ABWP Phase I Decommissioning

Marine Biodiversity

Volume 2, Chapter 5

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Project name ABWP Phase I Decommissioning

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Volume 3, Appendix 5.2	Underwater Sound Modelling
Volume 3, Appendix 5.3	Marine Mammal Mitigation Protocol

Statement of Authority

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Glossary

Term	Meaning
Arklow Bank Wind Park (ABWP) Phase I	Arklow Bank Wind Park (ABWP) Phase I comprises: • Offshore infrastructure seaward of High Water Mark (HWM), including: – Seven Wind Turbine Generators (WTG) with a combined capacity of 25.2 MW; – One meteorological (met) mast; – Inter-array cables connecting the WTGs and met mast; and – One offshore export cable connecting WTG T4 with landfall at HWM; • Onshore infrastructure landward of HWM including: – One onshore cable connecting landfall at HWM with the onshore substation; and – One onshore substation compound, where the onshore substation and ancillary infrastructure are located.
ABWP Phase II	ABWP Phase II comprises: • Offshore Infrastructure, including: – 53 or 47 WTGs and two Offshore Substation Platforms (OSPs) located within the "Array Area";

Term	Meaning
	– Inter-array cables connecting WTGs with the OSPs; and – Two offshore export cables; • Onshore grid connection infrastructure, including a 220 kV substation at Shelton Abbey with an associated connection to the existing National Electricity Transmission Network; • Operations and Maintenance Facility (OMF) at South Dock, Arklow Harbour; and • EirGrid Upgrade Works.
Additional mitigation	Actions that will be required to reduce the significance of environmental effects of the Proposed Works, which will be dependent on the significance of effects assessed in the EIAR. Also referred to as secondary mitigation in Institute of Environmental Management and Assessment (IEMA) (2024). IEMA is now the Institute of Sustainability and Environmental Professionals (ISEP).
Alternatives	A description of other options that have been considered during the conception of the Proposed Works (Environmental Protection Agency (EPA), 2022). Article 5(1) and Annex IV of the Environmental Impact Assessment (EIA) Directive) require "a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, including a comparison of the environmental effects" (EIA Directive 2011/92/EU (as amended)).
Anadromous	Fish species which migrate from the sea into freshwater to spawn.
Annex IV Species	Are species protected under the Habitats Directive. There are over 400 species listed in Annex IV of the Habitats Directive, including many Annex II species for which a strict protection regime must be applied across their entire natural range within the EU, both within and outside Natura 2000 sites (Office of the Planning Regulator, n.d.).
Appropriate Assessment (AA)	An assessment of the likely significant effects of a plan or project (in combination with other plans or projects) on the Natura 2000 site network, which in Ireland comprises Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). These sites are protected by National and European law. The assessment is underpinned by the precautionary principle whereby a proposal cannot be granted permission if significant impacts are anticipated or cannot be ruled out. It entails the preparation of a Natura Impact Statement (NIS) for projects, or a Natura Impact Report (NIR) for plans under the Planning and Development (Amendment) Act 2010 (Office of the Planning Regulator, n.d.).
AA screening	A process undertaken by the competent authority to assess, in view of best scientific knowledge, if a proposed development, individually or in combination with other plan or project is likely to have a significant effect on a European site, and whether an appropriate assessment (AA) is required or not (Section 177U(1), Planning and Development Act 2000 (as amended)).
Baseline	A description of the relevant aspects of the current state of the environment (baseline scenario) (EIA Directive 2014/52/EU).
Circalittoral	The benthic marine zone below the infralittoral, extending to the depth limit of photosynthesis, where light levels are too low for macroalgae and communities are dominated by sessile animals such as sponges, bryozoans, and corals.
Competent authority	Are those authorities that are entitled to give authorisation or consent to a plan or project. In the planning system, this means planning authorities and An Coimisiún Pleanála. There are, however, a wide range of other competent authorities in respect of other consent regimes e.g. EPA (environmental licencing), Minister for Agriculture, Food and the Marine (forestry, aquaculture and foreshore management), and various state bodies that have authority to undertake development under Part 9 of the Planning and Development Regulations (e.g. An Garda Síochána, defence forces, the courts service). The competent authority for this planning application is An Coimisiún Pleanála (ACP).
Consent	This shall include any licence, permission, permit, approval or other such authorisation granted by a public authority for any activity, or project where

Term	Meaning
	the authority is obliged to have regard to the requirements of the Environmental Impact Assessment (EIA) and/or Habitats Directive(s) (MDB, 2017).
Cumulative effect	The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects (EPA, 2022). Cumulative effects within this EIAR comprise those arising from the Proposed Works with other developments, i.e. plans and projects that are 'reasonably foreseeable' (Planning Inspectorate (PINS), 2024).
Cumulative effects assessment	Assessment of likely significant effects resulting from the Proposed Works Offshore cumulatively with other plans, projects or reasonably foreseeable activities.
Decommissioning	The final closing down and putting into a state of safety of a development, project or process when it has come to the end of its useful life (EPA, 2022).
Designated sites	Unless otherwise specified, the term 'designated' is used to refer to international sites, European sites and national sites (that are legally designated, or are going through the process of designation (MDB, 2017).
Detailed Lighting and Marking Plan (LMP)	The contractor-developed version of the Outline LMP (see **Volume 3, Appendix 3.7**), to be prepared before Proposed Works Offshore commence and maintained as a live document until completion.
Detailed Marine Mammal Mitigation Protocol (MMMP)	The contractor-developed version of the MMMP (see **Volume 3, Appendix 5.3**), to be prepared before Proposed Works Offshore commence and maintained as a live document until completion.
Detailed Offshore Decommissioning Management Plan (DEMP)	The contractor-developed version of the Outline Offshore DEMP (see **Volume 3, Appendix 3.4**), to be prepared before Proposed Works Offshore commence and maintained as a live document until completion.
Detailed Offshore Waste Management Plan (WMP)	The contractor-developed version of the Outline Offshore WMP (see **Volume 3, Appendix 3.8**), to be prepared before Proposed Works Offshore commence and maintained as a live document until completion.
Detailed Vessel Management Plan (VMP)	The contractor-developed version of the Outline VMP (see **Volume 3, Appendix 3.5**), to be prepared before Proposed Works Offshore commence and maintained as a live document until completion.
Diadromous	Fish species which migrate between freshwater and seawater during different life phases.
'Do-nothing' scenario	The situation or environment which would exist if the Proposed Works were not carried out. This scenario needs to take account of the continuation or change of current management regimes, as well as the continuation or change of trends currently evident in the environment (EPA, 2022). In this EIAR, the do-nothing scenario is described under "Future Baseline Conditions" in **Volume 2, Chapters 4 – 8**.
Dredged material	Seabed material arising from localised dredging potentially required to facilitate safe vessel access during Proposed Works Offshore, and / or extraction of seabed material located inside monopile (MP) foundations, as part of MP decommissioning.
Ecosystem	Dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (United Nations, 1992).
Effect	The consequence of an impact on a receptor. For example, in the offshore environment, vessel activity (activity) results in increased levels of underwater noise (impact), with the potential to disturb marine mammals (effect).
EIA Scoping	The scoping stage provides an opportunity for both developers and the Competent Authority to determine those key environmental impacts and issues of concern that are likely to be of the utmost importance to the Project proposal's decision-making and eliminates those that are less of a concern (European Commission (EC,) 2017).
EIA Scoping Presentation	Presentation scoping the likely environmental impacts of the Proposed Works to be further considered in the Environmental Impact Assessment Report (EIAR). The EIA Scoping Presentation is included in **Volume 3, Appendix 1.1** of the EIAR.

Term	Meaning
Embedded mitigation	Mitigation measures included as part of the Proposed Works. Include modifications arising through the iterative design process; and standard industry practice that would occur even without input from the EIA process, e.g. actions undertaken to meet other existing legislative requirements, or actions that are standard practices used to manage commonly occurring environmental effects. Correspond to primary and tertiary mitigation defined in Institute of Environmental Management and Assessment (IEMA) (now Institute of Sustainability and Environmental Professionals (ISEP)) (2024).
Environmental Impact Assessment (EIA)	Process of assessment of the effects of a project or development proposal on the environment. In the planning area, it is undertaken by a planning authority or An Coimisiún Pleanála during the consideration of applications for planning permission, taking account of an Environmental Impact Assessment Report (EIAR). The projects which require EIA are listed in Annex I and Annex II of the EIA Directive, as amended (Office of the Planning Regulator, n.d.).
Environmental Impact Assessment Report (EIAR)	A report or statement of the effects, if any, that Proposed Works, if carried out, would have on the environment. It is prepared by the developer to inform the EIA process (Office of the Planning Regulator, n.d.).
European site	Meaning assigned to it in the EC (Birds and Natural Habitats) Regulations 2011, which is also commonly known as a Natura 2000 site (Office of the Planning Regulator, n.d.).
Favourable Conservation Status (FCS)	Refers to an approach to habitat/species conservation through a system based on functioning ecological networks, provision of ecosystem services and resilience to the impacts of climate change
Foreshore	The bed and shore, below the line of high water of ordinary or medium tides, of the sea and of every tidal river and tidal estuary and of every channel, creek, and bay of the sea or of any such river or estuary. Its outer limit is coterminous with the seaward limit of the territorial sea (Foreshore Act 1933 (as amended)), which is at a distance of 12 nm from the nearest point of the baseline or otherwise prescribed (Maritime Jurisdiction Act 2021 (as amended)).
Good Environmental Status (GES)	Environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations (Marine Strategy Framework Directive (MSFD) (2008/56/EC)).
High Water Mark (HWM)	Level reached by the sea at high tide, measured as the mean of high tides.
Impact	A change brought about by the Proposed Works Offshore.
Impulsive sound	Sound that is broadband, extremely short in duration, with a rapid rise time and a peak level higher than its energy-averaged level.
Indirect impact	Impacts on the environment, which are not a direct result of the Proposed Works, often produced away from (the Offshore / Onshore Site) or as a result of a complex pathway (EPA, 2022).
Infralittoral	The shallow subtidal marine zone from the lowest tidal level to the depth limit of light penetration, where macroalgae can grow, typically dominated by kelps and other seaweeds.
Inter-array cables	Subsea power lines that link individual wind turbine generators (WTGs) together in an offshore wind farm, forming an electrical network. In ABWP Phase I, inter-array cables connect WTGs and the met mast to each other and have an overall length of 7.4 km.
Intertidal	The zone of the shoreline that is periodically exposed and submerged by the rise and fall of the tide, lying between the high-water and low-water marks.
Landfall	The point where the offshore export cable transitions from the offshore marine environment to the onshore terrestrial environment.
Lowest Astronomical Tide (LAT)	Exact, lowest theoretical sea level that can be predicted to occur under average meteorological conditions.
Marine Biodiversity Study Area	Area covered in the characterisation of the baseline environment and considered in the assessment of potential environmental effects relevant to

