suitable for FLOW technology identified within the North-West broad area (i.e. in water depths >60m) covers an estimated 8900 km^2 of Ireland's marine area in water depths between 70m and 200m, with an additional estimated 1400km^2 between 60m and 70m that may be suitable for either fixed or floating. The combined area suitable for FLOW technology reflects an estimated two thirds of the total area covered by the North-West broad area.

The FLOW area of interest identified within the OREDP II is subdivided into two depth ranges 60-200m depth and 200m to 1000m depth. However, the whole of the North-West broad area lies within the 100m water depth.

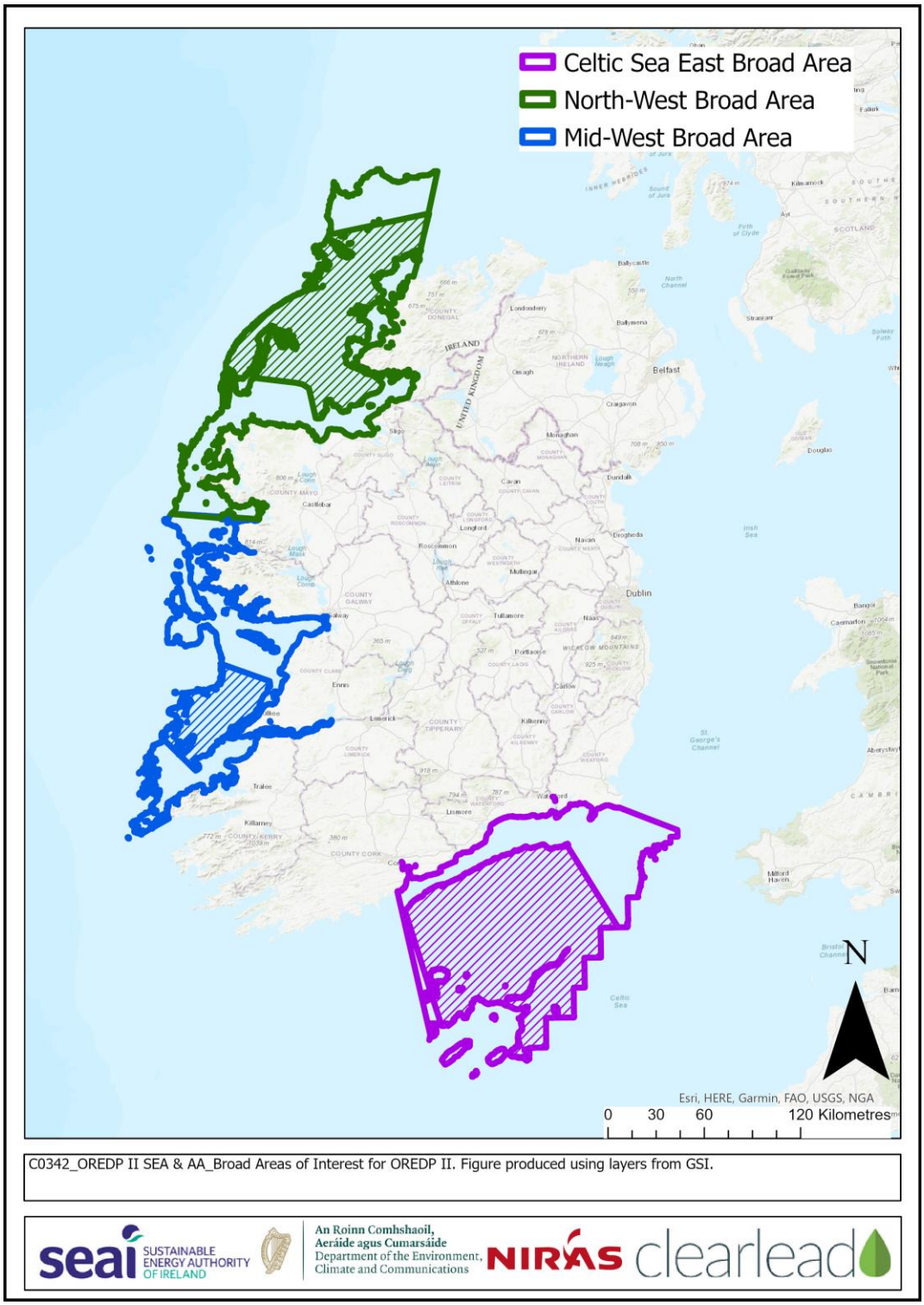
4.3.2 Mid-West

The area suitable for FLOW technology identified within the Mid-West broad area (i.e. in water depths >60m) covers an estimated 4500 km^2 of Ireland's marine area in water depths between 70m and 200m, with an additional estimated 550 km^2 between 60m and 70m that may be suitable for either fixed or floating. This combined resource area reflects an estimated half of the total area covered by the Mid-West broad area.

The FLOW area of interest identified within the OREDP II is subdivided into two depth ranges 60-200m depth and 200m to 1000m depth. However, the whole of the Mid-West broad area lies within the 100m water depth.

4.3.3 Celtic Sea East

The area suitable for FLOW technology identified within the Celtic Sea east broad area (i.e. in water depths >60m) covers an estimated 11000 km^2 of Ireland's marine area in water depths between 70m and 200m, with an additional estimated 1600 km^2 between 60m and 70m that may be suitable for either fixed or floating. This area of resource potential reflects an estimated 80% of the total area covered by Celtic Sea east broad area due to the technical constraints for FLOW close to the coast. It is however also noted that this broad area contains extensive exclusions, particularly associated with high density shipping areas (including vessel traffic management areas) and existing pipelines and cables. It is estimated that this may equate to approximately 5% of the broad area suitable for FLOW technology, resulting in an overall estimated three quarters of the Celtic Sea broad area suitable and available for consideration for deployment of FLOW technology.



C0342_OREDP II SEA & AA_Broad Areas of Interest for OREDP II. Figure produced using layers from GSI.

Figure 4-4: Broad Areas of Interest which have been preliminary identified to inform subsequent DMAP development process. Likely areas of focus are depicted by hatching.

The assessment comprises consideration of each of the spatial factors for the different technology types (technological resource, exclusions, environmental, heritage and economic). The assessment also considers each of the broad areas of interest (**Appendix 4 Workbook 6**, the results are summarised in Section 6). It should be noted at this stage, all alternatives remain part of the OREDP II and will be further considered as part of the DMAP development process.

4.4 Timing and implementation

The purpose of the OREDP II is to provide strategic guidance for the sustainable deployment of future offshore renewable energy and to provide a framework for subsequent further assessment when defining DMAPs, including further data collection (**Figure 2-1**).

The OREDP II does not define phasing for implementation of ORE, so this level within the hierarchy has not been applied to alternative assessment.

5 Summary of Environmental Baseline Conditions

An extensive range of available environmental data has been collated, reviewed and summarised in order to characterise essential elements of Ireland's marine environment baseline to inform this SEA for OREDP II.

Environmental information and characterisation is structured around the following environmental areas and are consistent SEA topics as identified in **Table 3-3-1** of this report. The environmental characterisation set out within this report is supported by the environmental baseline database, also included in this **Appendix 3** and by GIS mapping.

- The Physical Environment including Metocean conditions, hydrographic features, geology and sediments and Coastal Vulnerability,
- The Water Environment including both Chemical and Biological Characteristics,
- Climate and Air Quality, including Climate Change, Greenhouse Gas emissions, Carbon Sequestration, Ocean acidification and Air Quality emissions,
- Marine Pollution including underwater sound, Marine litter and EMF,
- Biodiversity, including designating sites, QIs and species, Seabed Habitats, Fish, Marine Mammals, Bats, Reptiles Birds, Plankton, Non-Indigenous Species and marine ecosystems,
- Cultural Heritage including protected sites, submerged landscapes and Wrecks,
- Landscape and Seascape,
- Population and Human health, including employment, health and leisure, and
- Material Assets, including Tourism, Mineral Exploitation and mining, defence, aquaculture, commercial fishing, marine infrastructure and exploration, Ports, shipping and navigation and other marine industries.

For each topic, the suitability of available baseline information has been reviewed for consideration at this strategic level. In many cases localised or partial data sets have been acknowledged, and whilst not of sufficient spatial coverage and/or resolution to be useful to inform this level of strategic planning, have been highlighted as having potential to make valuable contribution to decision-making and marine plan-making at lower tier assessments. Data gaps have also been identified.

Appendix 3: Summary of Environmental Baselin provides a characterisation of the available environmental baseline information which has been collated to inform the SEA for OREDP II.

6 Assessment of the OREDP II

6.1 Assessment of the OREDP II Objectives

The OREDP II Objectives (Section 3) were assessed against the SEA Objectives (Table 3-3-3). The assessment is presented in **Appendix 4 Workbook 1: OREDP** II Objectives and summarised below.

Overall, effects were assessed as neutral, minor positive or significant positive. The quantification of resource potential informs development of alternative energy sources, having **significant positive effects** on SEA Objectives for prioritising renewable energy and reducing greenhouse gas emissions. The OREDP II's objectives to provide an evidence base and identify data gaps will help inform sustainable development of ORE resources and help avoid negative impacts on environmental receptors. This is consequently anticipated to result in **minor positive effects** on the environment for example on SEA Objectives for the seabed, coastal processes, human health and wellbeing and local communities. Potential for higher magnitude **significant positive effects** were identified for receptors where the evidence base is likely to be more extensive at a strategic level, for example through the provision of designations and mapping information. This includes SEA Objectives for biodiversity and designated sites, heritage, landscape, material assets and navigation. It is acknowledged that some effects will occur at a project level (for example water pollution, air quality, noise pollution, EMF, marine litter) and are not influenced by Objectives, these were assessed as **neutral**.

6.2 Assessment of Technology Types using Data Models

This section summarises the assessment of each of the technology types (described in **Section 2.5** of this report) and the OREDP II's constituent GIS models (as described in **Section 0**). The technologies are assessed against each of the SEA Framework Objectives (as described in **Chapter 3: SEA Methodology)** and have been used to inform the draft OREDP II. The full assessment is set out within **Appendix 4** of this report.

6.2.1 Bottom-Fixed Offshore Wind Technologies

6.2.1.1 Overview

Initial spatial mapping of the technology opportunities model within the OREDP II identified preliminary areas of interest which were considered potentially suitable for bottom-fixed offshore wind technology at an early stage of development of the draft OREDP II. Based on the established parameters the technology opportunities model for bottom-fixed offshore wind covers a total area

of 17,670 km^2, with a further potential for approximately 7,494 km^2 at greater depth (60-70m) (total 25,164 km^2).

This preliminary area of interest represents a wide and varied range of environmentally sensitive factors across the full range of environmental topics covered by the SEA Objectives. Given the largely nearshore, shallow water (<70m) nature of the area, the majority of the area of interest also represents extensive environmental and economic constraints requiring appropriate consideration.

The exclusions model identifies a number of material assets within the marine area which are considered within the OREDP II to represent such significant constraints to development based on economic, and/or safety grounds, that they have been identified as incompatible with ORE development and are therefore excluded from the strategy. Once the exclusions model is overlaid with the technology model, this reduces the identified area of interest for bottom-fixed offshore wind to a total of 22,235 km^2.

A review of available environmental baseline information for each identified SEA Objective against the draft OREDP II, confirms that a significantly broader range of environmental data is available, partially available and/or more suitable to inform increasing refinement of environmental analysis through subsequent lower tier assessments. A series of recommendations for mitigation have been made within the SEA analysis (**Appendix 4** and summarised in **Chapter 7**), which will ensure that lower tier assessments can confidently be expected to adequately expand on and address a range of environmental issues initially identified within the SEA.

A summary of the assessment without mitigation, and then after mitigation has been applied, is presented in **Table 6-1** below, with full details in **Appendix 4, Workbook No. 2**.

Table 6-1: Summary of Bottom-fixed wind assessment

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 1	Protect the quality and character of the seabed and its sediments and avoid significant effects on seabed morphology and sediment transport processes.	Significant Negative	Minor Negative
SEA 2	Protect the integrity of coastal and estuarine processes.	Significant Negative	Uncertain
SEA 3	Protect, maintain, and improve status of classified water bodies within the OREDP II area in line with requirements of the WFD and MSFD.	Significant Negative	Uncertain
SEA 4	Avoid pollution of the coastal and marine environment.	Minor Negative	Minor Negative

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 5	Avoid, prevent or reduce harmful emissions to air, promoting air quality improvements through reduction of emissions As Low as Reasonably Practical (ALARP) (direct emissions)	Minor Negative	Minor Positive
SEA 6	Promote and prioritise use of renewable energy and energy efficiency measures.	Significant Positive	Significant Positive
SEA 7	Minimise emissions of Green House Gases	Significant Positive	Significant Positive
SEA 8	Promote resilience to Climate Change	Minor Negative	Minor Positive
SEA 9	Reduce/prohibit release of marine litter to the marine environment.	Minor Negative	Neutral
SEA 10	Minimise generation and propagation of manmade noise within the marine environment.	Significant Negative	Minor Negative
SEA 11	Promote energy transmission technologies and configurations which seek to minimise EMF within the marine environment.	Minor Negative	Minor Negative
SEA 12	Preserve, protect, maintain and, where appropriate, enhance biodiversity and ecosystems within OREDP II area.	Significant Negative	Uncertain
SEA 13	Avoid significant impact to EU and National level designated sites, Qualifying Interests and protected species.	Significant Negative	Minor Negative
SEA 14	Protect known wrecks and historic and cultural features of the OREDP II area.	Significant Negative	Minor Negative
SEA 15	Incorporate opportunities to enhance cultural/historic knowledge and understanding.	Neutral	Neutral
SEA 16	Implement the requirements of the European Landscape Convention through high quality design for the sustainable stewardship of Ireland's landscape and by integrating landscape into Ireland's approach to sustainable development.	Significant Negative	Minor Negative
SEA 17	Avoid significant impact on human health and wellbeing.	Significant Negative	Minor Positive
SEA 18	Avoid disruption, disturbance or nuisance to local communities.	Minor Negative	Minor Negative

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 19	Protect marine material assets (including fisheries, shellfish, military activity and infrastructure) and resources.	Significant Negative	Minor Negative
SEA 20	Ensure continuity and safety of navigation	Minor Positive	Minor Positive

6.2.1.2 Summary of Assessment

Without mitigation, the development of bottom-fixed offshore wind as set out in the technology model can result in potential **significant negative effects** on the environment. These include loss or disturbance to seabed sediments (SEA 1) and changes to coastal processes (SEA 2); pollution of classified water bodies through contamination and turbidity during construction (SEA 3); direct and indirect effects on nature conservation designations and qualifying interest features (SEA 13) as well as habitats and species (SEA 12) and indirect effects from noise (SEA 10); effects on historic environment (SEA 14) from loss or damage to heritage assets and landscapes (SEA 16) from visual impact; reduced access to recreational and leisure resources (SEA 17); and conflicts with use of other marine assets (SEA 19). The application of the exclusion model and various data models within the OREDP II and further data analysis at lower tiers of development, offer the opportunity to reduce or avoid many of these significant effects.