Term	Meaning
	marine biodiversity, defined for each marine biodiversity receptor group, that cover predicted likely Zones of Influence (ZoI), see **Section 5.4.3** and **Figure 5.1** in this document.
Maximum design scenario (MDS)	Represents 'realistic worst case' assessment parameters for each impact.
Meteorological (Met) mast	A mast with a number of meteorological sensors located at different heights to record wind data and other meteorological data
Mitigation measures	Measures to avoid, prevent or reduce impacts (EPA, 2022), which comprise both embedded and additional mitigation, see separate definitions for these.
Monitoring	The periodic or continuous observation of biodiversity indicators and of other parameters that may affect biodiversity for any changes that may occur over time, so as to confirm predictions made with respect to likely effects and identify adverse changes that may require remedial action (Office of the Planning Regulator, n.d.).
Monopile (MP)	Hollow steel cylinder driven into the seabed typically used to anchor an offshore wind turbine generator (WTG). In ABWP Phase I, MPs support the seven WTGs as well as the meteorological (met) mast.
Natura 2000	Network EU-wide network of nature conservation areas established under the 1992 Habitats Directive (and 1979 Birds Directive). The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats. It includes Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) (Office of the Planning Regulator, n.d.).
Natura Impact Statement (NIS)	A statement, for the purposes of Article 6(3) of the Habitats Directive, of the implications of a proposed development, on its own or in combination with other plans or projects, for one or more than one European site, in view of the conservation objectives of the site or sites. This is prepared by the applicant (Office of the Planning Regulator, n.d.).
Nautical mile (nm)	A standard unit of distance used at sea, equal to 1,852 metres.
Noise	The terms noise and sound are often used interchangeably. Noise usually refers to unwanted or disturbing sounds that interfere with normal hearing and can be unpleasant or harmful. It is often characterised by irregularities in the sound waves and is considered a form of sound pollution.
Non-impulsive sound	Sound that is continuous or occurs intermittently but does not exhibit the distinctive features associated with impulsive sound.
Offshore export cable	Subsea power cable that transports the total generated power from an offshore wind farm to the onshore power grid. In ABWP Phase I, the offshore export cable connects the wind turbine generator (WTG) T4 to landfall with an approximate overall length of 15.6 km. At landfall, the offshore export cable transitions to the onshore cable connecting to the onshore substation.
Offshore Site	Part of the Site where Proposed Works Offshore are proposed to take place. In this application for planning permission, the Offshore Site comprises the Sub Lease Area, where the ABWP Phase I wind turbine generators (WTGs), met mast and inter-array cables are located, and the offshore export cable 10 m corridor connecting WTG T4 to the landfall at high water mark (HWM) near Arklow Harbour.
Pathway	The route by which a pressure arising from an activity acts on a receptor to produce an environmental impact.
Permanent Threshold Shift (PTS)	A permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level.
Planning permission	Formal, legal approval required from a local planning authority or An Coimisiún Pleanála (ACP) to carry out development. The Proposed Works require planning permission submitted from ACP under Section 291 of the Planning and Development Act 2000, as amended.
Propagation of underwater sound	The process by which acoustic waves travel through water, influenced by factors such as temperature, salinity, pressure, and the presence of boundaries like the sea surface and. seabed
Proposed Works	The Proposed Works include decommissioning of ABWP Phase I offshore infrastructure (Proposed Works Offshore) and decommissioning of ABWP Phase I onshore infrastructure (Proposed Works Onshore).

Term	Meaning
Receptor	Any element in the environment which is subject to impacts (EPA, 2022).
Residual effect	The final predicted effect / impact remaining after mitigation (EPA, 2022).
Scour protection	Engineered barrier typically placed on the seabed around WTG foundations and subsea cables to prevents sediment erosion caused by accelerated water currents and waves, safeguarding the WTG's stability and protecting subsea cables. In ABWP Phase I, scour protection was originally introduced in the form of rock armour, however, this proved ineffective, and was removed in 2005. Since then, scour protection has been introduced through sandbags.
Sensitivity	The potential of a receptor to be significantly affected (EPA, 2022).
Significance	The importance of the outcome of the impact (or the consequence of change) for the receiving environment (EPA, 2022).
Sound	The terms noise and sound are often used interchangeably. Sound is a broad term that refers to any auditory experience created by vibrations that travel through a medium such as air, water, or solids to the ear.
Sound exposure level	A metric used to measure the cumulative sound energy exposed to a receptor.
Special Areas of Conservation (SACs)	Sites designated under the Habitats Directive (92/43/EEC). This requires the conservation of important, rare or threatened habitats and species (not birds, which are protected by Special Protection Areas (SPAs)) across Europe (Office of the Planning Regulator, n.d.).
Special Protection Areas (SPAs)	Sites designated under the Birds Directive (79/409/EEC), to conserve the habitats of certain migratory or rare birds (Office of the Planning Regulator, n.d.).
Statutory consultee	An organisation or authority stipulated by legislation to be notified by a competent authority or developer if an application is made which might give that organisation a cause for concern. These are specified in the applicable legislation, e.g. Article 28 of the Planning and Development Regulations, 2001 (as amended) (EPA, 2022).
Sub Lease Area	Area where the ABWP Phase I WTGs, met mast and inter-array cables are located, as defined in the Sub Lease granted by Sure Partners Limited (SPL) to Arklow Energy Limited (Arklow Energy) to construct and operate ABWP Phase I.
Temporary Threshold Shift (TTS)	A recoverable reversible increase in the threshold of audibility.
Transboundary effects	Potential environmental effects that may occur across jurisdictional boundaries (MDB, 2017).
Zone Of Influence (ZoI)	The potential geographic area that could be affected by the implementation of the Proposed Works, having regard to the source-pathway-target risk assessment concept. The ZoI for marine biodiversity is defined for each marine biodiversity receptor group.

Acronyms

Acronym	Meaning
ABWP	Arklow Bank Wind Park
ACP	An Coimisiún Pleanála
AUD INJ	Auditory Injury
CEA	Cumulative Effect Assessment
CIEEM	Chartered Institute for Ecology and Environmental Management
DAS	Digital Aerial Survey
DBT	Dibutyltin
DCEE	Department of Climate, Energy and the Environment
DEMP	Decommissioning Environmental Management Plan

Acronym	Meaning
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMODnet	European Marine Observation Data Network
EPA	Environmental Protection Agency
EPS	European Protected Species
EU	European Union
EUNIS	European Union Network for Information System
FMMS	Fisheries Management and Mitigation Strategy
HWM	High Water Mark
IAMMWG	Inter Agency Marine Mammal Working Group
ICES	International Council for the Exploration of the Sea
IEMA	Institute of Environmental Management and Assessment
IMMAs	Important Marine Mammal Areas
IMO	International Maritime Organisation
INNS	Invasive Non-Native Species
JUB	Jack-Up Barge
LAT	Lowest Astronomical Tide
MARA	Maritime Area Regulatory Authority
MarESA	Marine Evidence Based Assessment
MarLIN	Marine Life Information Network
MBES	Multi-beam Echosounder
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMOb	Marine Mammal Observers
MMMP	Marine Mammal Mitigation Protocol
MMMU	Marine Mammal Management Units
MP	Monopiles
MSFD	Marine Strategy Framework Directive
MSP	Marine Spatial Planning
NHAs	Natural Heritage Areas
NMFS	National Marine Fisheries Service
NMPF	National Marine Planning Framework
NOAA	National Oceanic and Atmospheric Administration
O&M	Operations and Maintenance
OMF	Operations and Maintenance Facility
OREDP	Offshore Renewable Energy Development Plan
OSP	Offshore Substation Platform
OSPAR	OSPAR Convention (Convention for the Protection of the Marine Environment of the North-East Atlantic
PAH	Polycyclic aromatic hydrocarbons
PAM	Passive Acoustic Monitoring

Acronym	Meaning
PCB	Polychlorinated biphenyls
pNHAs	Proposed Natural Heritage Areas
PTS	Permanent Threshold Shift
PVA	Population Viability Analysis
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SBP	Sub-Bottom Profiling
SCANS	Small Cetaceans in European Atlantic Waters and the North Sea
SCOS	Special Committee for Seals
SEA	Strategic Environmental Assessment
SELcum	Cumulative sound exposure level
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SPLpeak	Peak sound pressure level
SPLrms	Route-mean squared sound pressure level
SSC	Suspended Sediment Concentration
SSS	Side Scan Sonar
TBT	Tributyltin
TP	Transition Piece
TTS	Temporary Threshold Shift
USBL	Ultra-Short Baseline
UWS	Underwater Sound
VMP	Vessel Management Plan
WMP	Waste Management Plan
WTG	Wind Turbine Generators
ZoI	Zone of Influence

Units

Unit	Meaning
GW	Gigawatt
km	Kilometres
kHz	Kilohertz
NM	Nautical mile
m	metres

5 MARINE BIODIVERSITY

5.1 Introduction

5.1.1.1 Arklow Energy Limited (Arklow Energy) is seeking planning permission to decommission Arklow Bank Wind Park (ABWP) Phase I (referred to hereafter as 'the Proposed Works'). The Proposed Works include decommissioning of ABWP Phase I offshore infrastructure (Proposed Works Offshore) and decommissioning of ABWP Phase I onshore infrastructure (Proposed Works Onshore).

5.1.1.2 This chapter of the Environmental Impact Assessment Report (EIAR) presents the findings of the Environmental Impact Assessment (EIA) work undertaken to date for the Proposed Works Offshore as described in **Volume 2, Chapter 3: Proposed Works Description**.

5.1.1.3 The Proposed Works Offshore will be undertaken within the Offshore Site (see **Volume 2, Chapter 3**), which includes:

- The Sub Lease Area, located on the long narrow Arklow Bank sand bank, situated approximately 10 km off the coast of Arklow, south-east Ireland, where seven wind turbine generators (WTGs) and foundations, associated scour protection, 7.4 km of inter-array cables and one met mast are located; and
- A 10 m wide cable corridor along the 15.6 km offshore export cable route connecting WTG T4 to the landfall point at High Water Mark (HWM).

5.1.1.4 This chapter considers the potential impacts and effects on marine biodiversity that could result from the Proposed Works Offshore. For the purposes of this assessment, 'marine biodiversity' refers to intertidal and subtidal benthic ecology, fish and shellfish ecology, marine mammals, marine ornithology and offshore bats.

5.1.1.5 This chapter describes the methodology, datasets that have informed the EIA, baseline conditions, including future baseline, mitigation measures and the residual significant effects on marine biodiversity that could result from the Proposed Works Offshore.

5.1.1.6 The assessment is informed by the following chapters:

- **Volume 2, Chapter 1: Introduction;**
- **Volume 2, Chapter 3: Proposed Works Description;**
- **Volume 2, Chapter 4: Coastal Processes, Water and Sediment Quality;**
- **Volume 2, Chapter 6: Commercial Fisheries and Aquaculture**; and
- **Volume 2, Chapter 7: Shipping and Navigation.**

5.1.1.7 The chapter also draws on information contained within the following appendices:

- **Volume 3, Appendix 3.5: Outline Vessel Management Plan;**
- **Volume 3, Appendix 3.7: Outline Lighting and Marking Plan;**
- **Volume 3, Appendix 4.2: Coastal Processes Modelling;**
- **Volume 3, Appendix 4.3: Scour Assessment;**
- **Volume 3, Appendix 4.4: Sediment Sampling Results;**
- **Volume 3, Appendix 5.1: Benthic Live Habitat Cable Survey and Observations Log;**
- **Volume 3, Appendix 5.2: Underwater Sound Modelling;** and
- **Volume 3, Appendix 5.3: Marine Mammal Mitigation Protocol.**

5.2 Legislative and Policy Context

5.2.1 Overview

5.2.1.1 The full relevant legislation and policy context for the Proposed Works has been detailed in **Volume 2, Chapter 1.** This section sets out the legislation and planning policy that is relevant to the marine biodiversity assessment.

5.2.2 Legislation and Conventions

International Conventions

Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention)

5.2.2.1 The OSPAR Convention (OSPAR Commission, 1992) provides the principal international framework for protection of the North-East Atlantic, including Irish waters. Annex V of the OSPAR Convention requires the protection and conservation of marine ecosystems and biodiversity, including threatened and declining habitats and species identified on the OSPAR List of Threatened and / or Declining Species and Habitats.

Convention on Biological Diversity (CBD)

5.2.2.2 The CBD (Secretariat of CBD, 2011) establishes international commitments to conserve biodiversity, promote the sustainable use of biological resources and prevent biodiversity loss. Article 6 requires the development of national strategies for biodiversity conservation. Article 8 promotes in-situ conservation measures including the protection of ecosystems and natural habitats.

European Legislation

Council Directive 92 / 43 / EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive)

5.2.2.3 The Habitats Directive provides protection for habitats and species of community interest through the establishment of the Natura 2000 network. Article 3 establishes the network of Special Areas of Conservation (SACs), while Article 6 requires Appropriate Assessment of plans or projects that may affect European sites. Annex I lists protected habitat types, Annex II identifies species requiring SAC designation, and Annex IV provides strict protection for certain species including marine mammals and some migratory fish species.

Directive 2000 / 60 / EC of the European Parliament and of the Council Establishing a Framework for Community Action in the Field of Water Policy (Water Framework Directive)

5.2.2.4 The Water Framework Directive establishes a framework for the protection and improvement of inland, transitional, coastal and groundwater bodies across the EU. Article 4 requires Member States to prevent deterioration in water body status and to protect, enhance and restore water bodies to achieve at least good status (good ecological and chemical status for surface waters, and good quantitative and chemical status for groundwater).

Directive 2006 / 113 / EC of the European Parliament and of the Council on the Quality Required of Shellfish Waters (Shellfish Waters Directive)

5.2.2.5 Directive 2006 / 113 / EC established water quality requirements for designated shellfish waters to support shellfish growth and protect aquatic ecosystems. Article 1 outlines the objectives of protecting shellfish waters, while Annex I specifies water quality parameters such as suspended solids, trace metals and dissolved oxygen levels. Its objectives are now largely addressed under the Water Framework Directive.

Directive 2008 / 56 / EC of the European Parliament and of the Council Establishing a Framework for Community Action in the Field of Marine Environmental Policy (Marine Strategy Framework Directive)

5.2.2.6 The Marine Strategy Framework Directive aims at protecting and restoring the health of European seas. The Directive requires that Member States achieve "Good Environmental Status" of their marine waters by assessing ecosystem conditions, setting targets and implementing monitoring and management measures.

Directive 2009 / 147 / EC of the European Parliament and of the Council on the Conservation of Wild Birds (Birds Directive)

5.2.2.7 The Birds Directive protects all naturally occurring wild birds within the European Union and requires the designation of Special Protection Areas (SPAs). Article 4 requires Member States to classify SPAs for species listed in Annex I and for regularly occurring migratory species. Article 5 prohibits deliberate killing, disturbance or destruction of birds and their nests.

National Legislation

Wildlife Act 1976, as amended including by the Wildlife (Amendment) Act 2000

5.2.2.8 The Wildlife Act is Ireland's principal legislation for the protection of wild fauna and flora and for the designation of Natural Heritage Areas. Part III of the Wildlife Act 1976 deals with the protection of wild birds, wild animals and plants by establishing core legal protections for Ireland's wildlife, which were strengthened by the Wildlife (Amendment) Act 2000. Part VI of the Wildlife Act 1976 deals with the legal mechanisms enabling the enforcement of designation and protection of wildlife including designated sites. The Wildlife (Amendment) Act 2000 also strengthened the enforcement framework and increased the effectiveness of the legislation regarding the protection of wildlife.

Planning and Development Act 2000 (as amended)

5.2.2.9 The Planning and Development Act transposes the Habitats and Birds Directives into Irish law and provides the statutory basis for the protection and management of European Sites (SACs and SPAs). Part XAB of the Act includes the requirement for Appropriate Assessment screening and Natura Impact Statement where necessary, and tests regarding adverse effects on the integrity of European Sites.

European Communities (Marine Strategy Framework) Regulations 2011, as amended European Communities (Marine Strategy Framework Directive) (Amendment) Regulations 2017 and European Communities (Marine Strategy Framework) (Amendment) Regulations 2018

5.2.2.10 These Regulations implement Ireland's obligations under the European Marine Strategy Framework Directive (MSFD) (2008/56/EC) to achieve Good Environmental Status in marine waters. The 2017 amendments strengthen requirements around biodiversity indicators, ecosystem structure, and human pressures, improving how marine ecosystems are assessed and protected.

European Communities (Water Policy) Regulations 2003 (S.I. No. 722 / 2003), as amended

5.2.2.11 These Regulations transpose the Water Framework Directive into Irish law and establish measures to protect and improve water quality in rivers, lakes, transitional and coastal waters. Regulation 12 sets environmental objectives to prevent deterioration in water body status. Regulation 13 provides objectives for River Basin Management Plans to achieve good ecological status in accordance with Article 4 of the Directive.

5.2.3 Policy Context

National Policy Context

National Marine Planning Framework (NMPF)

5.2.3.1 The NMPF (The Department of Housing, Planning and Local Government (DHPLG, 2021) is the overarching policy framework for the sustainable management of Ireland's marine areas. The framework requires that all marine activities are planned and undertaken in a manner that protects marine biodiversity and ecosystem functioning, setting out planning objectives for the upcoming 20 years. Policies relevant to the Proposed Works are included in Chapter 13: Energy – Offshore Renewable and Chapter 5: Environmental – Ocean Health, with policies on biodiversity, protected marine sites, non-indigenous species, water quality, seafloor and water column integrity and underwater noise.

Ireland's Marine Strategy – Article 17 Update, Part 2: Monitoring Programme (Article 11) 2021

5.2.3.2 The Article 17 update to Ireland's Marine Strategy Part 2: Monitoring Programme (Article 11) 2021 is an updated component of Ireland's Marine Strategy under the European Marine Strategy Framework Directive, specifically focused on how the condition of Ireland's marine environment is monitored. The update revises and expands monitoring programmes, updates methodologies to align with new environmental targets set out in 2020 and improves data collection.

Irish Whale and Dolphin Group (IWDG) Policy on Offshore Windfarm Development

5.2.3.3 The IWDG policy document was produced in 2018 and is recognised as good practice guidance in relation to marine mammals and offshore wind projects. Relevant sections of the guidance are Section 3 (Potential Impacts of Offshore Windfarms on Cetaceans) and Section 4 (Recommendations and Mitigation). These sections identify key pressures affecting marine mammals during offshore wind development and decommissioning activities, such as underwater noise, vessel activity, habitat disturbance and changes in prey availability. Mitigation measures are also noted, including recommended exclusion zones, marine mammal observers (MMObs), passive acoustic monitoring (PAM), soft-start procedures and seasonal restrictions.