Residual **minor negative** effects (i.e. after mitigation) have been assessed for a number of SEA Objectives. The application of the exclusion model ensures development in some inshore and coastal areas is avoided. This includes areas of potential historic contamination such as heavily traffic shipping routes, oil and gas exploration areas, dredge deposit, offshore waste disposal sites or past military practice reducing risk of pollution (SEA 4). The application of the exclusion model also ensures conflict between ORE with some excluded uses or infrastructure can be avoided (SEA 19). Consideration of data within the economic model in addition to further analysis, for example on fishing and military activity, would inform future ORE development and support efforts to minimise potential conflict with material assets, although would not be expected to avoid impacts entirely.

The environmental model primarily focuses on identifying European and National designated nature conservation sites. Appropriate consideration of these designations and collection of further data to inform lower tier assessments is anticipated to offer opportunities to reduce effects relating to EU and national level designated sites (and associated QIs and species) (SEA 13), loss / disturbance to seabed sediments (SEA 1) and noise to sensitive receptors (SEA 10).

Further consideration of known wrecks and historic and cultural features along with potential use of location specific archaeological exclusion zones at lower tiers of assessment will reduce effects on heritage (SEA 14) to **minor negative** by providing protection from disturbance as a result of turbine foundations and array infrastructure. Similarly, the effects on landscape (SEA 16) could be reduced to **minor negative** with appropriate consideration of visual effects for lower tier assessment.

Minor negative effects have also been assessed for EMF within the marine environment (SEA 11) and disruption/ disturbance to local communities (SEA 18), although both will require further analysis at lower tiers of assessment. While there is potential for **minor negative** effects from release of marine litter (SEA 9), particularly during construction, compliance with relevant policy in addition to implementation of waste management would mean residual effects are **neutral**.

The technology model identifies an estimated 42GW of gross technical resource capacity from fixed bottom wind within 60m water depth, with a further 20GW potential within waters 60 - 70m depth. Given the extent of the available resource, **significant positive effects** are predicted in relation to promoting renewable energy (SEA 6) and minimising greenhouse gases (SEA 7). Although air quality emissions are expected, particularly from installation and maintenance vessels overall, positive effects are also predicted relating to reducing reliance on fossil fuel emissions resulting in residual **minor positive** effects on air quality (SEA 5). Application of best practise and the regulatory framework would mean that emissions from vessels are minimised. Similarly, while offshore wind is exposed to more extreme climatic conditions than their onshore equivalents, **minor positive effects** are also predicted for resilience to climate change (SEA 8). The exclusion model also helps to avoid development in some inshore coastal areas, corresponding with valuable carbon sequestration habitats such as seagrass beds, therefore indirectly providing protection to these habitats and therefore support to SEA 8 objective. Further assessment of sequestration potential is recommended at lower tiers.

The exclusions and environmental models correspond with many inshore, shallow waters most likely to be associated with coastal processes (SEA 2), classified waterbodies (SEA 3) and areas of high biodiversity or sensitive ecosystems (SEA 12), however, the nature of potential effects and detailed mitigation would need to be determined in future planning stages. It is unclear as to whether all potential adverse effects could be mitigated, hence residual **uncertain** effects remain.

The exclusion model also provides some protection for coastal communities resulting in **minor positive effects** including on navigation (SEA 20). There are residual **minor positive** effects anticipated on health and well-being (SEA 17) following further lower tier assessment to minimise impact on coastal recreational areas and the application of a minimum depth of 20m for fixed wind development.

At this strategic level, there are no known opportunities to enhance cultural/ historic knowledge or understanding (SEA 15) and effects were assessed as **neutral**.

6.2.2 Floating Offshore Wind Technologies

6.2.2.1 Overview

The technology opportunities model for floating offshore wind covers an approximate area of 126,404 km^2 (60-200m depth), with a further 83,707 km^2 between 200-1000m depth. This area of interest covers a large proportion of the Irish Exclusive Economic Zone, with only shallower inshore areas (<60m depth) and outer offshore areas (>1000m) not suitable for development.

Due to deployment at greater depths, the offshore floating wind resource extends outside the coastal area densely covered by uses and designations in the various GIS models, reducing the potential for conflict in comparison with fixed wind. Nonetheless there are number of exclusions (e.g. high density traffic routes, offshore cables and pipelines, renewable energy test sites), environmental (e.g. SAC designations, high density areas for seabirds and cetaceans) and economic factors (e.g. fishing grounds, areas of petroleum exploitation and potential for marine aggregates) in the area of potential for floating offshore wind. These are reflected in the assessment.

A summary of the assessment without mitigation, and then after mitigation, has been applied is presented in **Table 6-2** below, with full details in **Appendix 4, Workbook No. 3**.

Table 6-2: Summary of Floating Offshore Wind Assessment

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 1	Protect the quality and character of the seabed and its sediments and avoid significant effects on seabed morphology and sediment transport processes.	Minor Negative	Minor Negative
SEA 2	Protect the integrity of coastal and estuarine processes.	Minor Positive	Minor Positive
SEA 3	Protect, maintain, and improve status of classified water bodies within the OREDP II area in line with requirements of the WFD and MSFD.	Minor Positive	Minor Positive
SEA 4	Avoid pollution of the coastal and marine environment.	Minor Positive	Minor Positive

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 5	Avoid, prevent or reduce harmful emissions to air, promoting air quality improvements through reduction of emissions As Low as Reasonably Practical (ALARP) (direct emissions)	Minor Negative	Minor Positive
SEA 6	Promote and prioritise use of renewable energy and energy efficiency measures.	Significant Positive	Significant Positive
SEA 7	Minimise emissions of Green House Gases	Significant Positive	Significant Positive
SEA 8	Promote resilience to Climate Change	Minor Negative	Minor Negative
SEA 9	Reduce/prohibit release of marine litter to the marine environment.	Minor Negative	Neutral
SEA 10	Minimise generation and propagation of manmade noise within the marine environment.	Minor Negative	Minor Negative
SEA 11	Promote energy transmission technologies and configurations which seek to minimise EMF within the marine environment.	Significant Negative	Minor Negative
SEA 12	Preserve, protect, maintain and, where appropriate, enhance biodiversity and ecosystems within the OREDP II area.	Significant Negative	Uncertain
SEA 13	Avoid significant impact to EU and National level designated sites, Qualifying Interests and protected species.	Significant Negative	Minor Negative
SEA 14	Protect known wrecks and historic and cultural features of the OREDP II area.	Minor Negative	Minor Negative
SEA 15	Incorporate opportunities to enhance cultural/historic knowledge and understanding.	Neutral	Neutral
SEA 16	Implement the requirements of the European Landscape Convention through high quality design for the sustainable stewardship of Ireland's landscape and by integrating landscape into Ireland's approach to sustainable development.	Minor Negative	Minor Negative
SEA 17	Avoid significant impact on human health and wellbeing.	Minor Positive	Minor Positive
SEA 18	Avoid disruption, disturbance or nuisance to local communities.	Minor Positive	Minor Positive

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 19	Protect marine material assets (including fisheries, shellfish, military activity and infrastructure) and resources.	Significant Negative	Minor Negative
SEA 20	Ensure continuity and safety of navigation	Minor Positive	Minor Positive

6.2.2.2 Summary of Assessment

The assessment identified potential for **significant negative effects** arising from electromagnetic fields (EMF) (SEA 11), direct and indirect effects on nature conservation designations and qualifying interest features (SEA 13) as well as habitats and species (SEA 12), and potential for interaction with a range of material assets (SEA 19). For EMF, inter-array cabling for floating wind devices may be expected to be suspended in the water column, with increased potential for EMF to interact with sensitive receptors, when compared to fixed wind equivalents. However, it is noted that there are gaps in the understanding of how pelagic species (e.g. elasmobranchs – sharks, skates and rays, other fish, marine mammals, among other species) may react to dynamic cables suspended within the water column, including migration or foraging behaviours. EMF profiles will be project specific and will be affected by cable type, design (including armouring) and configuration and it is anticipated that effects relating to SEA 11 can be reduced to **minor negative** through project level assessment and mitigation. Consideration of designations identified in the environment model and qualifying interest features (SEA 13) at lower tiers also provides the opportunity to reduce effects. Effects after mitigation were assessed as **minor negative**.

However, the nature of potential effects relating to SEA 12 and detailed mitigation required would need to be determined in future planning stages. It is unclear as to whether all potential adverse effects could be mitigated, hence a residual **uncertain** effect remains.

There is extensive fishing activity (SEA 19) in the depth range identified as suitable for floating offshore wind technology, particularly along Ireland's Atlantic coast, which could be restricted in areas of ORE development. Oil and gas installations, including those currently being decommissioned and existing cables and interconnectors are also considered in the Exclusions model. At this stage military activity areas, radar and communications infrastructure are not considered. However, lower tier assessment (DMAP) would include a consideration of this infrastructure in addition to fisheries considerations, and therefore this will reduce effects on material assets to **minor negative**.

Minor negative effects were also identified in relation to:

- effects on the seabed (SEA 1) due to the potential impact of required mooring systems, which is likely to be less than for fixed wind foundations;
- resilience to climate change (SEA 8) due to exposure to more extreme climate offshore and also potential for limited loss of carbon sequestration capacity from disturbance to seabed sediments;
- limited generation of noise (SEA 10) for mooring line anchors and reduced risk of affecting sensitive species at greater depths;
- potential for loss or disturbance to known wrecks and historic and cultural features (SEA 14), which would need to be taken into account at lower tiers of assessment; and
- sensitivity of landscape and seascape for structures the further offshore they are installed (SEA 16).

The Technology model identifies an estimated 579GW of gross technical resource capacity from offshore (floating) wind between 60m and 1000m water depth (Section 9, Table 6 of draft OREDP II). Given the extent of the resource, **significant positive effects** are predicted in relation to promoting renewable energy (SEA 6) and minimising greenhouse gases (SEA 7) and reducing reliance on fossil fuel emissions resulting in residual **minor positive** effects on air quality (SEA 5). Application of best practise and the regulatory framework would mean that emissions from vessels are minimised.

Due to the proposed water depths for deployment (>60m), use of floating wind technology largely avoids effects on coastal and estuarine processes (SEA 2), classified waterbodies (river basins, coastal, bathing and shellfish waters) (SEA 3) and areas of existing or considered of highest potential for historic contamination in the marine/ coastal environment (SEA 4), resulting **in minor positive effects.** The potential to minimising some of these effects is also aided by the exclusion model which specifically seeks to avoids some of the potential sources of historic contamination such as heavily traffic shipping routes, oil and gas exploration areas, dredge deposit or offshore waste disposal sites.

Both the proposed water depth for floating wind technology and the application of the exclusion model also helps to avoids or minimise disturbance to coastal communities (SEA 18), coastal recreational areas (SEA 17) as well as key navigation areas (SEA 20), resulting in **minor positive effects.** It should be noted that some risk will remain and detailed consideration will be needed through lower tier assessments.

At this strategic level, there are no known opportunities to enhance cultural/ historic knowledge or understanding (SEA 15) therefore this has been assessed as **neutral**. While there is potential for release of marine litter (SEA 9), particularly during construction, compliance with relevant

policy in addition to implementation of waste management would mean residual effects for this objective are also **neutral**.

6.2.3 Wave Energy Technologies

6.2.3.1 Overview

The technology opportunities model for wave energy covers an approximate area of 119,289 km^2. This area of potential covers the Atlantic Ocean to 200m depth.

Similar to floating wind, area considered technologically suitable for wave energy infrastructure covers an extensive part of Ireland's marine area outside the exclusion and environmental models. Nonetheless there are number of exclusions (e.g. high density traffic routes, offshore cables and pipelines, renewable energy test sites), environmental (e.g. SAC designations, high density areas for seabirds and cetaceans) and economic factors (e.g. fishing grounds, areas of petroleum exploitation and potential for marine aggregates) which still overlap with the potential resource area for wave technology. These are reflected in the assessment.

A summary of the assessment without mitigation and then after mitigation has been applied is presented in **Table 6-3** below, with full details in **Appendix 4, Workbook No. 4**.