Local Policy Context

5.2.3.4 The Proposed Works Offshore lie within the jurisdiction of Wicklow County. The Wicklow County Development Plan 2022 – 2028 is relevant to marine biodiversity and has informed the assessment of potential effects in this chapter, as well as their relevance to the Proposed Works Offshore is outlined in **Table 5.1.**

Table 5.1: Local policy relevant to Marine Biodiversity

Summary of relevant local policy provisions	How and where considered in the EIAR
Wicklow County Development Plan 2022 – 2028	
Chapter 17: Natural Heritage and Biodiversity **Section 17.4**: Natural Heritage & Biodiversity Objectives • **CPO 17.4**: To contribute, as appropriate, towards the protection of designated ecological sites including SACs and SPAs; Wildlife Sites (including proposed Natural Heritage Areas); Salmonid Waters; Flora Protection Order sites; Wildfowl Sanctuaries (see S.I. 192 of 1979); Freshwater Pearl Mussel catchments; and Tree Preservation Orders (TPOs). • **CPO 17.5**: Projects giving rise to adverse effects on the integrity of European sites (cumulatively, directly or indirectly) arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects shall not be permitted on the basis of this plan. • **CPO 17.8:** Ensure ecological impact assessment is carried out for any proposed development likely to have a significant impact on proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, Annex I habitats, or rare and threatened species including those species protected by law and their habitats. Ensure appropriate avoidance and mitigation measures are incorporated into development proposals as part of any ecological impact assessment.	The marine biodiversity impact assessment methodology is detailed in **Section 5.4.** The Proposed Works Offshore do not overlap with any designated sites. Proximity to nearby designated sites (SACs, SPAs) and their respective designated features are detailed in **Section 5.5.5.14**. Interactions between the Proposed Works Offshore and surrounding designated sites are considered within their respective receptor groups for subtidal and intertidal benthic ecology, fish and shellfish, marine mammals, and marine ornithology in **Section 5.5**. Impacts to offshore bats have been screened out in **Section 5.4.3** as bat presence within the Offshore Site is expected to be very infrequent, highly seasonal, and restricted to individual bats in transit (SPL, 2024; APEM, 2026c). Annex I habitats and protected species are considered in **Section 5.5**, within their respective receptor group. Embedded mitigation for the Proposed Works Offshore is detailed in **Table 5.10**.

5.3 Consultation and Engagement

5.3.1.1 The EIA Scoping Presentation was issued to prescribed bodies in March 2026 (see **Volume 2, Appendix 1.1: EIA Scoping Presentation**). **Table 5.2** sets out the key comments raised specific to marine biodiversity in response to the EIA Scoping Presentation and/or at meetings

with relevant stakeholders held during the preparation of this EIAR, with details of how these comments have been addressed within the EIAR. See **Stakeholder Consultation and Engagement Report** prepared in support of the application for planning permission.

Table 5.2: Summary of consultation and engagement feedback relevant to marine biodiversity

Comment	How and where considered in the EIAR
National Parks & Wildlife Service (NPWS), online meetings held on 24 November 2025 and 14 January 2026	
The seasonal timing of works should be considered in relation to mobile marine species and the potential for generation of displacement pressures, including consideration of the breeding period of sensitive species.	As described in **Section 5.5** and **Section 5.6** of **Volume 2, Chapter 5**, the potential for mobile sensitive species to be present in high numbers around the Offshore Site is low. Due to the short-term, temporary nature of the Proposed Works Offshore, the limited potential for considerable interaction with sensitive species and distance of the Offshore Site from important breeding sites, seasonal timing of works are not considered neccessary.
The role of sandbank morphology and associated bird predation modes should be considered in the context of monopile removal and associated potential for sandbank shape disruption.	Effects on marine ornithology resulting from changes to prey resources during seabed disturbance and removal of hard infrastructure have been considered in **Section 5.6.10** of **Volume 2, Chapter 5.** The effect of monopile (MP) removal on morphology of benthic habitats is considered in **Section 5.6.5** of **Volume 2, Chapter 5**. However, the Offshore Site location is not considered particularly important for bird predation due to lack of spawning grounds for key prey items such as sandeel.
Inland Fisheries Ireland (IFI), written response to EIA Scoping Presentation, 18 March 2026	
The turbine foundations which have been in place for over 20 years will now have become somewhat part of the natural environment comprising, predominantly soft sediment substrate, supporting established benthic communities and contributing to local biodiversity and productivity. Migratory species, including Salmon, Eels and Sea Trout (*Salmo Trutta*), use this corridor and full removal activities (noise, vibration, sediment resuspension) risk disrupting migration, feeding, and habitat use. Given the duration over which these structures have been in place and the ecological communities likely to have developed and adapted, Inland Fisheries Ireland recommends a minimum disturbance approach with removal being undertaken in the quickest timeframe as possible be adopted.	As described in **Section 5.5** of **Volume 2, Chapter 5: Marine Biodiversity**, the Offshore Site is not considered to support significant benthic communities or provide important migratory routes for migratory fish. All potential effects on migratory species, including migratory fish, have been assessed. As noted above, **Volume 2, Chapter 2: Description of Alternatives** and **Volume 3, Appendix 2.1: Comparative Assessment Report**, considered the level of disturbance and programme as part of the criteria used to compare different options for Proposed Works Offshore.
Consideration should be given to partial decommissioning options, such as leaving foundations below seabed level in situ, where appropriate. Such approaches may significantly reduce environmental disturbance and to both benthic communities in the area as well as minimum disturbance to migratory pathways and feeding grounds for Salmonids.	**Volume 2, Chapter 2** and **Volume 3, Appendix 2.1** have considered partial decommissioning options, and in relation to monopile (MP) foundations, partial removal, with MPs cut below seabed has been selected as the preferred alternative for Proposed Works Offshore.
Maritime Area Regulatory Authority, written response to EIA Scoping Presentation, 30 March 2026	
MARA wish to draw the applicants attention to MAC reference no; 2022-MAC-002), which was granted to Sure Partners Limited for the purposes of occupying the maritime area adjacent to the proposed application location. The permitted maritime usage is 'The construction and operation of an offshore windfarm and associated infrastructure (including decommissioning and other works required on foot of any Development Permission for such Offshore Wind Farm).' for a term of 45 years with a commencement date of the 23/12/2022.	Noted. The adjacent 2022-MAC-002, granted to Sure Partners Limited and associated planning application for ABWP Phase II development have been considered in the assessment of potential cumulative effects in EIAR **Volume 2: Chapters 4 – 8**, also summarised in **Volume 2, Chapter 10: Summary of Cumulative Effects**.

Comment	How and where considered in the EIAR
Depending on the full nature and extent of the activities proposed, MARA applications and licences may need to be considered in the context of cumulative impacts on the marine environment.	MARA applications and licences have been considered as part of the cumulative screening (**Volume 3, Appendix 1.2 of the EIAR**) undertaken to inform the Cumulative Effect Assessment (CEA) included in **Volume 2, Chapters 4 – 8**, as well as the **Appropriate Assessment (AA) Screening Report** prepared in support of the application for planning permission of the Proposed Works.
An Coimisiún Pleanála (ACP), Inspector's Report (ACP 321635-25) – Matters arising, 07 May 2026	
Importance of having up-to-date, site-specific survey information in establishing the baseline environment to enable the Commission to determine a future planning application. Methodologies adopted, modelling assumptions and any data gaps are to be clearly set out.	**Volume 2, Chapter 4 – 8** and accompanying appendices (**Volume 3**) specify information and data used to describe baseline conditions, justifying these are considered representative and indicate any assumptions or limitations found. These chapters / appendices also specify the assessment methodologies used, including any modelling undertaken, and assumptions / limitations associated with these, where relevant.
Potential impact on biodiversity, including seabed and benthic communities and species, and migratory and /or mobile species (incl. European sites, seabirds, bats, marine mammals, fisheries), in particular potential noise impacts during the decommissioning works, including the transmission of noise into the water column.	**Section 5.6** of **Volume 2, Chapter 5** includes the assessment of potential impacts on marine biodiversity (benthic ecology, fish and shellfish, marine mammals and marine ornithology), including justification for scoping out bats. Among others, this chapter is informed by underwater sound modelling presented separately in **Volume 3, Appendix 5.2.** All European Sites and associated marine species, including migratory species, have also been considered in the **Appropriate Assessment (AA) Screening Report** and **Natura Impact Statement (NIS)** (prepared in support of the application for planning permission of the Proposed Works).
Consideration of potential cumulative impacts, in particular with regards to the five live Irish Sea offshore renewable projects.	**Volume 3, Appendix 1.2** presents the cumulative screening undertaken for Proposed Works, which uses the cumulative Zone of Influence of Proposed Works to determine with "other developments" should be considered in the assessment of potential cumulative effects. **Volume 2, Chapters 4 – 8** include an assessment of potential cumulative effects, summarised in **Volume 2, Chapter 10**.

5.4 Impact Assessment Methodology

5.4.1 Overview

5.4.1.1 **Volume 2, Chapter 1** sets out the overarching approach that has been used in this EIAR. This section describes the assessment scope, baseline characterisation method and criteria used to determine the sensitivity of the receptors and magnitude of effects and sets out the significance criteria that have been used for the marine biodiversity assessment.

5.4.2 Relevant Guidance

5.4.2.1 This chapter has been prepared in accordance with the following guidance documents:

- Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2024);
- Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects (Department of Communications, Climate Action and Environment, 2018);
- Guidance on EIS and NIS preparation for Offshore Renewable Energy Projects (MacCabe Durney Barnes, 2017)
- Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters (NPWS, 2014);

- JNCC draft guidelines for minimising risks of injury to marine mammals from geophysical surveys (JNCC, 2025);
- The Convention for the Protection of the Marine Environment of the North-East Atlantic, or OSPAR Convention (the Convention for the Protection of the Marine Environment of the North-East Atlantic), produced the OSPAR List of Threatened and / or Declining Species and Habitats, considered to be of conservation concern within the northeast Atlantic (OSPAR Commission, 2008).
- Defining and managing *S. spinulosa* reefs (Gubbay, 2007);
- Guidelines for the Assessment of Dredged Material in Irish Waters (Cronin *et al*., 2019);
- Guidelines for the assessment of dredged material for disposal in Irish waters (Cronin *et al*., 2006);
- Best Practice Guidelines for the Irish Wind Energy Industry" (2021) provide practical guidance on the avoidance, mitigation and monitoring of ecological effects associated with wind energy developments;
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (Environment Protection Agency, 2022); and
- Impact Assessment Guidelines: Implementing the Mitigation Hierarchy from Concept to Construction (IEMA, 2024).

5.4.3 Assessment Scope

Technical Scope

5.4.3.1 The approach to assessment was presented in the EIA Scoping presentation (see **Volume 3, Appendix 1.1**) and has been refined during the preparation of this EIAR (see **Volume 2, Chapter 1**).