Table 6-3: Summary of Wave Energy Assessment

<table>
<tr><th colspan="2">SEA Objectives</th><th>Significance without mitigation</th><th>Significance with mitigation</th></tr>
<tr><td>SEA 1</td><td>Protect the quality and character of the seabed and its sediments and avoid significant effects on seabed morphology and sediment transport processes.</td><td>Minor Negative</td><td>Minor Negative</td></tr>
<tr><td>SEA 2</td><td>Protect the integrity of coastal and estuarine processes.</td><td>Significant Negative</td><td>Uncertain</td></tr>
<tr><td>SEA 3</td><td>Protect, maintain, and improve status of classified water bodies within the OREDP II area in line with requirements of the WFD and MSFD.</td><td rowspan="3">Minor Negative</td><td>Minor Negative</td></tr>
<tr><td>SEA 4</td><td>Avoid pollution of the coastal and marine environment.</td><td>Minor Negative</td></tr>
<tr><td>SEA 5</td><td>Avoid, prevent or reduce harmful emissions to air, promoting air quality improvements through reduction of emissions As Low as Reasonably Practical (ALARP) (direct emissions)</td><td>Minor Positive</td></tr>
<tr><td>SEA 6</td><td>Promote and prioritise use of renewable energy and energy efficiency measures.</td><td>Significant Positive</td><td>Significant Positive</td></tr>
</table>

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 7	Minimise emissions of Green House Gases	Significant Positive	Significant Positive
SEA 8	Promote resilience to Climate Change	Minor Negative	Minor Negative
SEA 9	Reduce/prohibit release of marine litter to the marine environment.	Minor Negative	Neutral
SEA 10	Minimise generation and propagation of manmade noise within the marine environment.	Minor Negative	Minor Negative
SEA 11	Promote energy transmission technologies and configurations which seek to minimise EMF within the marine environment.	Significant Negative	Minor Negative
SEA 12	Preserve, protect, maintain and, where appropriate, enhance biodiversity and ecosystems within the OREDP II area.	Significant Negative	Uncertain
SEA 13	Avoid significant impact to EU and National level designated sites, Qualifying Interests and protected species.	Significant Negative	Minor Negative
SEA 14	Protect known wrecks and historic and cultural features of the OREDP II area.	Minor Negative	Minor Negative
SEA 15	Incorporate opportunities to enhance cultural/historic knowledge and understanding.	Neutral	Neutral
SEA 16	Implement the requirements of the European Landscape Convention through high quality design for the sustainable stewardship of Ireland's landscape and by integrating landscape into Ireland's approach to sustainable development.	Minor Negative	Neutral
SEA 17	Avoid significant impact on human health and wellbeing.	Minor Negative	Minor Negative
SEA 18	Avoid disruption, disturbance or nuisance to local communities.	Minor Negative	Minor Negative
SEA 19	Protect marine material assets (including fisheries, shellfish, military activity and infrastructure) and resources.	Significant Negative	Minor Negative
SEA 20	Ensure continuity and safety of navigation	Minor Positive	Minor Positive

6.2.3.2 Summary of Assessment

The assessment identified potential for **significant negative effects** arising from electromagnetic fields (EMF) (SEA 11), direct and indirect effects on nature conservation designations and qualifying interest features (SEA 13) as well as habitats and species (SEA 12), coastal and estuarine processes (SEA 2) and as a result of interactions with a range of material assets (SEA 19). Similar to floating wind, the inter-array cabling may be expected to be suspended in the water column with potential for complex interactions with sensitive marine species, including barrier effects from EMF. Mitigation, such as the identification of higher risk areas for biodiversity (including designations in the Environment model) (SEA 13), project level design for EMF (SEA 11) and lower tiers of assessment, can reduce some of these effects to **minor negative.** Further assessment for the DMAP stage and project level would also help minimise conflict with fisheries and marine infrastructure (SEA 19) leave residual **minor negative** effects. However, **uncertain** effects still remains in relation to costal and estuarine processes (SEA 2) and habitats and species (SEA 12), due to the need for further investigation into the precise nature of potential adverse effects and opportunities to mitigate these. It is unclear if all potential negative effects could be mitigated at this strategic stage.

A number of other **minor negative effects** were identified, including effects to the seabed (SEA 1) for either fixed or floating wave energy technology designs, classified waterbodies (SEA 3), marine environment in inshore and coastal areas (SEA 4), resilience to climate change in offshore environments (SEA 8), generation of noise through energy conversion (SEA 10) and potential for loss and disturbance of wrecks and historic features (SEA 14), conflict with leisure and recreational activities (SEA 17) and disturbance to local communities (SEA 18).

Some visual intrusion on landscapes/seascapes may also be expected (SEA 16) although this is likely to be reduced relative to offshore wind technology as a result of to the anticipated lower profile of infrastructure to the sea surface. Mitigation, potentially including specific consideration of protected landscapes during siting decisions as part of lower tier levels of assessment such as visual impact is anticipated to reduce effects for SEA 16 to **neutral.** While there is potential for release of marine litter (SEA 9), particularly during construction, compliance with relevant policy in addition to implementation of waste management would mean residual effects for this objective are also **neutral**.

Given the extent of the resource area available, **significant positive effects** are predicted in relation to promoting renewable energy (SEA 6) and minimising greenhouse gases (SEA 7) and reducing reliance on fossil fuel emissions resulting in residual **minor positive** effects on air quality (SEA 5). A potential **minor positive** effect was also identified in relation to the continuity and safety of navigation (SEA 20).

At this strategic level, there are no known opportunities to enhance cultural/ historic knowledge or understanding (SEA 15) and effects were assessed as **neutral**.

6.2.4 Tidal Energy Technologies

6.2.4.1 Overview

Unlike other technologies, tidal power opportunities are limited to areas of peak tidal stream which occur in specific areas of the Irish Sea. The technology opportunities model for tidal energy covers an approximate area of 4,451 km^2.

There is some overlap with the areas covered by the exclusion model particularly along the Atlantic Coast (e.g. in the Shannon Estuary) and also with areas of designated and/or sensitive habitats and importance for fish species (as identified within the environmental model). Areas identified as of interest for tidal stream technology also overlap with known impact areas for fishing activity as well as other economic activities/material assets (e.g. shipping and potential for marine aggregates). These are reflected in the assessment.

A summary of the assessment without mitigation and then after mitigation has been applied is presented in **Table 6-4** below, with full details in **Appendix 4, Workbook No. 5**.

Table 6-4: Summary of Tidal Energy Assessment

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 1	Protect the quality and character of the seabed and its sediments and avoid significant effects on seabed morphology and sediment transport processes.	Significant Negative	Minor Negative
SEA 2	Protect the integrity of coastal and estuarine processes.	Minor Negative	Minor Negative
SEA 3	Protect, maintain, and improve status of classified water bodies within the OREDP II area in line with requirements of the WFD and MSFD.	Minor Negative	Minor Negative
SEA 4	Avoid pollution of the coastal and marine environment.	Minor Negative	Minor Negative
SEA 5	Avoid, prevent or reduce harmful emissions to air, promoting air quality improvements through reduction of emissions As Low as Reasonably Practical (ALARP) (direct emissions)	Minor Negative	Minor Positive

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 6	Promote and prioritise use of renewable energy and energy efficiency measures.	Minor Positive	Minor Positive
SEA 7	Minimise emissions of Green House Gases	Significant Positive	Significant Positive
SEA 8	Promote resilience to Climate Change	Neutral	Minor Positive
SEA 9	Reduce/prohibit release of marine litter to the marine environment.	Neutral	Neutral
SEA 10	Minimise generation and propagation of manmade noise within the marine environment.	Significant Negative	Minor Negative
SEA 11	Promote energy transmission technologies and configurations which seek to minimise EMF within the marine environment.	Uncertain	Uncertain
SEA 12	Preserve, protect, maintain and, where appropriate, enhance biodiversity and ecosystems within the OREDP II area.	Significant Negative	Uncertain
SEA 13	Avoid significant impact to EU and National level designated sites, Qualifying Interests and protected species.	Significant Negative	Minor Negative
SEA 14	Protect known wrecks and historic and cultural features of the OREDP II area.	Significant Negative	Minor Negative
SEA 15	Incorporate opportunities to enhance cultural/historic knowledge and understanding.	Neutral	Neutral
SEA 16	Implement the requirements of the European Landscape Convention through high quality design for the sustainable stewardship of Ireland's landscape and by integrating landscape into Ireland's approach to sustainable development.	Minor Negative	Minor Negative
SEA 17	Avoid significant impact on human health and wellbeing.	Minor Negative	Minor Negative
SEA 18	Avoid disruption, disturbance or nuisance to local communities.	Minor Negative	Minor Negative
SEA 19	Protect marine material assets (including fisheries, shellfish, military activity and infrastructure) and resources.	Significant Negative	Minor Negative

SEA Objectives		Significance without mitigation	Significance with mitigation
SEA 20	Ensure continuity and safety of navigation	Minor Positive	Minor Positive

6.2.4.2 Summary of Assessment

The assessment predicted potential for **significant negative** effects on:

- the seabed (SEA 1) associated with mooring infrastructure on floating or seabed mounting devices;
- noise from installation activities and underwater turbines (SEA 10);
- effects on habitats and species, including sensitive populations of mammals, fish and other species (SEA 12);
- direct and indirect effects on nature conservation designations and qualifying interest features (SEA 13);
- loss and damage to wrecks and historic features (SEA 14) particularly including wrecks off the north coast of County Donegal in the northern approaches to the North channel; and
- Potential conflict with other marine uses, in particular inshore fishing vessels and indirect and secondary impacts on shell-fisheries (SEA 19).

A range of potential mitigations have been identified which could help to reduce residual effects to **minor negative**. These include further investigation into areas of enclosed coastal areas from the OREDP II (SEA 10). Areas included within the environment model should be subject to further, more detailed analysis in lower tier assessments to understand and appropriately mitigation potential effects for aspects such as seabed geology, coastal processes, water quality, designated sites and interest features (SEA 1 and SEA 13); use of archaeological exclusion zones (SEA 14); and commitment to appropriate liaison with fisheries organisations so that uses can be successfully deconflicted at more local/project specific scale (SEA 19). However, a residual **uncertain** effect still remains in relation to the protection of habitats and species (SEA 12), as it is unknown if all potential effects identified during further investigations will be mitigatable as the detailed mitigation measures have not yet been defined.

Areas of interest for tidal technology development largely comprise near-shore shallow and coastal waters, resulting in **minor negative** effects for a number of SEA Objectives, although these are limited in some cases by the application of the Exclusion model which covers similar

areas. Minor negative effects were predicted from alteration of coastal processes where the technology deployment requires areas of high current flow (SEA 2); classified waters including bathing and shellfish waters, although these are currently classified as not polluted in areas of interest (SEA 3); and pollution of the coastal environment (SEA 4) due to potential for disturbance to potential historic sources of contamination.

The majority of infrastructure associated with tidal stream generation will be installed below the sea surface or with a low above water profile, resulting in **minor negative** impact to Ireland's landscape/seascape in sensitive coastal areas (SEA 16). There are also **minor negative** direct and indirect effects on health and wellbeing (SEA 17) and disturbance to local communities (SEA 18), due to the close proximity of areas of interest to coastal residential areas and local centres of population, tourism and areas where shallow coastal waters are extensively used for recreation and leisure activities. While there is potential for release of marine litter, particularly during construction (SEA 9), compliance with relevant policy and implementation of waste management would mean residual effects are **neutral**.

Significant positive effects are predicted in relation to minimising greenhouse gases (SEA 7) although **a minor positive** effect has been identified for the support to the promotion of renewable energy (SEA 6) due to certain limitations, particularly the already identified overlap with parts of the sea area excluded from development by the exclusions model within the OREDP II. Correspondingly, the reduced reliance on fossil fuel emissions results in residual **minor positive** effects on air quality (SEA 5). Tidal technology requires resilience to harsh environmental conditions, where flow rates may change over time as a result of climate change impacts (SEA 8) and therefore any positive effects are expected to be limited to **minor positive**. While the majority of sediments within the areas of interest for tidal technology, are identified as making a low contribution towards carbon sequestration, small pockets that may make a higher contribution to sequestration have been identified and should be considered further at the DMAP/individual project planning stage. A potential **minor positive** effect was also identified in relation to the continuity and safety of navigation (SEA 20).

An **uncertain** effect has been identified in relation to the minimisation of EMF (SEA 11) as it is not know at this stage, what configuration of interarray cabling will be required to support tidal generation technology, nor whether these may be floating within the water column or encased within the physical infrastructure/buried in the seabed. This should be further investigated at lower tier assessment stages and for the purposes of this SEA has been scored as a residual uncertain effect.

At this strategic level, there are no known opportunities to enhance cultural/ historic knowledge or understanding (SEA 15) and effects were assessed as **neutral**.

6.2.5 Technology comparison in areas of overlap

Figure 4-2 and **Figure 4-3** show where parameters for technology types overlap. In these areas, there is potential for different ORE technologies to be developed. While it is acknowledged that the type of technology will depend on lower tiers of assessment, including the DMAP process, project level data and even prospective developers, a number of broad comparisons can be made based on assessments at this stage.

Table 6-5: Comparison of different technologies in areas of overlap

SEA Objectives		Comment
SEA 1	Protect the quality and character of the seabed and its sediments and avoid significant effects on seabed morphology and sediment transport processes.	All technologies have some impact on the seabed, although this is likely to vary depending on how they are moored (FLOW, some tidal and wave) or fixed (fixed wind, some tidal and wave) to the seabed. The latter is likely to have a higher impact.
SEA 2	Protect the integrity of coastal and estuarine processes.	Tidal technology, is more likely to disrupt coastal processes than other technologies, as it relies on mostly nearshore, high velocity tidal stream movements to generate ORE.
SEA 3	Protect, maintain, and improve status of classified water bodies within the OREDP II area in line with requirements of the WFD and MSFD.	Depending on location, all technologies have the potential to affect classified waters, particularly during construction.
SEA 4	Avoid pollution of the coastal and marine environment.	All technologies have potential to mobilise pollution during construction, this will be dependent on proximity to historic contamination and level of seabed disturbance, which is likely to be higher for bottom fixed devices (fixed wind, some wave and tidal).
SEA 5	Avoid, prevent or reduce harmful emissions to air, promoting air quality improvements through reduction of emissions As Low as Reasonably Practical (ALARP) (direct emissions)	Emissions to air will occur with all technologies, including through vessel operation. However, all technologies will also provide alternative energy sources to those with high emissions (coal, oil and gas). The extent of the opportunity to replace high emissions sources with renewables will vary depending on scale of deployment and scale of resultant energy produced. It is likely, given the current stages of technology development that wind generation technologies may offer the greatest opportunity, at least in the early

SEA Objectives		Comment
		years of the OREDP II timeline, with floating offering greater potential than fixed.
SEA 6	Promote and prioritise use of renewable energy and energy efficiency measures.	All technologies will promote use of renewable energy, the extent will vary depending on the scale of energy production with the greatest opportunity likely from wind generation technologies, as discussed above with FLOW offering the greatest potential.
SEA 7	Minimise emissions of Green House Gases	All technologies will reduce greenhouse gases emissions when compared with energy generated from fossil fuels. The extent will vary depending on the scale of energy production, with the greatest opportunity likely from wind generation technologies, as discussed above with FLOW offering the greatest potential.
SEA 8	Promote resilience to Climate Change	All technologies are likely to be affected by changing weather and metocean conditions in marine environments, although design would be expected to take into account more extreme operating parameters. Local considerations such as hydrodynamics and the potential for the environment to support sequestration of carbon from seabed sediments would also apply to all technologies.
SEA 9	Reduce/prohibit release of marine litter to the marine environment.	None of the technologies are likely to have a differential effect on marine litter.
SEA 10	Minimise generation and propagation of manmade noise within the marine environment.	Piling for bottom-fixed devices (fixed wind, some wave and tidal devices) will likely generate greater levels of noise than anchored devices. During operation, wave energy devices may generate underwater noise as a result of the energy conversion mechanism. Tidal devices also generate underwater radial noise associated with turbine operation. Potential risk of cavitation noise under certain conditions may also occur.
SEA 11	Promote energy transmission technologies and configurations	All technologies have the potential to generate EMF, but this is strongest adjacent to transmitting cables and may be effectively mitigated by burial of cables within the Seabed.

SEA Objectives		Comment
	which seek to minimise EMF within the marine environment.	Effects are therefore potentially greater when interarray cabling is suspended in the water column. Therefore effects are likely to be greater for floating offshore wind, some tidal and wave technologies.
SEA 12	Preserve, protect, maintain and, where appropriate, enhance biodiversity and ecosystems within the OREDP II area.	All technologies have the potential for complex interactions with biodiversity and ecosystems. These will be location specific to habitats and species, including mobile species. Effects include those listed from other SEA Objectives above associated with seabed habitat, coastal processes, water quality, noise and EMF.
SEA 13	Avoid significant impact to EU and National level designated sites, Qualifying Interests and protected species.	All technologies have potential for complex interactions with Qualifying Interests (QIs) protected by designation's conservation objectives. These will also be location specific.
SEA 14	Protect known wrecks and historic and cultural features of the OREDP II area.	All technologies have the potential to directly or indirectly (e.g. through local erosion) affect wrecks and other cultural features. Risks are greater with seabed mounted devices (fixed wind, some tidal and wave) due to the greater anticipated seabed footprint. Impacts will be highly location specific and dependent on the presence of known wrecks as receptors.
SEA 15	Incorporate opportunities to enhance cultural/historic knowledge and understanding.	None of the technologies specifically incorporate opportunities to enhance cultural/ historic understanding.
SEA 16	Implement the requirements of the European Landscape Convention through high quality design for the sustainable stewardship of Ireland's landscape and by integrating landscape into Ireland's approach to sustainable development.	All technologies have the potential for effects on landscape and seascape, particularly in coastal or near-shore locations. These are greatest for fixed and floating wind, due to the height of the turbines. Wave and tidal devices have lower above-water profiles, or in the case of some tidal devices can be below sea surface, generally resulting in minimal impacts.
SEA 17	Avoid significant impact on human health and wellbeing.	Coastal locations for all technologies have greater potential to conflict with a range of coastal and marine recreation and leisure activities.

SEA Objectives		Comment
SEA 18	Avoid disruption, disturbance or nuisance to local communities.	Coastal locations for all technologies have greater potential to cause disruption to businesses and residents.
SEA 19	Protect marine material assets (including fisheries, shellfish, military activity and infrastructure) and resources.	All technologies have potential for conflict with other marine uses. While some uses have been excluded from development in the OREDP II, there is a still a range of potential conflicts, including fishing and shellfisheries in particular.
SEA 20	Ensure continuity and safety of navigation	While major shipping routes are excluded from the OREDP II, all technologies have the potential to affect navigation through use of exclusion zones around infrastructure.

While many of the effects identified are similar for different offshore technologies, the magnitude of the effect can vary depending on the infrastructure and operational parameters for each technology type. Where there is potential to deploy alternative technology types in the same location, it is likely that a range of project considerations such as location-specific sensitivities, design, energy generation, engineering constraints, cost and cumulative effects will also need to be taken into account. Further assessment will therefore be needed at lower tiers ORE development.

6.3 OREDP II for Broad Areas

As described above in Section 4.3, the OREDP II also identifies the mechanism for the preliminary identified of three initial broad areas of interest to be considered as options to be taken forward for further consideration during the subsequent DMAP process specifically for the potential deployment of FLOW technology.

An assessment of the three identified broad areas was undertaken and the results are presented in **Appendix 4, Workbook 6.** Below provides a summary and comparison of the assessment.

Table 6-6: Comparison of broad areas of interest for FLOW technology

SEA Objectives		North-West		Mid-West		Celtic Sea East	
		Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
SEA 1	Protect the quality and character of the seabed and its sediments and avoid significant effects on seabed morphology and sediment transport processes.	Minor Negative	Minor Negative	Significant Negative	Minor Negative	Minor Negative	Minor Negative
SEA 2	Protect the integrity of coastal and estuarine processes.	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive
SEA 3	Protect, maintain, and improve status of classified water bodies within the OREDP II area in line with requirements of the WFD and MSFD.	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive
SEA 4	Avoid pollution of the coastal and marine environment.	Minor Positive	Minor Positive	Minor Negative	Minor Positive	Minor Positive	Minor Positive
SEA 5	Avoid, prevent or reduce harmful emissions to air, promoting air quality improvements through reduction of emissions As Low as Reasonably Practical (ALARP) (direct emissions)	Minor Negative	Minor Positive	Minor Negative	Minor Positive	Minor Negative	Minor Positive
SEA 6	Promote and prioritise use of renewable energy and energy efficiency measures.	Significant Positive	Significant Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive
SEA 7	Minimise emissions of Green House Gases	Significant Positive	Significant Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive
SEA 8	Promote resilience to Climate Change	Neutral	Neutral	Minor Negative	Neutral	Neutral	Neutral

SEA Objectives		North-West		Mid-West		Celtic Sea East	
		Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
SEA 9	Reduce/prohibit release of marine litter to the marine environment.	Minor Negative	Neutral	Minor Negative	Neutral	Minor Negative	Neutral
SEA 10	Minimise generation and propagation of manmade noise within the marine environment.	Minor Negative	Minor Negative	Minor Negative	Minor Negative	Minor Negative	Minor Negative
SEA 11	Promote energy transmission technologies and configurations which seek to minimise EMF within the marine environment.	Significant Negative	Minor Negative	Significant Negative	Minor Negative	Significant Negative	Minor Negative
SEA 12	Preserve, protect, maintain and, where appropriate, enhance biodiversity and ecosystems within the OREDP II area.	Significant Negative	Minor Negative	Significant Negative	Uncertain	Significant Negative	Minor Negative
SEA 13	Avoid significant impact to EU and National level designated sites, Qualifying Interests and protected species.	Significant Negative	Minor Negative	Significant Negative	Minor Negative	Neutral	Neutral
SEA 14	Protect known wrecks and historic and cultural features of the OREDP II area.	Minor Negative	Neutral	Neutral	Neutral	Significant Negative	Minor Negative
SEA 15	Incorporate opportunities to enhance cultural/historic knowledge and understanding.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
SEA 16	Implement the requirements of the European Landscape Convention through high quality design for the sustainable stewardship of Ireland's landscape and by integrating landscape into Ireland's approach to sustainable development.	Significant Negative	Minor Negative	Significant Negative	Minor Negative	Minor Negative	Minor Negative
SEA 17	Avoid significant impact on human health and wellbeing.	Minor Positive	Minor Positive	Minor Negative	Minor Negative	Minor Positive	Minor Positive

SEA Objectives		North-West		Mid-West		Celtic Sea East	
		Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
SEA 18	Avoid disruption, disturbance or nuisance to local communities.	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive	Minor Positive
SEA 19	Protect marine material assets	Minor Negative	Minor Negative	Significant Negative	Minor Negative	Significant Negative	Minor Negative
SEA 20	Ensure continuity and safety of navigation	Neutral	Neutral	Minor Negative	Neutral	Minor Negative	Neutral

All three broad areas have potentially **significant negative** effects from EMF (SEA 11). Effects from EMF include the potential for inter-array cabling suspended within the water column to generate an EMF profile, with potential to disturb foraging and migration patterns of marine species. The resulting EMF profile is expected to be project specific and project level design and assessment is anticipated to offer the opportunity for this to be reduced to **minor negative** residual effect.

In relation to biodiversity (SEA 12) and designated sites for nature conservation (SEA 13), the **North-West** broad area is considered to be a level 2 (medium) risk area for migratory fish (including lamprey and salmon (which are features of the Lower Shannon River SAC) at sea. The broad area is also considered to be a level 3 (High) risk areas for marine mammals at sea particularly off the coast of County Mayo and overlapping with the southern-most extent of the North-West broad area, which also lies immediately adjacent to but outside a level 3 (high) site risk for marine mammals associated with the West Connacht Coast SAC (specifically designated for the protection of Common bottlenose dolphin).

The southern-most extent of the **Mid-West** broad area directly overlaps with the Blasket Island SAC designated for reefs, vegetated sea cliffs of Atlantic and Baltic coasts, submerged or partially submerged sea caves as well as for both Harbour Porpoise and Grey Seal. The northern-most extent of the North-West area suitable for FLOW technology also lies immediately adjacent to West Connaght SAC designated for the protection of common bottlenose dolphin. The full extent of the Mid-West broad area has been categorised at level 3 (high) risk for migratory fish at sea. The Northern-most and Southern-most extents of the Mid-West broad area are also considered level 3 (high risk) for marine mammals at sea.

All of the **Celtic Sea East** broad area is considered a level 3 (high) risk area for migratory fish at sea. Although there are some SAC designations present in the area, these do not lie within the FLOW potential technology area, so effects on SEA 13 were assessed as **neutral**.

Application of buffer zones, where further investigation is required at lower tiers of assessment, can potentially mitigate effects identified within SEA 12 for the Mid-West area, but uncertainty still remains as to whether this would be practicable. Therefore, a residual **uncertain** effect remains.

The **North-West** broad area may also lead to additional potentially **significant negative** effects on landscapes (SEA 16). The coast of counties Mayo, Sligo and Donegal as part of the 'Wild Atlantic Way' make significant contributions to Ireland's landscape and seascape as a result of the natural beauty, traditions and preservation of Ireland's cultural heritage that are supported. The closest parts of the marine area considered suitable for FLOW are estimated to be 2km from the high granite / sandstone cliffs at Malin Beg and much of Donegal Bay lies within 12NM of the nearest coastline. Installation along this coast could be considered highly visible. The majority of the North-West broad area however lies outside 12NM from the coast where FLOW turbines may

be less visible. Careful siting of turbines, particularly in relation to Donegal Bay, can reduce the effect to **minor negative**.

Potential for **significant negative** effects in the **Mid-West** area comprises effects on the seabed (SEA 1), biodiversity (SEA 12), landscapes (SEA 16) and fishing (SEA 19). Data relating to the characteristics of seabed sediments and habitats within this area indicates that much of the central part of the area in outer Galway Bay is dominated by circalittoral sand sediments, grading to offshore circalittoral coarse sediments towards the southern extent of the area and some rock in the southern parts. As described above the biodiversity of the area is sensitive due to nature conservation designations and mobile species.

The coast of Counties Galway, Clare and Kerry as part of the 'Wild Atlantic Way' make significant contributions to Ireland's landscape and seascape. While areas identified as suitable for floating wind are generally further offshore, with the rapidly increasing water depth within this area, sites that are technical suitable can lie as close as 500m-1km from sensitive landscapes. These include the Dingle Peninsula, County Galway and Blasket Islands. The area lies inshore of the continental rise, which are sources of important landing value for the Irish fishing industry, including Irish pelagic fishing, and otter trawling industry. In addition, there are spawning and nursery grounds for certain commercial fish species including: whiting and herring spawning within the nearshore waters of Galway Bay; deeper waters west of this broad area (towards the continental rise) are identified spawning grounds for megrim, mackerel and horse mackerel; and nursery grounds for hake, haddock and cod.

These effects may be reduced to **minor negative** using mitigation as previously summarised for floating wind and set out in Chapter 7 as well as measures specific to this broad area. These include avoidance of sensitive sites such as the Blasket Islands and Shannon River SACs, and the northern coast of the Dingle peninsula and through careful consideration of siting of individual arrays at lower tier assessments in order to minimise visual intrusion at coastal communities and other sensitive receptors.

Potential for **significant negative** effects on biodiversity (SEA 13) and historic features (SEA 14) were identified for the Celtic Sea East broad area. The Celtic Sea is a key area for migratory fish and there is potential for disturbance from EMF and noise in particular. There are a significant number of recorded wrecks (>80) in the Celtic Sea East, data for many of which are unknown (vessels, condition or date of loss). Lower tier assessments should reduce effects on biodiversity, including avoiding multiple arrays which may cause cumulative effects on migratory fish. Further assessment would also ensure that recorded wrecks, as well as any potential as yet unknown wrecks are identified and protected from any impact from FLOW installation, which it is noted is considered likely to be less impactful on such features on the seabed than fixed wind equivalents, reducing the effect to **minor negative**.

Residual **neutral** effects on wrecks were assessed for the Atlantic sites (in the Mid-West area a single unknown wreck is recorded in outer Galway Bay to the south of Inishmore Island and in the North-West area there are less than 20 sites.

There remains potential for development in the nearer shore parts of the Mid-West area coast of Counties Galway, Clare and Kerry as described above, with potential for residual **minor negative** effects on recreational use (SEA 17).

While **significant positive** effects are identified for SEA Objectives which promote renewables (SEA 6) and minimise greenhouse gases (SEA 7) for the North-West area, these are considered likely to be only **minor positive** for Mid-West and Celtic Sea East as a reflection of the proportion of the available area within each broad area which is considered technically feasible for deployment (half to three quarters respectively). In addition, there are a number of spatial exclusions and environmental designations present, which although not significantly restricting the overall footprint for development, do introduce a series of additional considerations at lower tier assessment stages. This may represent some potential to slow or limit timely delivery of renewable generation sources.

In relation to climate resilience (SEA 8), offshore renewable energy requires installation of turbines in more hostile environments than their onshore equivalents. However, sediments within the North-West and Celtic Sea are mostly identified as making a lower contribution towards carbon sequestration, and effects were assessed as **neutral.** Sediments in the Mid-West area were identified as having a moderate contribution to sequestration, a **minor negative** effect could be reduced to **neutral** if these sediments are avoided at lower tiers of assessment.

As per the assessment for FLOW technology above (Section 6.2.2) there are residual **neutral effects** for navigation and safety (SEA 20), although these were neutral pre-mitigation for North West area due to lower density of shipping and cargo vessels and therefore a correspondingly lower risk than may be encountered elsewhere.

At this level of assessment, there is no discernible difference between the broad areas for SEA Objectives 2, 3, 4, 5, 9, 10, 15, and 18.

6.4 Business as Usual/ OREDP I

The aim of the OREDP I is to set out scenarios for the development of up to 4,500MW from offshore wind energy and 1,500MW from wave and tidal energy in Irish waters up to 2030[13]. The

[13] Department of Communications, Energy and Natural Resources (DCENR), 2014, Ireland Offshore Renewable Energy Development Plan

OREDP I Plan was developed between 2010 and 2014 based on industry standard technologies appropriate to the time and when available technologies particularly relating to floating offshore wind were under intensive development as early concept / emerging technology. Consequently, a significant degree of uncertainty around resource potential and potential environmental interactions existed. OREDP II and the supporting assessment set out in this report, seek to reflect developments in knowledge as well as evolution in available technology and understanding of and ability to exploit available resource potential.