5.4.3.2 The potential impacts that have been scoped into the assessment are summarised in **Table 5.3.**

Table 5.3: Potential impacts scoped into the assessment for marine biodiversity

Potential impact	Potential effects scoped into the assessment
Temporary habitat loss / disturbance	Potential for effects of temporary habitat loss / disturbance on benthic ecology receptors and fish and shellfish during the Proposed Works Offshore
Increased Suspended Sediment Concentration (SSC) and deposition	Potential for effects of increased SSC and associated deposition on benthic ecology receptors and fish and shellfish during the Proposed Works Offshore
Disturbance / remobilisation of sediment bound contaminants	Potential for effects of disturbance / remobilisation of sediment bound contaminants on benthic ecology receptors and fish and shellfish during the Proposed Works Offshore
Alteration of seabed habitat from changes in physical processes	Potential for effects of alteration of seabed habitat from changes in physical processes on benthic ecology receptors during the Proposed Works Offshore
Removal of hard offshore infrastructure	Potential for effects of removal of hard offshore infrastructure on benthic ecology receptors during the Proposed Works Offshore
Injury and / or disturbance from underwater noise	Potential for effects of injury and / or disturbance from underwater noise on fish and shellfish and marine mammal receptors during the Proposed Works Offshore
Injury and / or disturbance from vessels activity	Potential for effects of injury and / or disturbance from vessels on marine mammal receptors during the Proposed Works Offshore
Increased risk of invasive and non-native species (INNS) introduction / spread	Potential for effects of increased risk of INNS introduction / spread on benthic ecology receptors during the Proposed Works Offshore
Changes in the fish and shellfish community affecting prey resources	Potential for effects of changes in the fish and shellfish community affecting prey resources on marine mammal and marine ornithology receptors during the Proposed Works Offshore
Disturbance and / or displacement of birds	Potential for effects of disturbance and / or displacement on marine ornithology receptors during the Proposed Works Offshore

5.4.3.3 Effects that are not considered likely to be significant have been scoped out of the assessment and these impacts will not be considered further. A summary of the effects scoped out of the assessment is presented in **Table 5.4**.

Table 5.4: Impacts scoped out of the assessment for marine biodiversity

Impact	Potential effects scoped out of the assessment
Accidental release of pollutants	The Detailed Offshore Decommissioning Environmental Management Plan (DEMP) and Detailed Vessel Management Plan (VMP) (see outline versions in **Volume 3, Appendices 3.4 and 3.5**) will include management measures and controls for accidental spills, minimising the likelihood and magnitude of any potential impacts associated with the accidental release of pollutants. It is therefore considered that any potential impacts from accidental release of pollutants are unlikely to become significant and this heading has been scoped out of the EIAR.
Increased collision risk	The temporary increase in vessel activity introduced by Proposed Works Offshore has potential to result in increased collision risks, mainly relevant to marine megafauna, including sea turtles, large fish species, such as basking sharks (*Cetorhinus maximus*), and marine mammals. Sea turtles are present in the Irish Sea, with distribution and presence driven by jellyfish abundance (APEM, 2026a; 2026b). However, sea turtle activity is considered concentrated around the southern and western coasts of Ireland rather than the eastern coast where the Offshore Site is located (APEM, 2026a; 2026b). During site-specific aerial surveys for the ABWP Phase II, no turtles were identified. Furthermore, only one leatherback turtle was recorded during observations undertaken as part of site investigations in 2020. Due to the limited extent of the Proposed Works Offshore, highly temporary nature of expected impacts and few records of turtle presence in the Study Area, and any potential environmental effects, including hose resulting from increased collision risk, to sea turtles are considered unlikely to become significant and has been scoped out. Basking sharks are known to migrate through the Irish Sea during spring and summer and migration routes cover large distances from the north of Scotland to North Africa. A single basking shark was recorded in October 2019 following two years of aerial surveys undertaken to support ABWP Phase II development. Whilst there is potential for basking shark to be present within the Sub Lease Area, high numbers are not considered likely (Southall *et al.*, 2005). Given the low number of sea turtle and basking shark occurrences within the Offshore Site, the probability of an encounter / collision is considered to be very low and unlikely to become significant. Accordingly, it is proposed that this heading is scoped out of the EIAR. There are several marine mammal species present in the Irish Sea and that occur within the Offshore Site. Increased collision risk has been assessed as part of the potential impact pathway "injury and / or disturbance from vessels activity", which has been scoped in the EIAR, see **Volume 2, Chapter 5**.
Visual and / or airborne noise disturbance to marine mammals	Site specific surveys for ABWP Phase II were undertaken between 2018 to 2020, and in 2025 (HiDef, 2020; APEM, 2024a; APEM 2026c). Between 2018 to 2020, only 15 grey seals and two harbour seals were identified in the marine mammal Study Area (APEM, 2024a; HiDef, 2020). Updated vantage point surveys conducted between June to November 2025 at the ABWP Phase II landfall site (approximately 7 km north of the Offshore Site) recorded a total of 30 individual grey seals and no harbour seals (APEM, 2026g). There are no specific haul-out sites recorded on this region of the coastline however (Morris and Duck, 2019). Overall presence of grey seals during the ABWP Phase II surveys from June to November 2025 was relatively low and suggested low level and opportunistic usage of the wider offshore area by grey seals (APEM, 2026g). Airborne noise generated by the Proposed Offshore Works is expected to be minimal, short-term and negligible from background noise levels at the Offshore Site. In addition, the nearest haul-out site recorded by APEM (2026g) is located approximately 7 km north of the Offshore Site, making visual disturbance highly unlikely. Therefore, visual and/or airborne noise disturbance to seals hauled out, from the Proposed Works Offshore is unlikely to be significant and has been scoped out.

Impact	Potential effects scoped out of the assessment
Increased SSC and associated deposition affecting marine mammals and marine ornithology	Increased SSC and associated deposition could occur where activities interact with the seabed, such as dredging, disposal and inter-array and offshore export cable removal works. However, marine mammals are known to forage in turbid waters with low visibility and therefore are considered to have low sensitivity to turbidity. For instance, harbour porpoise and harbour seals were found to forage under strong tidal flows in the UK demonstrating that elevated SSCs are not likely to cause a significant impact on marine mammals (Pierpoint, 2008; Marubini *et al*., 2009; Hastie *et al*., 2016). This is a result of marine mammals relying on hearing instead of vision for navigation, foraging and socialisation (Hanke *et al*., 2010; Hanke and Dehnhardt, 2013; Hanke *et al*., 2013). For instance, seals are able to sense their environment by detecting water movements using mystacial vibrissae (whiskers) when vision is compromised. Whilst there is the potential for elevated SSCs to be experienced by marine mammals as a result of activities such as dredging, disposal and cable removal works, it is expected that the majority of the sediments will settle to the seabed within one tidal excursion. As indicated in **Volume 2, Chapter 5**, suspended sediments are not anticipated to reach any key areas for marine mammals such as Special Areas of Conservation (SACs) designated for marine mammals or take place in proximity to seal haul outs. The area potentially effected by elevated SSCs is likely to be spatially limited in the context of the wider available habitat. Significant impacts from increased SSC and associated deposition are considered unlikely to affect marine mammals and have been scoped out from the EIAR. Diving birds may be susceptible to increases in SSC when foraging. However, any increase of SSC and associated deposition as a result of the Proposed Works Offshore are expected to be highly localised. Due to the high mobility of marine birds, alternative foraging habitat will be available elsewhere. Furthermore, any increase in SSC will occur close to the seabed and be highly temporary, beyond the foraging and diving depth of marine birds. Therefore, for marine ornithology, any potential impacts from increased SSC and deposition are considered unlikely to be significant and have been scoped out.
Disturbance / remobilisation of sediment bound contaminants affecting marine mammals and marine ornithology	Disturbance and/or remobilisation of sediment bound contaminants could occur where activities interact with the seabed (if contaminated), including dredging, disposal and cable removal works. Sampling undertaken (see **Volume 2, Chapter 4**) has demonstrated that contamination in the offshore sediments is low and at levels which are unlikely to result in any significant effects on marine mammals or marine ornithology. Furthermore, given the tolerance of marine mammals and marine ornithology to increased SSCs described above, significant impacts from disturbance/ remobilisation of sediment bound contaminants are considered unlikely and have been scoped out of the EIAR.

Impact	Potential effects scoped out of the assessment
Underwater noise affecting marine ornithology	Although there are limited empirical data on hearing sensitivity of birds underwater, mounting evidence indicates that diving birds detect and respond to underwater sound (Zeyl *et al*., 2022). Plunge diving birds include both 'pursuit-plunging' species such as gannets, cormorants and shearwaters and 'surface-plunging' species, particularly terns. The middle ears of such birds show adaptations, with most pronounced differences observed in deep-diving and underwater-pursuit species, for underwater hearing. However, some of the structural differences observed may also play a role in baroprotection, as well as underwater hearing (Zeyl et al., 2022), such that some level of protection from underwater sound is afforded. Available evidence from gannets and cormorants indicates the underwater hearing range of birds is from 1 to 4 kHz (Hansen *et al*., 2017). The Arklow Bank sandbank and wider area supports a typical Irish Sea seabird assemblage which includes the following diving species: the manx shearwater (*Puffinus puffinus*), gannets *(Morus bassanus*) and both common and little terns (*Sterna Hirundo* and *Sterna albifrons* respectively). However, there are no European or other protected sites designated for seabirds within 15 km of the Offshore Site, indicating that the presence of such birds on Arklow Bank is opportunistic and the area is part of these species significantly wider foraging ranges. The underwater sound resulting from Proposed Works Offshore activities includes non-impulsive sound sources such as from support vessels, dredging, dynamic positioning, jet lancing, underwater mechanical cutting, vibratory extraction tools and vessel noise from the jack-up barge (JUB). These sound sources are of low intensity and occurring in a very small localised area. There will be some impulsive sound from geophysical survey activities, such as sub-bottom profiling and ultra-short baseline (USBL) survey, but these sound sources will occur for a matter of days only. Thus, although some diving bird species can detect underwater sound, exposure is limited to the short periods when birds are submerged and is therefore intermittent. Given the temporary, localised and spatially limited nature of the underwater sound sources, any potential disturbance would be short-term, temporary and reversible. Birds are also highly mobile and able to use alternative foraging areas. Thus, significant effects on birds from underwater sound are therefore considered to be highly unlikely and this pathway can be scoped out from further consideration.
Removal of potential bird roosting / resting / nesting site	Given that Proposed Works offshore may be phased, Transition Pieces (TPs) and monopiles (MPs) may be temporary left *in situ* without operating wind turbine generators (WTGs), resulting in these becoming attractive spots for bird roosting, resting and/or nesting. However, the TPs lack shelves, ledges or other features suitable for nesting, and the temporary breaks between campaigns are considered unlikely to lead to the establishment of significant roosting / resting habitat. Accordingly, removal of potential offshore bird roosting / resting / nesting sites is unlikely to become significant and has therefore been scoped out of the EIAR.
Disturbance and / or displacement of offshore bats	ABWP Phase II offshore bat surveys (undertaken between 2021 – 2023 and 2024 – 2025) (SPL, 2024; APEM, 2026c) suggest that offshore bat activity at Arklow Bank is low and limited to occasional detections of three migratory species: Nathusius' pipistrelle (*Pipistrellus nathusii*), soprano pipistrelle (*Pipistrellus pygmaeus*), common pipistrelle (*Pipistrellus pipistrelllus*) and Leisler's bat (*Nyctalus leisleri*), during spring, summer and autumn periods. Offshore bat presence within the Offshore Site is expected to be very infrequent, highly seasonal, and restricted to individual bats in transit (SPL, 2024; APEM, 2026c). Furthermore, bat activity recorded by detectors on coastal headlands around the Arklow coastline was significantly higher than offshore activity (APEM, 2026c). However, despite an increased presence of bats around onshore headlands (APEM, 2026c), the onshore walkover survey at the landfall did not identify suitable roosts or foraging habitat (SPL, 2024). Therefore, disturbance and / or displacement of bats from the Proposed Works Offshore is unlikely to become significant and has been scoped out.