It should be noted that SEA Objectives developed for the two plans, while covering broadly similar topics, do differ in scope. For OREDP II some new Objectives were introduced (for example, to cover climate resilience, air quality and cultural understanding), some objectives from OREDP I are also consolidated into a single objective in this assessment of OREDP II. It is also important to note, based on the Assessment Criteria descriptions set out in **Table 3-3-2** that this assessment of OREDP II is Objective led. By contrast the assessment of OREDP I was more focused on the condition of identified environmental receptors. Consequently, it is noted that the results of the assessments are not directly comparable on a detailed level. This comparison has therefore sought to identified high level patterns only, based on the summary and conclusions of the two assessments.

While the assessment for the two plans were broadly similar, reflecting their similar scope, the key differences are set out below:

- For OREDP II, the application of the exclusion model helps to avoid or reduce some impacts, particularly for technologies deployed in coastal or in-shore areas, providing greater protection to navigation and shipping and some materials assets, as well as indirectly avoiding or reducing effects on coastal receptors including local communities, recreational resource and landscapes.

- The application of the data models in OREDP II also helps to identify areas of higher risk, which can be used to avoid or reduce effects at lower tiers of assessment, including the DMAP development. This includes heritage, biodiversity (including designations) and economic interests such as fisheries.

- OREDP II delivers greater magnitude positive effects in relation to reducing greenhouse gases, through promoting a greater renewable resource potential, primarily through floating offshore wind.

7 Mitigation and Monitoring

Given the strategic nature of the OREDP II and conversely the often spatially specific nature of potential effects from ORE development, it is recommended that the OREDP II incorporates a guiding commitment to more detailed identification and consideration of key issues at lower tier assessment stages, including DMAP and / or individual project level. This is consistent with similar commitments previously made within OREDP I. Mitigation commitments made within OREDP I have been reviewed as part of this SEA. Many of these commitments remain relevant to OREDP II and have been maintained. The following tables below summarise the mitigation commitments proposed for OREDP II, which have been considered within the SEA in order to determine potential residual effects. These are contextualised further within the assessment workbooks set out within **Appendix 4**. Further supplementary mitigation, many of which are a recommitment to requirements originally set out within OREDP I (marked throughout the following sections with an *), are discussed by topic below each table.

7.1 Suggested lower tier (DMAP and Project Level) mitigation commitments

The following tables have been structured by SEA Topic and SEA Objectives applied throughout this report and summarise the relevant mitigation commitments proposed for incorporating into OREDP II. These are summarised here and reference should also be made to the Assessment workbooks set out within **Appendix 4.** Beneath each topic mitigation table set out throughout the remainder of this section, consideration is also given to potential project-level (EIA) mitigation which could be considered and applied in addition to the identified strategic level mitigation at lower tier assessments.

Table 7-1: Physical Environment (SEA Objectives 1 and 2) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
OREDP II should include a recommendation for lower tier assessment (DMAP stage) to further analyse enclosed coastal areas e.g. the interior of Loch Swilly and the Shannon Estuary, to identify areas where development would not be suitable. OREDP II should include a recommendation for lower tier assessment (DMAP stage) to limit suitable areas to >20m water depth to reduce potential for interaction with coastal processes. OREDP II should provide guidance on the infrastructure design parameters particularly for tidal technologies which may be most suitable to deploy in shallow inshore parts of the areas of interest.	Areas included within the environment model should be subject to further, more detailed analysis to understand and appropriately mitigate potential effects in lower tier assessment. Potential for ORE development to affect coastal processes should be subject to further, more detailed analysis in lower tier assessments including Strategic modelling of coastal processes at DMAP stage, to inform location refinement. Strategic modelling of hydrodynamics and sediment transport should be carried out at DMAP stage, to further inform understanding of potential for energy extraction and location refinement. DMAP areas should be refined to exclude enclosed coastal areas (e.g. interior of Loch Swilly and Shannon Estuary). Data gaps relating to location of specific seabed sediments and geology data should be addressed at lower tier assessments, specifically at DMAP stage. Recorded presence of protected seabed habitats and species should be given specific consideration in a subsequent DMAP or lower tier assessment. DMAP areas should be refined to limit suitable areas to >20m water depth to reduce potential for interaction with coastal processes.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative only. Project mitigations should be fully investigated and evaluated as part of individual project development.

- Site specific geophysical and geotechnical surveys should be completed to inform array siting and layout,
- Site specific modelling of hydrodynamics and sediment transport should be carried out at individual project stage to inform EIA,

- Modelling of effects on coastal processes as pre-project activity to optimise location,
- Avoid specific project placement where sediment transport systems/coastal processes are highly sensitive to change,
- Avoid specific project placement where sediment transport systems/coastal processes are highly sensitive to change,
- Carry out pre-installation bottom surveys,
- Use installation methods that minimise disturbance to sediments,
- Carry out work in appropriate tidal conditions,
- Avoid sensitive time periods for local receptors,
- Risk Assessment and Contingency Planning, and
- Appropriate procedures for management/removal of unexploded ordnance (UXO) should be followed.

Table 7-2: Water (SEA Objectives 3 and 4) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
It is recommended that the OREDP II limit areas of interest for bottom-fixed wind technology to 150m beyond the seaward limit of classified coastal water bodies (to help minimise potential influence of turbine wakes) or to >20m water depth, which ever is the greater.	Data gaps relating to known areas of historic seabed contamination should be addressed at lower tier assessments, specifically at DMAP stage including through the completion of targeted surveys. DMAP to limit installation of ORE to 150m beyond the seaward limit of classified coastal water bodies (e.g. to help minimise potential influence of turbine wakes) or to >20m water depth, which-ever is the greater. Preference for lower tier assessment areas to be identified where prevailing current conditions are offshore/will avoid sediment plumes being carried inshore to affect designating waters. Areas included within the environment model should be subject to further, more detailed

	analysis to understand and appropriately mitigate potential effects in lower tier assessment. Preference should be considered to the use of floating wave energy technology which may requiring anchoring only rather than piled foundations.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative only. Project mitigations should be fully investigated and evaluated as part of individual project development.

- Complete hazardous operations during appropriate weather/tide conditions,
- Design devices to minimise risk of leakage of pollutants,
- Use low toxicity and biodegradable materials,
- Use minimum quantities,
- Design for minimum maintenance,
- Project-specific risk assessment and contingency planning,
- Avoid shipping routes where collision risk is high,
- Shipboard Oil Pollution Emergency Planning (SOPEP),
- Avoid placement within 500m of areas of known sediment contamination, and
- Survey to identify potential sources of seabed contamination.

Table 7-3: Climate and Air Quality (SEA Objectives 5, 6, 7 and 8) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
The OREDP II should incorporate and endorse existing regulatory and policy comments to offshore/vessel management air pollution protocols as set out with MARPOL and Ireland's enacting legislation. The OREDP II should set out the high-level process to address the data gap relating to baseline AQ conditions in the marine environment, to inform lower tier assessments.	Consideration needs to be given to ensuring minimal disturbance to areas which have potential for high carbon sequestration. DMAPs should further consider Ecosystem mapping of sediment potential for carbon sequestration, known areas of carbon management habitats e.g. seagrass. Further consideration should be given to addressing the data gap relating to baseline AQ conditions in the marine environment, to inform lower tier assessments. Areas included within the environment model should be subject to further, more detailed analysis to understand and appropriately mitigate potential effects in lower tier assessments.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative only. Project mitigations should be fully investigated and evaluated as part of individual project development

- Project-specific impacts on carbon sequestration resources should be considered at project EIA,
- MARPOL vessel management protocols should apply as a commitment to any subsequent projects brought forward under this strategy,
- Further consideration should be given to addressing the data gap relating to baseline AQ conditions in the marine environment, to inform lower tier assessments, and
- Areas included within the environment model should be identified within the OREDP II as higher risk, lower priority for development.

Table 7-4: Marine Pollution (SEA Objectives 9, 10 and 11) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
The OREDP II needs to highlight compliance with Policy on Marine Litter set out within the NMPF, specifically priority should be given to proposals that facilitate reuse and recycling. Where waste is expected to be generated the OREDP II should require a waste management plan to be in place to prioritise a hierarchy of avoid, minimise, mitigate in relation to marine litter. The OREDP II needs to highlight compliance with Policy on underwater noise set out within the NMPF, including to ensure the spatial distribution, temporal extent, and levels of anthropogenic impulsive sound sources do not exceed levels that adversely affect the marine environment. The OREDP II should recommend lower tier assessments, specifically DMAP stage should further assess enclosed coastal water bodies (for example, Loch Swilly and Shannon Estuary), to identify areas where development would not be suitable (where these areas are not already covered by the Exclusions model). The OREDP II should commit to appropriate consideration of electromagnetic fields (EMF) during lower tier assessment and could acknowledge the importance of project design mitigation and technology selection in minimising EMF in the marine environment.	DMAPs should exclude enclosed coastal water bodies (e.g. Loch Swilly and Shannon Estuary). Cabling configurations and installation methods to be further investigated at Lower tier assessment. Project-specific design to minimise EMF field strength (Prioritise cable burial where possible). Areas included within the environment model should be subject to further, more detailed analysis to understand and appropriately mitigate potential effects in lower tier assessments.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative

only. Project mitigations should be fully investigated and evaluated as part of individual project development.

Underwater Noise

- Implement NPWS Code of Practice for the Protection of Marine Mammals during acoustic sea floor surveys in Ireland waters,
- Programme survey and installation works to reduce potential for noisy or other disturbing activities to occur at the same time,
- Undertake studies to determine site specific noise effects,
- Minimise use of high noise emission activities such as impact piling,
- Consider using alternatives (clump weights, gravity bases, routing cables through soft sandy sediment) rather than burial,
- 'Softstart' piling activities and acoustic deterrents,
- Underwater noise during operation may be beneficial in alerting species to presence of device, reducing risk of collisions,
- Noise from operating turbines could be reduced by using isolators. However, this has not been tested over long term and to account for cumulative effects,
- Use of sound insulation and equipment,
- Use of bubble curtains and other methods to discourage species for entering areas (this is expensive and may only be effective in shallow water),
- Investigate options for the use off acoustic deterrents (where suitable) or other disturbance devices to scare sensitive species away,
- Use of PAMs, if calibrated and available to facilitate implementation of exclusion area during noisy activities,
- Time noisy activities for individual developments to avoid cumulative effect, and
- Programme developments to reduce potential for adverse cumulative in/combination effects e.g. noise from piling or other activities (surveying) from a number of developments to occur at the same time.

Light Pollution

- Avoid large-scale continuous illumination.

Table 7-5: Biodiversity (SEA Objectives 12 and 13) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
Specific mitigation relating to the AA should be included and is available within the full NIS report. The OREDP II should commit to requiring further investigations to inform lower tier assessments, to determine the precise assemblage of species present in potential locations for ORE development.	Areas included within the environment model should be subject to further, more detailed analysis to understand and appropriately mitigate potential effects in lower tier assessments. Recorded presence of sensitive habitats and species should be given due consideration as part of subsequent DMAP or specific project development process. More detailed consideration should be given to identifying and understanding migratory routes and potential for cable generated EMF to result in disturbance to, or barriers to movement of receptor species at lower tier assessments. Opportunities for ecosystem enhancement through habitat enhancement, population aggregation (particularly fish species) and refuge habitats should be maximised at DMAP and individual project stages. Opportunities for linkages between arrays across the wider marine area should be given consideration at lower tier assessments, specifically at DMAP assessment stage.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative only. Project mitigations should be fully investigated and evaluated as part of individual project development.

Surveys/Installation

- Site specific modelling of sediment transport should be carried out,
- Benthic surveys to characterise seabed and sensitive sites and species should be completed,

- Site specific surveys should be completed to identify key breeding and nursery areas, foraging and migratory routes and 'hotspots; for birds, marine mammals and marine reptiles, and haul out locations for seals,
- Surveys of potential offshore bat activity should be carried out,
- Implement NPWS Code of Practice for Protection of Marine Mammals during acoustic seafloor surveys,
- Adhere to IWDC recommendations to minimise impacts on marine mammals including from multibeam surveys,
- Use of MMOs and PAM to implement exclusion zones during noisy activities,
- Enforce speed limits for installation vessels particularly in areas of high animal abundance, and
- Use of acoustic deterrent devices such as pingers.

Site Selection

- Careful selection must ensure sensitive sites for devices (and export cables) are avoided. (e.g. areas with known sensitive intertidal and subtidal benthic habitats,
- Site selection should avoid development near seabird breeding colonies, important feeding/roosting areas, near shore areas and migration corridors,
- Avoid multiple installations on identified migratory corridors,
- Installation should seek to avoid sensitive seasons,
- O&M programmes should avoid sensitive seasons,
- Design mitigations,
- Use of scour protection around fixed structure foundations to reduce effects of scour on habitat and non-mobile species,
- Ensure adequate spacing between wave and tidal developments to reduce potential for energy extraction,
- Ensure adequate spacing between developments to allow migration between windfarms,
- Integrate programming of survey and installation works for multiple projects to reduce potential for cumulative effects e.g. on noise environment,
- Soften risk of injury through collusion, by adding smooth edges or padding,

- Protect against entrapment by incorporating escape hatches etc.,
- Use protective screens to prevent marine organism (e.g. fish) entering device (e/g/ shrouded turbines),
- Use of protected netting or grills,
- Avoid placement of devices as to cause block or a significant perceptual barrier to marine species,
- Design cabling configurations and installation methods to minimize EMF field strength (Prioritise cable burial where possible),
- Align turbines parallel to main bird migratory direction. Likewise orientating arrays parallel to coastline may help minimise barrier effect for marine species (e.g. marine reptiles swimming past),
- Operational mitigations,
- Increase device visibility or use acoustic deterrent devices, and
- Consider operating restrictions, e.g. shut down turbines at night, in bad weather/visibility/ during periods of high migration density.

Table 7-6: Archaeology and Cultural Heritage (SEA Objectives 14 and 15) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
Further clarification / explanation of the level of consideration or risk that the heritage features identified within the model is given within the multi criteria analysis need to be included within the OREDP II. The OREDP II should include a commitment to further consideration of wrecks at lower tier assessment, and if necessary, implementation of archaeological exclusion zones around known protected wreck sites within the technology/exclusions model. The OREDP II should commit to requirement for further detailed identification and location specific mitigation at lower tier assessments.	Areas included within the environment model should be subject to further, more detailed analysis to understand and appropriately mitigate potential effects in lower tier assessments.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative only. Project mitigations should be fully investigated and evaluated as part of individual project development.