Spatial Scope

5.4.3.4 For the purposes of this assessment, Study Areas have been defined for each marine biodiversity receptor group. The Study Areas are defined to include predicted likely Zones of Influence (ZoI) of potential impact pathways (and potential significant effects) resulting from the Proposed Works Offshore for each receptor. The Marine Biodiversity Study Areas for different receptor groups are shown on **Figure 5.1**.

5.4.3.5 The Study Area is specific for each marine ecological receptor group and recognises the highly mobile nature of some receptors such as marine mammals and fish, and the likely impact pathways that could affect those receptors. A summary of the Study Area for each receptor is defined below:

- **Intertidal and Subtidal Benthic Ecology** – The Benthic Ecology Study Area has been defined based on sediment plume modelling presented in **Volume 3, Appendix 4.2**, which considers for the tidal excursion distance (the maximum distance sediment is expected to disperse and then deposit based on one tidal ellipse on a spring tide). Modelling indicates that for works occurring along the export cable route, the maximum dispersion of sediment is 48 m (up to the HWM). For dredging works occurring in the Sub Lease Area, the maximum sediment dispersion distance is 7 km in a north and south direction, and approximately 1 km to the east. This is illustrated on **Figure 5.1** and indicates the largest ZoI for intertidal and subtidal benthic habitats and species. Within the offshore export cable route, the maximum sediment dispersion distance is 48 m due to the limited works occurring along the offshore export cable route. Therefore, the Benthic Ecology Study Area is a maximum of 7 km (north and south) for the Sub Lease Area, and 48 m (north and south) for the offshore export cable route;
- **Fish and Shellfish** - The Fish and Shellfish Study Area has also been determined through sediment plume modelling presented in **Volume 3, Appendix 4.2**, which considers the tidal excursion distance (based on one tidal ellipse on a spring tide). The Fish and Shellfish Study Area is therefore defined as a 48 m (up to the HWM) for the offshore export cable route and a maximum of 7 km (north and south) for the Sub Lease Area, based on the largest ZoI for fish and shellfish habitats and species (furthest extent that sediment is likely to travel and be deposited following disturbance, i.e. the tidal excursion distance);
- **Marine Mammals** – The Marine Mammal Study Area encompasses the Offshore Site plus a 45.5 km buffer, up to the HWM, to account for the maximum extent of underwater noise disturbance as a result of activities associated with the Proposed Works Offshore (see **Volume 3, Appendix 5.2**); and
- **Marine Ornithology** – The Marine Ornithology Study Area is defined as a 50 km radius around the Proposed Works Offshore, based on review of surrounding designated sites with marine birds as qualifying features and presence of notable bird species in field surveys undertaken for ABWP Phase II (Aquafact, 2025). However, the Marine Ornithology Study Area also acknowledges that marine bird species are highly mobile and therefore local impacts could have potential implications on wider bird populations. Therefore, consideration is also given to large foraging distances exhibited by some seabird species, provided in Woodward *et al*. (2019).

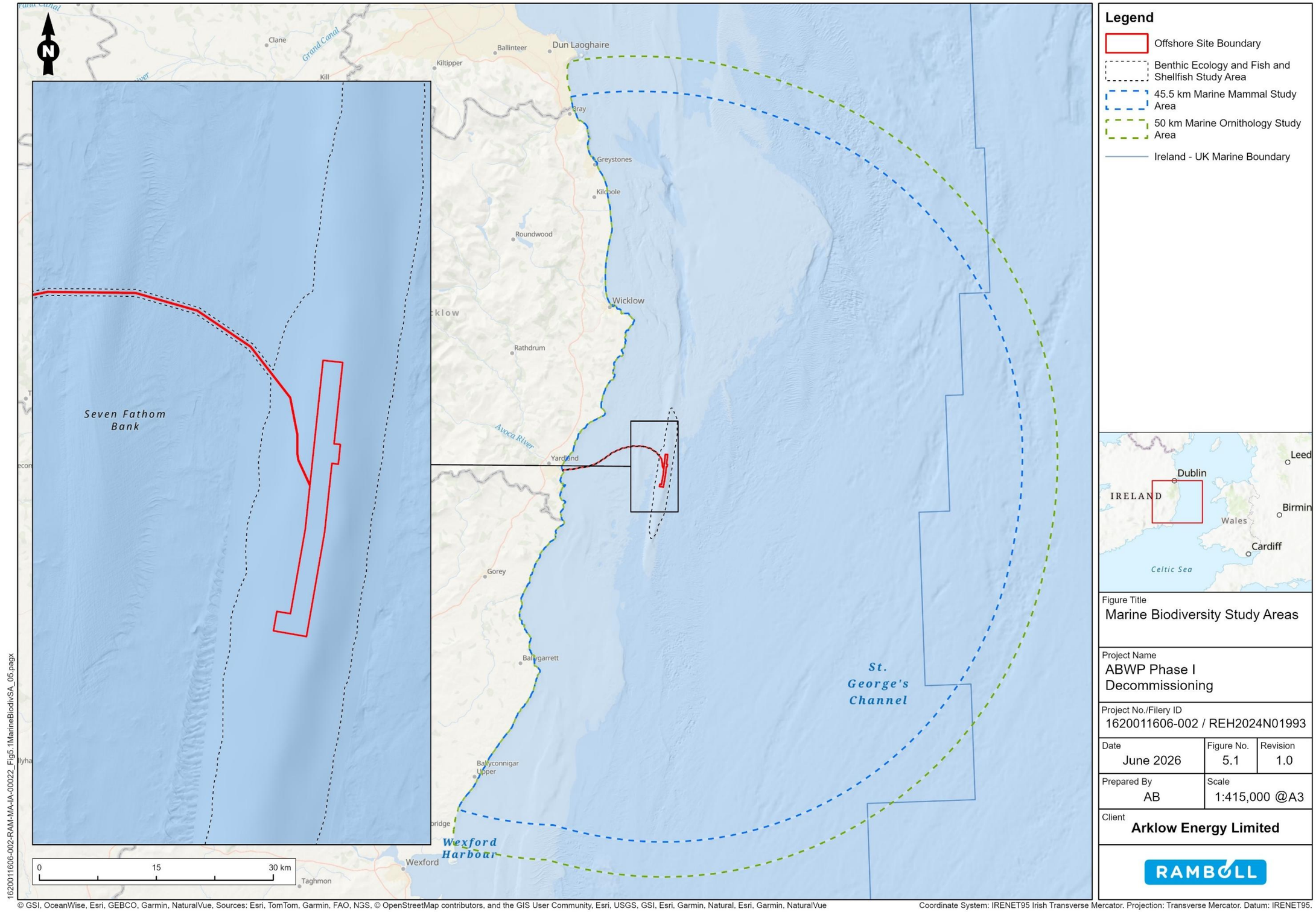


Figure 5.1: Marine Biodiversity Study Areas

Temporal Scope

5.4.3.6 The assessment has considered impacts arising during the Proposed Works Offshore which would be temporary and short-term (up to weeks / months) in nature, as well as any long-term residual impacts that may continue / arise following the completion of Proposed Works Offshore.

5.4.4 Baseline Characterisation Method

Desk Study

5.4.4.1 The Study Areas shown in **Figure 5.1** have been used to define the area over which a desk-based study has been conducted. Publicly available data sources were identified relevant to each marine receptor group and their corresponding Study Area.

5.4.4.2 Sources of information which have been reviewed and have informed this assessment include:

- European Marine Observation Data Network (EMODnet) Seabed Habitats Project data for broad-scale habitat maps of the Study Area (EMODnet, 2023);
- The Marine Life Information Network (MarLIN, 2026);
- Marine Plan Ireland (Department of Climate, Energy and the Environment, 2021);
- Spawning and nursery grounds for UK waters (Coull *et al*., 1998; Ellis *et al*., 2012);
- Landings data recorded in International Council for the Exploration of the Sea (ICES) statistical rectangles 34E3 and 34E4 (MMO, 2026);
- UK sea fisheries annual statistics report 2024 (MMO, 2026);
- ObSERVE annual 2024 report on aerial surveys of cetaceans and seabirds in Irish waters (Giralt Paradell *et al*., 2024);
- Modelled Distributions and Abundance of Cetaceans and Seabirds of Wales and Surrounding Waters (Evans and Waggitt, 2023);
- Modelled distribution maps of cetacean and seabird populations in the northeast Atlantic (Waggitt *et al*., 2019) which collates diverse survey datasets to maximise spatial and temporal coverage;
- Small Cetaceans in European Atlantic Waters and the North Sea (SCANS) IV (Gilles *et al*., 2023); and
- Arklow Bank Wind Park Phase II 2026 EIAR technical chapters and reports:
    - Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) (APEM, 2026a);
    - Volume III, Appendix 10.1: Fish, Shellfish and Sea Turtle Ecology Technical Report (APEM, 2026b);
    - Volume II, Chapter 13: Offshore Bats (Revised March 2026) (APEM, 2026c);
    - Volume III, Appendix 11.4: Seal Survey – 2025 Survey Report (Revised March 2026) (APEM, 2026d);
    - Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) (APEM, 2026e);
    - Volume III, Appendix 9.1: Benthic Subtidal and Intertidal Ecology Technical Report (Revised March 2026) (APEM, 2026f); and
    - Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026) (APEM, 2026g).