- Conform to the legislative requirements of the National Monuments Act (1930 – 2004) and follow codes of practice published by the National Monuments Service (NMS),
- Carry out seabed investigations in preferred site locations prior to device installation in consultation with the Underwater Archaeology Unit of the NMS,
- Avoid sites of interest/exclusion zones for marine archaeology,
- Submit artefacts recovered to NMS. Record and Report potential archaeological and vessel remains to NMS,
- Avoid protected and other sites of interest.

Table 7-7: Land and Seascape (SEA Objective 16) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
The OREDP II should recommend lower tier assessment, specifically at DMAP stage should limit suitable areas considered to >20m water depth to reduce potential for interactions with sensitive coastal landscapes. The OREDP II should recommend lower tier assessments, specifically DMAP stage should further assess enclosed coastal water bodies (for example, Loch Swilly and Shannon Estuary), to identify areas where development would not be suitable (where these areas are not already covered by the Exclusions model).	Landscape and visual effects to be given due consideration during lower tier (DMAP and/or individual project) assessments and due account should be given to any regulations or guidance on visual assessments by the Minister Housing, Local Government and Heritage. Areas included within the environment model should be subject to further, more detailed analysis to understand and appropriately mitigate potential effects in lower tier assessments. DMAP to limit installation of ORE to 150m beyond the seaward limit of classified coastal water bodies (e.g. reduce potential for interactions with sensitive coastal landscapes) or to >20m water depth, which-ever is the greater.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative only. Project mitigations should be fully investigated and evaluated as part of individual project development.

- Consideration should be given to locating devices at a maximum distance from the shore/coast (within technological constraints),
- Windfarms should not be sited where they appear to block or close the entrance to bays/loughs/narrows/sounds of where that separate a bay from open sea,
- Windfarms should reflect the shape of the coastline and align with the dominant coastal edge,
- Windfarms should not be sited where they have potential to fill a bay. The open expansive nature of the water surface area should be allowed to continue to dominate,
- Windfarms should avoid locations near scattered settlements as the scale of the array has the potential to dominate the fragmented pattern of settlement*,

- Windfarms should avoid where they conflict with the scale and subtleties of complex indented coastal forms*, and
- Consideration should be given to located devices in already industrial and developed seascapes*.

Table 7-8: Population and Human Health (SEA Objectives 17 and 18) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
It is recommended that the OREDP II be refined to further analyse enclosed coastal areas e.g. the interior of Loch Swilly and Shannon Estuary, to identify areas where development would not be suitable. It is recommended that the OREDP II consider providing guidance on the infrastructure design parameters which may be most suitable to deploy in shallow inshore parts of the areas of interest. The OREDP II should recommend lower tier assessment, specifically at DMAP stage should limit suitable areas considered to >20m water depth to reduce potential for interactions with sensitive coastal landscapes. The OREDP II should commit to further detailed assessments on human nuisance and local communities and mitigation at lower tier assessments. The OREDP II should commit to further detailed assessments on human health and wellbeing and mitigation at lower tier assessments.	Areas included within the environment model should be subject to further, more detailed analysis to understand and appropriately mitigate potential effects in lower tier assessments. DMAP stage should not include enclosed coastal areas e.g. the interior of Loch Swilly, where these areas are not already covered by the Exclusions model. DMAP to limit installation of ORE to 150m beyond the seaward limit of classified coastal water bodies (e.g. to reduce potential for interactions with sensitive coastal landscapes) or to >20m water depth, which-ever is the greater.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative only. Project mitigations should be fully investigated and evaluated as part of individual project development.

- Undertake construction where possible outside peak tourist seasons (June to September) to minimise disruption to visitors and local people,

- Identify and avoid popular recreation areas including popular routes for sailing or other water sports such as kayaking as well as dive and surf locations etc.,
- Avoid areas that are popular with tourists and wildlife tour operators,
- Where possible facilitate safe access through arrays for sailing or other water sports,
- Incorporate suitable safety features such as lighting, netting and buoys into device design,
- Provide suitable information for the public regarding safety, and
- Restrict access to construction sites.

Table 7-9: Material Assets (SEA Objectives 19 and 20) Proposed Mitigation

Proposed for incorporating into Consultation Draft of OREDP II	Recommendations for DMAP and lower tier assessment level SEA
The OREDP II should include a commitment to appropriate liaison with fisheries organisations at lower tier assessments, including appropriate application of Communications Protocol currently under development as part of the Seafood/ORE working group. A commitment to consideration of critical military/radar and communications material assets at lower tier assessments should be included within the OREDP II.	Appropriate liaison with fisheries organisations should be completed at lower tier assessments. Detailed consideration of navigational risk will be required as appropriate throughout lower tier assessments. Localise vessel traffic routes should be given further consideration as appropriate as part of lower tier assessments (DMAP, specific project EIA). Clear consideration and evaluation of any safeguarding issues should be given appropriate consideration at specific project stage.

In addition, the following possible project-specific mitigation has been identified for additional consideration as part of lower tier assessment / project-specific EIA. (Note this list is indicative only. Project mitigations should be fully investigated and evaluated as part of individual project development.

Commercial Fishing

- Avoid device placement in areas sensitive for commercial fishing,
- Avoid key and peak fishing seasons for installation,

- Clear area of debris, post installation,
- Early liaison with the fishing industry could help identify key fishing areas, particularly the area where there is a lack of fishing effort distribution information for vessels under 15m,
- Minimise effects by using procedures and structures that reduce the area of seabed disturbed for turbine foundations,
- Consider spacing of turbines at wide enough intervals to permit use of mobile fishing gear,
- Workshops with expert representatives from the Marine Institute, BIM, NPWS industry and other appropriate bodies,
- Liaison with Industry and BIMS,
- Avoid device placement in or near to existing fish farms,
- Military, Aviation and Radar,
- As required under Obstacles to Aircraft in Flight Order S.I. 2014 of 2005 provide notification of the erection of wind devices to Irish Aviation Authority,
- Consult with the IAA on location of wind devices so they can accurately plot on radar and any signals received from that area will not be confused with aeroplanes,
- Avoid byelawed / danger military exercise areas, and
- Carry out site selection studies in conjunction with Department of Defence and UK MoD where applicable.

Marine Infrastructure

- Use of recommended 500m avoidance zone around existing cables and pipelines,
- Use of crossing agreements in accordance with ICPC guidelines,
- Seabed lease pertaining to existing infrastructure will legally need to be observed when selecting sites for devices and export cables,
- Avoid development within 500m of dredging and/or disposal sites,
- Careful site selection to factor in the access needs of existing infrastructure to ensure that the proposed sites do not conflict with the activities of existing renewable energy infrastructure,
- Communication with existing wind farm operators,

- Careful site selection taking into account resource assessment and modelling to determine if and how commercial-scale arrays could co-exist with the existing renewable energy infrastructure,
- Consultation with relevant regulatory body to establish areas of search for possible future gas/carbon storage sites within Irish waters, and
- Careful site selection avoiding areas of existing and proposed oil and gas activity.

Navigation and Shipping

- Site devices away from constraints (including those constrained by land, e.g. adjacent to entry to ports) and areas of high vessel densities,
- Undertake navigation risk assessment (NRA) which should include a survey of all vessels in vicinity of the proposed development,
- Maintain good communication with relevant ports, including timely and appropriate notifications or proposed works,
- Issue appropriate notifications during installation and maintenance,
- Site selection for device arrays to take into account the requirement for continued access to ports and harbours,
- In busy shipping areas, potential visibility effects may be reduced by minimising the period of installation, the number of vessels required and the area occupied during installation,
- Any vessel and device should be lit and marked in accordance with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) guidelines in agreement with the Commissioners of Irish Lights,
- The scale of potential effect on navigation should be assessed as part of the project-specific EIA and NRA, and
- Ensure wind devices are lit with aviation lights in accordance with OAM 09/02 “Offshore Wind Farm Conspicuity Requirements”.

7.2 Strategic Level Monitoring Commitments

In accordance with Article 17 of the SEA Regulations 2004, significant or uncertain environmental effects of the implementation of the OREDP II are required to be monitored. This will ensure that unforeseen adverse effects are identified at an early stage and that appropriate remedial action is taken as required.

Residual uncertain effects within this SEA relate to several SEA objectives and are specified below:

- For fixed wind and wave technology, an uncertain effect remains in relation to coastal sediments and processes (SEA 2). A further uncertain effect remains for fixed wind relating to classified waterbodies (SEA 3), due to the coastal nature of resource potential for this technology type. These may be possible to mitigate at DMAP and project level after further investigations;

- For fixed wind, floating wind, tidal and wave technologies, the precise nature of potential adverse effects on habitats, species and ecosystems (SEA 12) and the ability to mitigate these is currently unknown. These may be possible to mitigate at DMAP and project level after further investigations;

For tidal technology, the configuration of interarray cabling required to support tidal generation technology, whether these may be floating within the water column or encased within the physical infrastructure/buried in the seabed is unknown. Therefore a residual uncertain effect has been identified for SEA 11 and this will need to be investigated further and the DMAP and project planning stages.

These residual uncertain effects will need to be included within the OREDP II monitoring plan. It is noted that there were no residual significant negative effects identified within the assessments once mitigation is in place.

As a reflection of the strategic nature of the OREDP II, identified potential for significant effects or residual uncertain effects is in most cases primarily mitigated through commitments to further assessment as part of lower tier assessments which will subsequently be brought forward within the parameters set out by the OREDP II.

Lower tier assessments should be required to include a compliance statement setting out how each assessment complies with the overarching requirements of the OREDP II.

The OREDP II will include a review programme a minimum of 5 years after OREDP II is first published. These reviews will allow for technological developments as well as evolution of baseline conditions, for example additional environmental protection designations which may come forward and availability of additional data to enhance understanding of Ireland's marine environment characteristics and sensitivities to be given due consideration as the national strategy matures.

This OREDP II review programme should also include a review of lower tier assessment compliance statements to monitor accurate and successful delivery of the national strategy's objectives throughout the review period.

7.3 The role of SEA mitigation in the development of OREDP II

As stated previously, SEA is an iterative process, allowing for a feedback loop between the assessment and development of the plan, programme or strategy involved. This feedback has been key to the development of OREDP II and below sets out the ways in which the proposed mitigated for inclusion within the Consultation Draft of OREDP II have been incorporated into the OREDP II. It is noted that in several instances, mitigation may be provided through further assessment at lower tiering stages, such as DMAPs, or existing plans and legislation, such as the NMPF. This table will be updated as the OREDP II evolves post-consultation, and presented within the SEA Adoption Statement.

Table 20: SEA Mitigation and OREDP II development

	OREDP II specific mitigation measures proposed by the SEA	How was this addressed in the OREDP II?
Overall OREDP II and tiered assessment approach	Given the strategic nature of the OREDP II and conversely the often spatially specific nature of potential effects from ORE development, it is recommended that the strategy incorporates a guiding commitment to more detailed identification and consideration of key issues at lower tier assessment stages, including DMAP and / or individual project level. This OREDP II review programme should also include a review of lower tier assessment compliance statements to monitor accurate and successful delivery of the strategy objectives throughout the OREDP II review period. Lower tier assessments should be required to include a compliance statement setting out how each assessment complies with the overarching requirements of the OREDP II. Areas included within the environment model should be subject to further, more detailed analysis to understand and appropriately mitigate potential effects in lower tier assessment.	OREDP II Principles (Section 3.6) The statutory framework sets out the process that must be followed in terms of lower-tier environmental assessments at both the DMAP and project levels. Compliance with this process will be assessed by the relevant planning authorities. The Environmental Assessment introduction (Section 10) was updated to reflect the guiding commitment to lower-tier assessments. ORE DMAP proposals submitted to DHLGH will include a section outlining how the DMAP aligns with the principles and objectives of the OREDP II. The OREDP II adoption and implementation approach (Section 12) was updated to reflect the updating of the environmental model via lower-tier assessment, which may include planned environmental sensitivity mapping for Broad Areas of Interest. The Adaptive Management Plan (Section 12.1 and 12.2) was updated to include a proposed Environmental Subgroup in the governance structure to oversee an Environmental Monitoring Programme.

Physical Environment (SEA Objectives 1 and 2)	OREDP II should include a recommendation for lower tier assessment (DMAP stage) to further analyse enclosed coastal areas e.g. the interior of Loch Swilly and the Shannon Estuary, to identify areas where development would not be suitable. OREDP II should include a recommendation for lower tier assessment (DMAP stage) to limit suitable areas to >20m water depth to reduce potential for interaction with coastal processes. OREDP II should provide guidance on the infrastructure design parameters particularly for tidal technologies which may be most suitable to deploy in shallow inshore parts of the areas of interest.	Consideration of specific enclosed coastal areas or limiting suitable areas to >20m water depth would be more appropriately addressed at the DMAP level when localised environmental assessments can be carried out. The OREDP II Resource Area Potential is 10m to 1000m water depth is a measure based on ORE technology viability only from a national-level perspective. It is out of scope for the OREDP II to provide technology or infrastructure design parameters that would be more appropriately and effectively addressed at DMAP and project level. The OREDP II is a strategy, not a statutory plan, and therefore the need to develop any guidance or guidelines would be more appropriately considered as part of the development of Marine Planning Guidelines under the MAP Act by DHLGH.
Water (SEA Objectives 3 and 4)	It is recommended that the OREDP II limit areas of interest for bottom-fixed wind technology to 150m beyond the seaward limit of classified coastal water bodies (to help minimise potential influence of turbine wakes) or to >20m water depth, whichever is the greater.	The OREDP II has assessed technical feasibility from 10m-60m for fixed wind technology. A more refined assessment to incorporate this mitigation will be carried out at the lower-tier assessment stage when designations are being considered.