Site-specific Surveys

5.4.4.3 In order to inform this EIAR, a benthic-live habitat cable survey was undertaken in December 2025 to identify any areas of potential cable exposure and any areas of significant seabed variation along the offshore export and inter-array cable routes where benthic habitats of potential ecological interest could occur, see **Volume 3, Appendix 5.1**.

5.4.4.4 In addition, a number of previous site-specific monitoring surveys for ABWP Phase I, and site-specific surveys undertaken to inform ABWP Phase II EIAR have informed this chapter:

- Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report – June 2011 (GE Wind Energy, 2012);
- Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report – September 2021 (GE Wind Energy, 2022); and

- Arklow Bank Wind Park 2 – Environmental Impact Assessment Technical Reports (see above).

Baseline Data Limitations and Assumptions

5.4.4.5 The following data limitations and assumptions have been considered in this assessment:

- The availability of existing public data for marine mammals within the Irish Sea region is considered sufficient to characterise the baseline, and as such, provides a good understanding of the existing environment. However, as marine mammals are highly mobile, there are some limitations to the survey data which forms the basis of the baseline. In particular, SCANS surveys are conducted in UK and Irish waters in the summer (predominantly July) and therefore data regarding cetacean abundance and distribution are representative of summer distributions only; and
- Similarly, at-sea seal distributions presented in Carter *et al*. (2022) were estimated for harbour and grey seals during their foraging seasons, when they are anticipated to spend most of their time at sea. As such, although the available data only provide snapshots in time, the abundances are considered to represent the worst-case scenario and indicate the greatest abundances at sea likely to be encountered within the Marine Mammal Study Area.

5.4.5 Assessment Criteria

Overview

5.4.5.1 The overarching approach for the impact assessment in this EIAR is set out in **Volume 2, Chapter 1.** However, consideration has also been given to CIEEM guidelines for ecological assessment in Britain and Ireland (CIEEM, 2024), which allows for professional judgement in determining the significance of an effect. This section describes the technical methods used to determine the sensitivity of the receptors, the magnitude of impacts and sets out the significance criteria that have been used for the marine biodiversity assessment.

Receptor Sensitivity

5.4.5.2 When defining sensitivity, reference has been made to the criteria levels set out in **Volume 2, Chapter 1**. To determine sensitivity of the receptor specific to marine biodiversity, the vulnerability of the receptor to change, its ability to recover and adapt, and its inherent value or importance have also been considered, as presented in **Table 5.5**.

5.4.5.3 Vulnerability to impacts and the ability to recover differs between receptor groups and species, with timeframes for recovery ranging from short-term to long-term.

5.4.5.4 To assist in determining sensitivity of receptors identified in **Section 5.5**, existing information such as sensitivity scores provided in the Irish Government's ecological sensitivity analysis of the western Irish Sea (Marine Protected Area Advisory Group, 2023) have been used in addition to the definitions provided in **Table 5.5**. The analysis was developed to identify and safeguard areas of higher environmental sensitivity in the western Irish Sea in response to potential siting of offshore wind infrastructure and designation of new marine protected areas. The sensitivity analysis focuses on species and habitats listed as threatened or declining national and / or internationally, species and habitats of recognised ecological importance, areas of high biodiversity and a feature with high potential for restoration (Marine Protected Area Advisory Group, 2023). Features included in the sensitivity assessment had no existing sensitivity analysis from international sources such as the MarLIN Marine Evidence Based Assessment (MarESA) (MarLIN, 2026).

5.4.5.5 Where features have not been included in the ecological sensitivity analysis of the western Irish Sea (Marine Protected Area Advisory Group, 2023), the existing MarLIN MarESA (MarLIN, 2026) sensitivity analysis has been considered by this EIAR Chapter. The MarESA analysis uses a systematic approach to consider the biology and ecology of a feature and compile evidence of effect against given pressures to assess the likely sensitivity.

Table 5.5: Definition of terms relating to the sensitivity of the receptor specific to marine biodiversity

Sensitivity	Definition
Very high	Effect is very likely to cause a large-scale permanent change in habitat or species population structure and / or survival, with no capacity or ability to adapt behaviours. No ability for the habitat or animal to recover from the effect – permanent damage with no resilience. Where adverse effects to multiple key ecological functions could occur with no potential for recovery. Feature or receptor possesses key characteristics which contribute to the distinctiveness, rarity and character of the site or receptor at an international level. May include habitats or species which are a protected feature of an SAC or SPA in the Study Area (i.e., very high value).
High	Limited ability to adapt behaviour and / or limited ability for the habitat or animal to recover; effect may cause a change in both habitat / species population structure and survival of individuals. Habitat may not recover or may take several years to return to baseline conditions. Where adverse effects on multiple key ecological functions could occur with limited potential for recovery. Feature or receptor possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site or receptor at a national level. May include habitats or species which are a protected feature of an SAC or SPA that represent supporting habitat for an SAC or SPA (i.e. high value).
Medium	Some ability to adapt behaviour or exhibit some resilience; habitat / species population may be affected but survival rates not likely to be affected. Habitat likely to recover but over a period of months, up to a year. Where adverse effects on one or more key ecological functions could be sustained beyond the duration of the impact, but not at a level that would affect individual survival. Feature or receptor possesses key characteristics which contribute significantly to the distinctiveness and character of the site or feature at a regional level May include habitats or species which are of conservation importance but are not a qualifying feature of a designated site (i.e. medium value).
Low	Ability to adapt behaviour and / or tolerate the effect without any impact on habitat / species population and survival rates. Habitat likely to recover rapidly with minimal long-lasting change i.e. highly dynamic environment which is regularly subject to changing environmental conditions. Low sensitivity is such that adverse effects on ecological functions are likely to be very short-term and would not affect individual survival. Habitats or species that are limited in extent / distribution and are not subject to any protected status (i.e. low value).
Negligible	Very little or no effect on existing marine ecology receptors. Feature or receptor is generally tolerant and can accommodate the proposed change or is easy to replace. Habitats or species that are very common and widespread and not subject to any marine conservation status i.e. feature or receptor characteristics do not make a significant contribution to local distinctiveness nor are they designated.

Magnitude of Impact

5.4.5.6 When defining magnitude of impact, reference has been made to the criteria levels set out in **Volume 2, Chapter 1**. To determine the magnitude of impact specific to marine biodiversity, the scale, extent, duration and frequency, and severity of the change have also been considered, as detailed in **Table 5.6**.

Table 5.6: Definition of terms relating to the magnitude of an impact in relation to marine biodiversity

Magnitude of impact	Definition
High	Adverse - impact would lead to large scale effects on the distribution of receptors, with sufficient severity to affect the long-term viability of the population over a generational scale.
	Beneficial - long-term, large-scale increase in the population trajectory over a generational scale
Medium	Adverse - impact would lead to temporary changes in distribution of habitat and / or species with the potential for reduced population sizes, but not at a scale which would affect the population trajectory over generations. Impact would lead to permanent effects on individuals that may influence individual survival but not at a level that would alter population trajectory over a generational scale.
	Beneficial – impact that would result in increased size and supporting habitat extent.
Low	Adverse - impact would result in some measurable change in attributes, quality or vulnerability (e.g. minor population disturbance), minor loss of habitat, or detrimental alteration to species at an individual level but is unlikely to be measurable at a population level.
	Beneficial - Minor benefit to, or addition of, one (maybe more) key characteristics; some beneficial impact on attribute (e.g. increase in extent of habitat or population sizes) but is unlikely to be measurable at a population level.
Negligible	Adverse - impact would result in a very minor, temporary loss or detrimental alteration to habitat, species or individuals which would not affect the population.
	Beneficial - very minor benefit to habitat or species, or positive addition of one or more characteristics at an individual level but which would not benefit the species at a population level.
No change	No change to habitat or species population / individuals.

Significance of Effect

5.4.5.7 The significance of the effect upon marine biodiversity is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The method employed for this assessment is presented in **Table 5.7.**

Table 5.7: Matrix used for the assessment of the significance of the effect in relation to marine biodiversity

Sensitivity of receptor	Magnitude of impact				
	No change	**Negligible**	**Low**	**Medium**	**High**
Negligible	Neutral	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Neutral	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Neutral	Negligible or minor	Minor	Moderate	Moderate or major
High	Neutral	Minor	Minor or moderate	Moderate or major	Major
Very high	Neutral	Minor	Moderate or major	Major	Major

5.4.5.8 Following the classification of an effect using this methodology, a clear statement will then be made as to whether that effect is significant or not significant. Major and moderate effects are considered to be significant, whilst minor and negligible effects are considered to be not significant. However, professional judgement will also be applied in reaching conclusions as to the significance of effects. Typical definitions for the classification of effects are shown in **Table 5.8.**

Table 5.8: Significance definitions relevant to marine biodiversity

Significance classification	Definition	Significant effect
Major	A large and detrimental change to a valuable / sensitive receptor, likely exceeding an accepted threshold. A large and beneficial change, resulting in enhancements in baseline conditions, transitioning from previously poor conditions to new legal compliance, or making a major contribution to national goals These effects may represent key factors in the decision-making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional scale. Major effects may relate to features that are unique and irreplaceable.	Significant
Moderate	A medium scale change that, although not beyond an accepted threshold, is still considered to be generally unacceptable, unless offset by significant positive benefits of the project. If adverse, these effects are likely to be important at a regional or local scale and on their own could influence on decision making. A positive moderate effect is a medium scale change that is improves baseline conditions sufficiently to contribute to guideline targets.	Significant
Minor	A minor adverse change that remains within legal and planning policy limits. minor positive change that is unlikely to significantly impact the overall balance of considerations. These effects might be raised as local issues and could be relevant to the detailed design of a project, but they are unlikely to be critical in the decision-making process.	Not significant
Negligible	A very small change that is so inconsequential it can be considered acceptable to disregard. These effects fall below perceptible limits, lie within normal variations, or fall within the margin of forecasting error. They are unlikely to influence decision-making.	Not significant
Neutral	No noticeable change or effects within normal bounds of variation.	Not significant