Climate and Air Quality (SEA Objectives 5, 6, 7 and 8)	The OREDP II should incorporate and endorse existing regulatory and policy comments to offshore/vessel management air pollution protocols as set out with MARPOL and Ireland's enacting legislation. The OREDP II should set out the high-level process to address the data gap relating to baseline AQ conditions in the marine environment, to inform lower tier assessments.	OREDP II Principles (Section 3.6) sets out that the NMPF recognises that proposals for ORE developments must be consistent with national policy, and outlines that the OREDP II's role is to support the implementation of the forward marine planning framework. The OREDP II monitoring approach (Section 10.3) was expanded to explain the plan's reliance on the NMPF and MSFD in setting out relevant compliance requirements with existing regulatory and policy relevant to ORE development. The Adaptive Management Plan, Data Action Plan and Research Integration Schedule, Data Subgroup, and the Data Management Framework are the mechanism through which all data gaps will be addressed following publication of the OREDP II.
Marine Pollution (SEA Objectives 9, 10 and 11)	The OREDP II needs to highlight compliance with Policy on Marine Litter set out within the NMPF, specifically priority should be given to proposals that facilitate reuse and recycling. Where waste is expected to be generated the OREDP II should require a waste management plan to be in place to prioritise a hierarchy of avoid, minimise, mitigate in relation to marine litter. The OREDP II needs to highlight compliance with Policy on underwater noise set out within the NMPF, including to ensure the spatial distribution, temporal extent, and levels	OREDP II Principles (Section 3.6) sets out that the NMPF recognises that proposals for ORE developments must be consistent with national policy, which includes the statutory NMPF, and outlines the OREDP II's place in supporting the implementation of the forward marine planning framework. DMAPs for ORE, as defined by law, will adhere to all policies and principles set out in the NMPF. The OREDP II monitoring approach (Section 10.3) was expanded to explain the plan's reliance on the legal and

	of anthropogenic impulsive sound sources do not exceed levels that adversely affect the marine environment. The OREDP II should recommend lower tier assessments, specifically DMAP stage should further assess enclosed coastal water bodies (for example, Loch Swilly and Shannon Estuary), to identify areas where development would not be suitable (where these areas are not already covered by the Exclusions model). The OREDP II should commit to appropriate consideration of electromagnetic fields (EMF) during lower tier assessment and could acknowledge the importance of project design mitigation and technology selection in minimising EMF in the marine environment.	policy framework established by the MAP Act and NMPF in setting out the relevant compliance requirements. Consideration of specific enclosed coastal areas or limiting suitable areas to >20m water depth would be more appropriately addressed at the DMAP level when localised environmental assessments can be carried out. The OREDP II Resource Area Potential is 10m to 1000m water depth is a measure based on technology viability only from a national level perspective. It is out of scope for OREDP II as a strategy document to provide technology or infrastructure design parameters that would be more appropriately and effectively considered as part of the development of Marine Planning Guidelines developed by DHLGH.
Biodiversity (SEA Objectives 12 and 13)	Specific mitigation relating to the AA should be included and is available within the full NIS report. The OREDP II should commit to requiring further investigations to inform lower tier assessments, to determine the precise assemblage of species present in potential locations for ORE development.	Specific mitigation relating to the AA is included in Table 11. The OREDP II adoption and implementation approach (Section 12) was updated to reflect the updating of the environmental model via lower-tier assessments, which may include environmental sensitivity mapping for Broad Areas of Interest.
Archaeology and Cultural Heritage (SEA	Further clarification / explanation of the level of consideration or risk that the heritage features identified	Mitigations related to shipwrecks are already embedded in the system in the NMPF which ORE DMAPs will have to comply with. A range of heritage

Objectives 14 and 15)	within the model is given within the plan/multi criteria analysis need to be included within the OREDP II. The OREDP II should include a commitment to further consideration of wrecks at lower tier assessment, and if necessary, implementation of archaeological exclusion zones around known protected wreck sites within the technology/exclusions model. The OREDP II should commit to requirement for further detailed identification and location specific mitigation at lower tier assessments.	features including shipwrecks were considered for inclusion in the OREDP assessment. Given the broad distribution and small scale of shipwrecks relative to the size of the maritime area, it was determined that they are more appropriately considered at the lower tier assessment level.
Land and Seascape (SEA Objective 16)	The OREDP II should recommend lower tier assessment, specifically at DMAP stage should limit suitable areas considered to >20m water depth to reduce potential for interactions with sensitive coastal landscapes. The OREDP II should recommend lower tier assessments, specifically DMAP stage should further assess enclosed coastal water bodies (for example, Loch Swilly and Shannon Estuary), to identify areas where development would not be suitable (where these areas are not already covered by the Exclusions model).	Consideration of specific enclosed coastal areas or limiting suitable areas to >20m water depth would be more appropriately addressed at the DMAP level when localised environmental assessments can be carried out. The OREDP II Resource Area Potential is 10m to 1000m water depth is a measure based on technology viability only from a national level perspective.
Population and Human Health (SEA Objectives 17 and 18)	It is recommended that the OREDP II be refined to further analyse enclosed coastal areas e.g. the interior of Loch Swilly and Shannon Estuary, to identify areas where development would not be suitable. It is recommended that the OREDP II consider providing guidance on the infrastructure design parameters which	Consideration of specific enclosed coastal areas or limiting suitable areas to >20m water depth would be more appropriately addressed at the DMAP level when localised environmental assessments can be carried out. The OREDP II Resource Area Potential is 10m to

	may be most suitable to deploy in shallow inshore parts of the areas of interest. The OREDP II should recommend lower tier assessment, specifically at DMAP stage should limit suitable areas considered to >20m water depth to reduce potential for interactions with sensitive coastal landscapes. The OREDP II should commit to further detailed assessments on human nuisance and local communities and mitigation at lower tier assessments. The OREDP II should commit to further detailed assessments on human health and wellbeing and mitigation at lower tier assessments.	1000m water depth is a measure based on technology viability only from a national level perspective. It is out of scope for the OREDP II as a strategy document to provide technology or infrastructure design parameters that would be more appropriately and effectively considered as part of the development of Marine Planning Guidelines by DHLGH. Similarly, the plan's guiding commitment to lower-tier assessments includes areas such as human nuisance and local communities and human health and wellbeing.
Material Assets (SEA Objectives 19 and 20)	The OREDP II should include a commitment to appropriate liaison with fisheries organisations at lower tier assessments, including appropriate application of Communications Protocol currently under development as part of the Seafood/ORE working group. A commitment to consideration of critical military/radar and communications material assets at lower tier assessments should be included within the OREDP I.	The Adaptive Management Plan (Section 12.1) was updated to include a specific reference to support for continued engagement, potentially through the Seafood-ORE Working Group. OREDP II Principles (Section 3.6) was updated to reflect engagement with fisheries sector at DMAP level. Considerations in respect of critical military/radar and communications material assets are included in Chapter 10 of the NMPF (Defence and Security). All ORE DMAPs will comply with the policies and principles set out in that chapter.

8 Cumulative Assessment

The emerging OREDP II represents one of a number of inter-related plans and policies supported by tiers of evaluation and assessment which are being prepared by the Irish Government to ensure an integrated, plan-led enduring regime to govern decision-making and marine plan-making plus the development of Ireland's Offshore Renewable Energy Resource.

A long list of other PPPs with potential to influence and/or interact with OREDP II was developed as part of scoping of the SEA (Appendix 3: Summary of Regulation and Policy Review). This long list was then reviewed in order to identify a short-list of other PPPs where significant potential for cumulative effect on key receptors may occur, and which it was considered required further consideration.

8.1 PPPs considered within Cumulative Assessment

The short list of other PPPs included within the cumulative assessment of this SEA is set out in **Table 8-1** below and discussed further throughout this section of the report.

Table 8-1: Short-List of other Plans, Policies and Programmes given consideration as part of the Cumulative Assessment

Plan/Policy	Date	Justification for consideration in CE assessment
National Marine Planning Framework	2021	Establishes a national plan for Ireland's seas and for the future development of the marine planning system in Ireland towards 2040. The NMPF sits at the top of a hierarchy of plans and sectoral policies for the marine area, of which OREDP II is one, and provides a coherent framework in which sectoral policies and objectives can be realised. It implements the Maritime Spatial Planning (MSP) Directive 2014/89/EU for Ireland.
Climate Action Plan (CAP)	2021	Increases the target to up to 80% renewable electricity for Ireland by 2030.
Programme for Government	2020	Sets a target for 70% of electricity to be generated from renewable sources by 2030 and sets a target of 5GW of offshore wind by 2030.
National Energy and Climate Plan (NECP) 2021 – 2030	2020	Integrates and incorporates all planned policies and measures in relation to Climate Change and Energy provision in Ireland into a single coherent Plan. Of particular relevance to offshore renewables NECP includes

Plan/Policy	Date	Justification for consideration in CE assessment
		objectives and policies for 'Decarbonisation - Renewable Energy'. including: achieving a 34% share of renewable energy in energy consumption by 2030; Increase electricity generated from renewable sources to 70%; At least 3.5 GW of offshore renewable energy; The NECP defines the policy context which frames the need for OREDP II.
EirGrid – Shaping Our Electricity Future Roadmap	2021	Provides an outline of the key developments from a networks, engagement, operations and market perspective needed to support a secure transition to at least 70% renewables on the electricity grid by 2030 Covers both Ireland and Northern Ireland. Roadmap makes a commitment to further review and updates, to take account of emerging energy policy. The future evolution of the power system beyond 2030 is also implicitly considered in delivering the broader EU ambition of net zero carbon emissions in the economy by 2050. Grid development strategy as considered within this roadmap must work closely with, and integrate with OREDP II This roadmap is considered relevant although potentially in in a limited capacity, as it sets out a roadmap to 2030 (covering connection of OREDP I). OREDP II will also consider ORE beyond 2030.
Policy Statement on the Framework for Ireland's Offshore Electricity Transmission System	2021	Relates to the future development, operation and ownership of Ireland's offshore electricity transmission system and includes commitments to a phased transmission to a centralised offshore transmission system: The first phase will see individual projects responsible for their offshore system requirement; The second phase will require individual projects or EirGrid to provide their transmission system requirement; The third phase will see EirGrid develop the transmission grid network, in association with developments brought forward under OREDP II.
Policy Statement on the Facilitation of Offshore Renewable Energy by Commercial Ports in Ireland	2021	Sets out the multi-port approach to be applied to addresses the requirements of the ORE industry and is consistent with and updates the National Ports Policy 2013 (see also Ports Policy 2013).

Plan/Policy	Date	Justification for consideration in CE assessment
		Identifies requirement for a minimum of two facilities to support deployment activities, with a multiple of typically smaller ports required to support operational and maintenance requirements.
National Ports Policy	2013	The core objective of National Ports Policy is to facilitate a competitive and effective market for maritime transport services. National Ports Policy introduces clear categorisation of the ports sector into Ports of National Significance (Tier 1), Ports of National Significance (Tier 2) and Ports of Regional Significance. Sets out a framework through which essential ports services required for the successful delivery of OREDP II will be delivered.
OREDP I	2014	Defined a series of enablers which provide specific precursor to OREDP I and sets out the framework under which a number of offshore wind farm projects in Ireland's maritime area are currently being brought forward (see section 7.1.1)

8.1.1 OREDP I

Ireland's move from a developer-led to a plan-led model with greater state involvement is underway and is expected to take place over three phases. Phases one and two are designed to deliver the Climate Action Plan (CAP) target of at least 5GW of installed offshore wind capacity by 2030 (and an additional 2GW for green hydrogen). These are initially being developed and brought forward under the development parameters set out within the first Offshore Renewable Energy Development Plan (OREDP I) which was published in 2014 (and updated in 2018) and established scenarios for the development of offshore renewable generation in Irish waters up to 2030. It also sought to define a longer-term vision for growth beyond 2030. These projects are also being initially developed under the Marine Planning Policy Statement and the National Marine Planning Framework.

OREDP II builds on and updates OREDP I and provides a national level strategy and framework for the final Phase which is the transition to the enduring plan-led regime as set out within OREDP II and subsequent Designated Maritime Area Plans (DMAPs) which are provided for under the Maritime Area Planning (MAP) Act 2021.

8.1.2 Phase 1 Projects

A series of individual Offshore Wind Energy projects are currently being progressed under the parameters set out with OREDP I and are anticipated to provide in the region of 2.5GW combined output. These projects will continue to progress through the marine planning regime requirements under which they were initiated as set out within the Transition Protocol (DECC, 2021).

8.1.3 Phase 2 Projects

Projects to come forward under Phase 2 have yet to be agreed. These are currently subject to consultation and anticipated to be brought forward through the second offshore wind specific auction which is currently under development and is expected to deliver approximately 4.5GW of installed capacity MAC applications for Phase 2 projects will be consented through MARA. Any projects identified as Phase 2 projects are therefore expected to be largely deliverable by 2030, however the construction and any resultant impact from construction is included within the assessment for OREDP II.

8.1.4 OREDP I Parameters considered within Cumulative Assessment

The potential for cumulative effect of OREDP I, including specified projects where they have been identified, with OREDP II has been considered as part of this SEA.

An estimated total of 2GW offshore windfarm output, comprised of the following OREDP I projects have been considered as part of the cumulative assessment:

- Oriel Wind Park
- Dublin Array (2 projects – previously named Bray and Kish Banks)
- Codling Wind Park, (2 projects – previously named Codling I and Codling extension)
- Sceirde Wind Farm (Fuinneamh Sceirde Teoranta (Skerd Rocks))
- North Irish Sea Array
- Arklow Bank (known as Arklow Bank Phase 2, as this will extend the existing Arklow Bank wind farm)

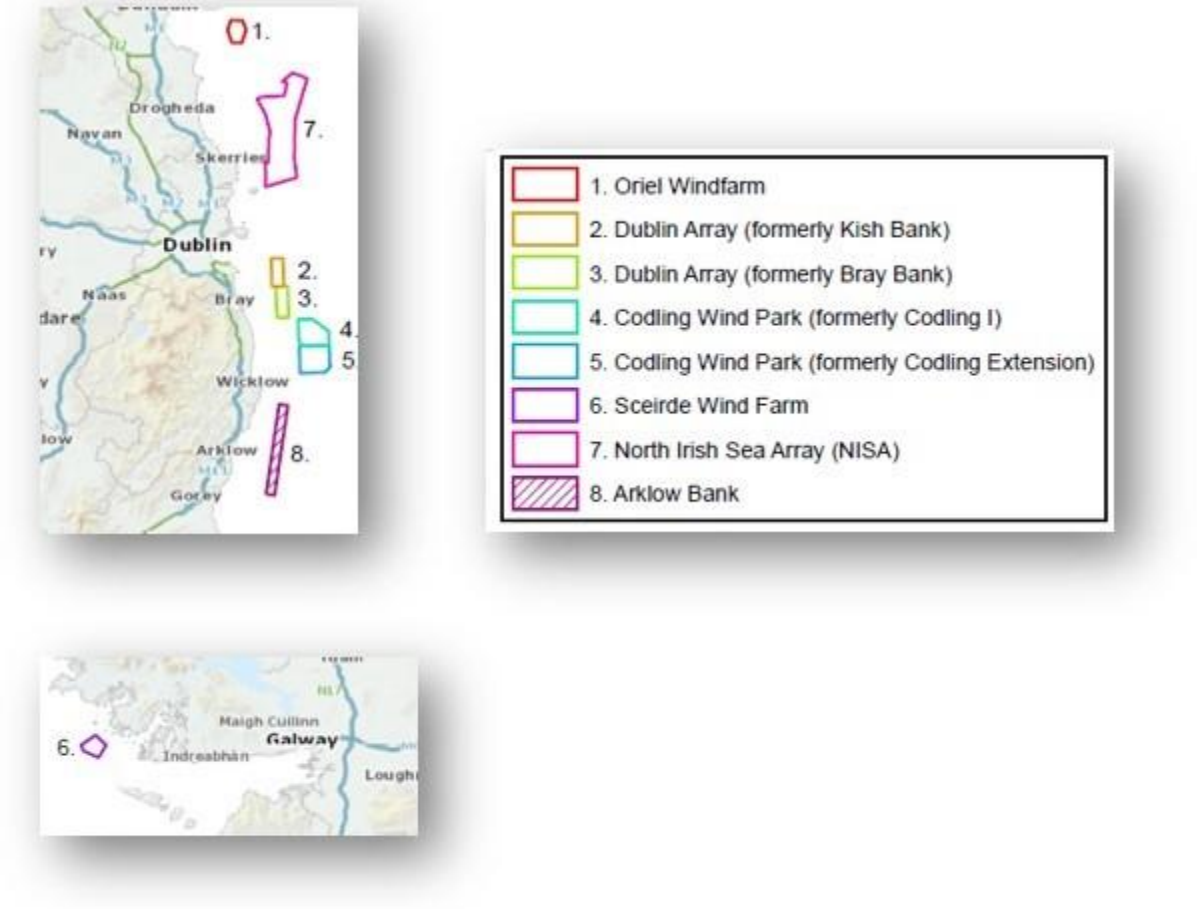


Figure 8-1: OREDP I, Phase I Offshore Windfarm Projects under Transition Protocol

In addition, an estimated total of a further 4.5GW offshore windfarm output from Phase 2 projects has also been considered. Specific locations of potential Phase 2 projects were not available to inform the cumulative assessment.

8.2 Summary of Cumulative Assessment

OREDP II will be delivered through the structures and policies set out within the NMPF which in turn delivers an important policy structure through which the Marine Strategy Framework Directive (MSFD) commitments are delivered. Together, working coherently and in an integrated manner, these PPPs can be expected to strengthen the policy commitment and the potential cumulatively beneficial effect of these policies on the SEA Objectives considered within this report.

The NMPF policies on ocean health are closely aligned with MSFD GES Indicators which are also reflected within the SEA Objectives for OREDP II which are considered within this report. Consequently, the NMPF and OREDP II together offer a cumulative opportunity to strengthen the beneficial contribution to the achievement of the relevant SEA Objectives considered within this report. Specifically, potential for a positive cumulative effect has been identified relative to the consistent integration and consideration across this group of PPPs of SEA topics covered by **SEA Objectives 1** (Seabed and Sediments); **SEA 2** (Coastal and estuarine processes); **SEA 3 and 4** (water quality and pollution); **SEA 9** (marine litter) **SEA 10** (manmade noise) and **SEA 12** (Biodiversity and ecosystems, including the ecology of commercial fish stocks, nonindigenous species and food webs).

Likewise, the NMPF's 'Thriving Maritime Economy' policies sets the framework of overarching marine planning policies for co-existence with other maritime users and with marine material assets (**SEA 19**) with NMPF's sector policies on offshore renewable energy specifically identify Fisheries, Defence, Security, Ports, Harbours and Shipping under this overarching policy of co-existence.

NMPF group of policies relating to 'Engagement with the Sea' particularly provide a policy structure applicable to **SEA 14 and 15** (marine cultural heritage), **SEA 17** (human health and wellbeing) and **SEA 18** (local communities)**.**

NECP and CAP both provide strong support and cumulative benefit particularly to **SEA 6** (promote and prioritise use renewable energy), providing the policy framework for the ORE targets which form the basis of OREDP II. It is noted that the target originally set at 3.5 GW of ORE within this PPPs is subject to constant review and strengthen, particularly relating to the post 2030 targets which are most applicable to OREDP II.

The cumulative effect of supporting infrastructure activities such as transmission grid development, ports facilities and capacity planning, as well as supply chain development will require increasingly detailed consideration as planning and policy development continues through lower tier assessments, including DMAP planning for ORE development. This will also need consideration through the identification and support for individual port masterplans through the PPS, NPS and subsequent emerging documentation. Existing grid policies particularly focus on the connection requirements, network and market development required to 2030 as required to support OREDP I (Phase 1 and 2 projects) anticipated in this timescale. Post 2030 grid development planning will be required to take account of requirements off and potential for cumulative effects with OREDP II.

Projects identified within OREDP I: Although Phases 1 and 2 are expected to be deliverable by 2030 (Govt of Ireland, 2021), the assessment of OREDP II takes into account effects of these

projects through the cumulative assessment and through this assessment no additional cumulative effects are anticipated.

OREDP I commits to reviewing consideration of in-combination effects throughout the life of the Plan in light of policy developments. The OREDP II maintains this commitment to consideration of in-combination/cumulative effects based on relevant policy.

Further discussion of the potential for the OREDP II to result in cumulative effect with other relevant PPPs when considered against the SEA Framework described in Chapter 3: SEA Methodology is set out within assessment Appendix 4, Workbook 7 of this report.

9 Transboundary Effects

Whilst this SEA Report initially focuses on potential effects arising from the OREDP II within Ireland's marine area, this section of the report also seeks to acknowledge potential for effects outside Ireland's marine boundaries i.e. transboundary effects. Where transboundary effects are considered to be possible, these have been identified in the relevant assessment workbooks in **Appendix 4.**

Transboundary effects have been considered at each level of the OREDP II including the assessment of objectives, technologies and also in relation to the alternative broad areas for further focus at DMAP stage.

OREDP II Objective 1 specifically aims to assess the resource potential for ORE in Ireland's EEZ. Targets set by the Irish Programme for Government in 2021 (Gov't of Ireland, 2021) estimate a framework for the delivery of at least 30GW of floating offshore wind power from 2030. Preliminary OREDP II estimates indicate the theoretical capacity within Ireland's marine area may be significantly more than this, which, if realised offers opportunity for Ireland not only to meet much of its domestic needs from such renewable sources, but also look to future export opportunities to adjacent jurisdictions. The OREDP II acknowledges however, the requirement as set out within the EU Strategy for Offshore Renewable Energy, of the need to promote the protection of the environment and biodiversity along with co-existence with other marine activities. Therefore, whilst a theoretical potential positive contribution to power export may exist, it is not possible to conclude at this stage that the OREDP II will bring significant transboundary effects in the availability of resilient and renewable energy supply to other jurisdictions **(SEA 6 and 8)**.

Direct adverse impacts at discrete locations, including direct disturbance to seabed as discussed under **SEA 1** (seabed sediments) and **SEA 14 and 15** (wrecks and historic features) are considered unlikely to result in any significant transboundary effects in adjacent jurisdictions.

As the nearest and adjacent land and marine area and jurisdiction to Ireland's marine area, negative transboundary effects resulting from the potential proximity of ORE development to Northern Ireland's coastline and marine area may be encountered, particularly in relation to **SEA 2** (coastal processes), **SEA 3 and 4** (classified water bodies and pollution of coastal and marine environment). Transboundary impacts here are likely to be indirect and heavily influenced by individual project design and siting decisions and the relationship between these and local metocean, coastal and water quality conditions. These should be given detailed further and careful consideration in lower tier assessments.

SEA 5 and 7 are concerned with air quality and Greenhouse Gas (GHG) emissions. As global level receptors a reduction in GHG emissions which may be expected as a result of OREDP II in

support of **SEA 7** would not only bring a positive effect at a national level but also on a transboundary level, across multiple jurisdictions. Where other Air Quality emissions are considered, under **SEA 5,** the OREDP II could be expected to make a more localised positive contribution to air quality management, through vessel operations etc. Transboundary effects on Air Quality are more likely to be experienced in the adjacent jurisdiction of Northern Ireland.

Waste will be generated as part of ORE installation, once released into the marine environment as litter, particles, large or small will travel. This can often be over great distances, with ocean current conditions outside Ireland's marine area, leading to the potential for negative transboundary effects (**SEA 9**). Given the location specific nature of potential sources of underwater noise and EMF the potential for either noise (**SEA 10**) or EMF (**SEA 11)** profiles to be felt outwith Ireland's marine area is considered unlikely. Notwithstanding this however, secondary effects such as barrier effects or effects on migration patterns may occur relating to migratory species (see below).

Potential for significant negative effects on a range of biodiversity receptors considered under **SEA 12** have been identified as a result of ORE development, particularly relating to direct habitat disturbance and generation of underwater sound and EMF etc. Biodiversity receptors including a number of different species of marine mammals and fish are migratory in nature, with their natural foraging and migration ranges extending and crossing over into adjacent jurisdictions. Migratory marine mammals along Ireland's Atlantic coast are also present, particularly within Northern Irish waters. Well documented and studied populations of dolphin, resident in adjacent Welsh waters are known to frequently forage within Irish waters of the Celtic Sea.

Parts of Ireland's marine area identified as technically suitable for one or more ORE technology type particularly of the northern and western coast of Donegal are also important migration routes particularly for anadromous migratory salmonids giving access to Northern Irish salmon rivers (e.g. River Bann).

Potential for significant negative effects on designating features and QIs of designated sites both within Ireland's jurisdiction and in adjacent jurisdictions, particularly in Wales and Northern Ireland has been identified **(SEA 13)** in relation to mobile and migratory species including birds and marine mammals. The potential for transboundary effects on these designations has been further considered within the NIS Report (see gov.ie/OffshoreEnergyPlan). Preliminary studies relating to the potential visibility of ORE technology within land and seascapes from coastal receptors around Ireland indicates a basic premise that significant visual effects from ORE in close proximity to Regional Character Areas (RCAs) defined around the Irish Coast may occur. A review of Northern Ireland RCA studies for coastlines/seascapes adjacent to the Irish marine area indicates the following regional character areas which may lie within the visual envelope of ORE

development and therefore where potential for a negative transboundary effect on **SEA 16** may occur and which should be further considered:

- Lough Foyle coast and dunes (north coast);
- North Coast and Rathlin Island (north coast); and
- Mourne and Slieve Croob (east coast).

These should be given detailed further and careful consideration in lower tier assessments.

10 Next Steps

10.1 Consultation

As described within Chapter 3 of this report, the SEA process follows a number of further steps, following preparation of this SEA Report.

This environment report alongside the draft OREDP II and supporting Natura Impact Statement (NIS) will be put out for consultation in February 2023.

Following this consultation, the authors will review all responses received and consider any amendments to the draft OREDP II document as appropriate.

10.2 SEA Statement

SEA is required by the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (SI No. 435 of 2004), amended by the European Communities (Environmental Assessment of Certain Plans and Programmes) (Amendment) Regulations 2011 (SI No. 200 of 2011)1. In accordance with these Regulations:

- After the OREDP II has been adopted, an 'SEA statement' must be prepared which explains how environmental information was taken into account, and how OREDP II's impacts will be monitored; and
- The SEA statement should focus on the changes made to the OREDP II in response to the SEA process.

Much of this information is already included in this environmental report, showing that the SEA process influenced the plan-making process.

The SEA statement essentially 'tells the story' of the SEA process and will set out how the SEA was undertaken in an effective and timely manner. The specific requirements are set out within the Regulations are:

"16. (1) As soon as practicable after the adoption of a plan or programme, or modification to a plan or programme, the competent authority shall—

> *(a) send notice of adoption of, and a copy of, the plan or programme, or modification to a plan or programme, and a copy of the statement referred to in sub-article (2)(b) to the environmental authorities specified in article 9(5), as appropriate, and*

(b) publish notice of the adoption of the plan or programme, or modification to a plan or programme, in at least one newspaper with a sufficiently large circulation in the area covered by the plan or programme, or modification to a plan or programme.

(2) A notice under sub-article (1)(b) shall state that

(a) a copy of the plan or programme, or modification to a plan or programme, is available for inspection at a stated place or places and at stated times and a copy shall be kept available for inspection accordingly, and

(b) a statement is also available for inspection which summarises—

(i) how environmental considerations have been integrated into the plan or programme, or modification to a plan or programme,

(ii) how

(I) the environmental report prepared pursuant to article 12,

(II) submissions and observations made to the competent authority in response to a notice under article 13, and

(III) any consultations under article 14,

have been taken into account during the preparation of the plan or programme, or modification to a plan or programme,

(iii) the reasons for choosing the plan or programme, or modification to a plan or programme, in the light of the other reasonable alternatives dealt with, and

(iv) the measures decided upon to monitor, in accordance with article 17, the significant environmental effects of implementation of the plan or programme, or modification to a plan or programme."

10.3 Publication of Finalised OREDP II and supporting reports

A finalised OREDP II supported by an SEA Adoption Statement is expected to be published in mid-2023.

10.4 Subsequent Lower Tier Assessments

The process for delivery of ORE through a fully developed and finalised plan-led regime is described in principle in section 2.1

It is currently anticipated that a series of broad areas, given initial consideration within the alternatives assessment within this Environment Report, will provide the starting point for the next tier assessment of more focused, spatially specific DMAPs. OREDP II is not expected to provide direction on the preferred broad area and all alternatives identified will be given appropriate consideration for possible further consideration at DMAP stage.

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Appendix 1: Consultation on Scoping Report

Appendix 2: Summary of Regulation and Policy Review

Appendix 3: Summary of Environmental Baseline

Appendix 4: Assessment Workbooks

Workbook 1: OREDP II Objectives

Workbook 2: OREDP II for Bottom-Fixed Offshore Wind Technologies

Workbook 3: OREDP II for Floating Offshore Wind Technologies

Workbook 4: OREDP II for Wave Energy Technologies

Workbook 5: OREDP II for Tidal Energy Technologies

Workbook 6: OREDP II Alternative Broad Areas

Workbook 7: OREDP II Cumulative Effects Assessment with other relevant PPPs