5.4.6 Key Parameters for Assessment

Maximum Design Scenario

5.4.6.1 The maximum design scenario (MDS) for each impact pathway identified in **Section 5.4.3** has been selected as that having the potential to result in the greatest effect on an identified receptor or receptor group. The MDS presented in **Table 5.9** has been selected from the parameters provided in **Volume 2, Chapter 3** and methodology outlined in **Volume 2, Chapter 1.**

Table 5.9: MDS relevant for the assessment of potential impacts on marine biodiversity

Impact	MDS	Explanation
Temporary habitat loss / disturbance	Maximum of total temporary habitat loss is 0.357 km^2, comprised of: • Maintenance dredging for vessel access to Sub Lease Area, maximum area of 0.287 km^2 (which represents 21.3% of the total Sub Lease Area); – Total volume of dredged material for -4.5 m Lowest Astronomical Tide (LAT) = 38,139.75 m^3; – Total volume of dredged material for -6.5 m LAT = 86,000 m^3; • Disposal of dredged material within the Sub Lease Area; • A Jack-Up Barge (JUB) will also be required for works. Based on a standard diameter of 2 m per spud leg, there is expected to be approximately 12.57 m^2 (12.57 $x10^{-5}$ km^2) of habitat disturbance per jack-up event, with eight jack-up events expected in total. Therefore, a total area of 0.0001 km^2; • All exposed hard infrastructure (WTG foundations, met mast, inter-array and offshore export cable) will be removed across an area of 0.07 km^2: – Removal of seven WTG foundations and one met mast: ○ Each foundation is 5.1 m in diameter, total area for seven WTG foundations is 0.000143km^2 in area; ○ The met mast is 1.8 m in diameter and 0.000002 km^2 in area; ○ Seabed material inside foundation to be removed using internal dredge pump fitted with water jets or cutter head to remove material which has become compacted over time – up to 171 m^3 in each foundation; ○ Target dredging depth of 3 m below target cutting depth; ○ Dredged material from within foundation to be released via pipeline within 100 m of foundation location during dredging activity; – Removal of residual scour protection and release of material back onto the seabed: ○ Use of grab dredger to grab sandbags; ○ Recovery of sandbags and release of material back onto seabed via casting; – Removal of inter-array cables: ○ Total length of 7.4 km and maximum footprint of 3 m width for running method, total seabed disturbance of 0.02 km^2; ○ Unburial of the cables using grapnel run or similar; ○ Pulled out using clamps and cable puller towed slowly across seafloor; – Removal of offshore export cable: ○ Total length of 15.6 km and maximum footprint of 3 m width for running method, total seabed disturbance of 0.05 km^2; ○ Disconnection / cut of the export cable within the vicinity of the landfall, with some localised excavation potentially required if the export cable is buried within this area, and grabbed from the multicat vessel; and ○ Unburial of cable with a running method using a grapnel run or similar, pulled out using clamps and a cable puller.	This represents the maximum extent of temporary habitat loss and disturbance during the Proposed Works Offshore, based on the complete removal of all exposed infrastructure.
Increased Suspended Sediment	Increased SSC to be produced by:	The maximum distance over which sediment could

Impact	MDS	Explanation
Concentration (SSC) and deposition	• Maintenance dredging for vessel access to Sub Lease Area, maximum area of 0.287 km^2 (which represents 21.3% of the total Sub Lease Area); – Total volume of dredged material for -4.5 m LAT = 38,139.75 m^3; – Total volume of dredged material for -6.5 m LAT = 86,000 m^3; • Disposal of dredged material within the Sub Lease Area; • A JUB will also be required for works. Based on a standard diameter of 2 m per spud leg, there is expected to be approximately 12.57 m^2 (12.57 $x10^{-5}$ km^2) of habitat disturbance per jack-up event, with eight jack-up events expected in total. Therefore, a total area of 0.0001 km^2; • All exposed hard infrastructure (WTG foundations, met mast, inter-array and offshore export cable) will be removed across an area of 0.07 km^2: – Removal of seven WTG foundations and one met mast: ○ Each foundation is 5.1 m in diameter, total area for seven WTG foundations is 0.000143km^2 in area; ○ The met mast is 1.8 m in diameter and 0.000002 km^2 in area; ○ Seabed material inside foundation to be removed using internal dredge pump fitted with water jets or cutter head to remove material which has become compacted over time – up to 171 m^3 in each foundation; ○ Target dredging depth of 3 m below target cutting depth; ○ Dredged material from within foundation to be released via pipeline within 100 m of foundation location during dredging activity; – Removal of residual scour protection and release of material back onto the seabed: ○ Use of grab dredger to grab sandbags; ○ Recovery of sandbags and release of material back onto seabed via casting; – Removal of inter-array cables: ○ Total length of 7.4 km and maximum footprint of 3 m width for running method, total seabed disturbance of 0.02 km^2; ○ Unburial of the cables using grapnel run or similar; ○ Pulled out using clamps and cable puller towed slowly across seafloor; – Removal of offshore export cable: ○ Total length of 15.6 km and maximum footprint of 3 m width for running method, total seabed disturbance of 0.05 km^2; ○ Disconnection / cut of the export cable within the vicinity of the landfall, with some localised excavation potentially required if the export cable is buried within this area, and grabbed from the multicat vessel; and ○ Unburial of cable with a running method using a grapnel run or similar, pulled out using clamps and a cable puller. Sediment plume modelling indicates sediment plume could travel a maximum of 7 km (see **Section 5.4.3**).	be transported is based on sediment plume modelling found in **Volume 3, Appendix 4.2**.

Impact	MDS	Explanation
Disturbance / remobilisation of sediment bound contaminants	The MDS, as described above, for changes to SSC and associated deposition during the decommissioning phase.	The maximum distance over which sediment and therefore sediment bound contaminants could be transported is based on sediment plume modelling found in **Volume 3, Appendix 4.2**.
Alteration of seabed habitat from changes in physical processes	The MDS, as described above, for temporary habitat loss / disturbance during the decommissioning phase with a maximum total temporary habitat loss / disturbance of 0.357 km^2.	Alteration of seabed habitat is expected to be limited to the footprint of the Proposed Works Offshore and determined by areas of temporary habitat loss.
Removal of exposed hard offshore infrastructure	• All exposed hard infrastructure will be removed; • Removal of hard offshore infrastructure where they are colonised by benthic species; • Limited to the footprint and length of the TP / MP colonised by benthic species and inter-array / offshore export cable serving as substratum for benthic growth; and • Total footprint of hard infrastructure removal = 0.07 km^2.	Removal of hard offshore infrastructure to be limited to the footprint of the Proposed Works Offshore.
Injury and / or disturbance from underwater noise	Underwater noise to be generated by: • Pre-decommissioning geophysical surveys: – Multi-beam Echosounder (MBES); – Side Scan Sonar (SSS); – Sub-Bottom Profilers (SBP); – Ultra-Short-Baseline (USBL) acoustic positioning systems; – Cutter suction dredger, backhoe dredger or plough dredger; – Duration / frequency: ○ Three days / max twice per year (when covering the Offshore Site only); ○ 10 days / max twice per year (when also covering the offshore export cable route); • Vessel use with dynamic positioning: – Survey vessel; – Small tugboat(s); – Small split hopper barge; – Barge equipped with plough; – JUB; – Transport barge; – Multicat vessel; and – Minimum of 305 vessel trips between Offshore Site and available Irish port during Proposed Works Offshore.	Underwater noise generation with potential to cause injury and / or disturbance is based on underwater sound modelling found in **Volume 3, Appendix 5.2**.

Impact	MDS	Explanation
Injury and / or disturbance from vessels activity	• Use of around six vessels for Proposed Works Offshore: – Survey vessel; – Small tugboat(s); – Small split hopper barge; – Barge equipped with plough; – JUB; – Transport barge; – Multicat vessel; and • Minimum of 305 vessel trips between Offshore Site and available Irish port during Proposed Works Offshore.	
Increased risk of invasive and non-native species (INNS) introduction / spread	• Vessel presence: – Use of around six vessels for Proposed Works Offshore: – Survey vessel; – Small tugboat(s); – Small split hopper barge; – Barge equipped with plough; – JUB; – Transport barge; – Multicat vessel; – Minimum of 305 vessel trips between Offshore Site and available Irish port during Proposed Works Offshore; and • All exposed hard infrastructure will be removed.	The main pathway for INNS introduction / spread is vessel activity and associated equipment introduced by Proposed Works Offshore.
Changes in the fish and shellfish community affecting prey resources	Maximum of total temporary habitat loss is 0.357 km^2, comprised of: • Maintenance dredging for vessel access to Sub Lease Area, maximum area of 0.287 km^2 (which represents 21.3% of the total Sub Lease Area); – Total volume of dredged material for -4.5 m Lowest Astronomical Tide (LAT) = 38,139.75 m^3; – Total volume of dredged material for -6.5 m LAT = 86,000 m^3; • Disposal of dredged material within the Sub Lease Area; • A Jack-Up Barge (JUB) will also be required for works. Based on a standard diameter of 2 m per spud leg, there is expected to be approximately 12.57 m^2 (12.57 $x10^{-5}$ km^2) of habitat disturbance per jack-up event, with eight jack-up events expected in total. Therefore, a total area of 0.0001 km^2; • All exposed hard infrastructure (WTG foundations, met mast, inter-array and offshore export cable) will be removed across an area of 0.07 km^2: – Removal of seven WTG foundations and one met mast: ○ Each foundation is 5.1 m in diameter, total area for seven WTG foundations is 0.000143km^2 in area; ○ The met mast is 1.8 m in diameter and 0.000002 km^2 in area;	The main pathways for changes in fish and shellfish communities are related to habitat loss, and underwater noise affecting fish and shellfish receptors.

Impact	MDS	Explanation
	○ Seabed material inside foundation to be removed using internal dredge pump fitted with water jets or cutter head to remove material which has become compacted over time – up to 171 m^3 in each foundation; ○ Target dredging depth of 3 m below target cutting depth; ○ Dredged material from within foundation to be released via pipeline within 100 m of foundation location during dredging activity; – Removal of residual scour protection and release of material back onto the seabed: ○ Use of grab dredger to grab sandbags; ○ Recovery of sandbags and release of material back onto seabed via casting; – Removal of inter-array cables: ○ Total length of 7.4 km and maximum footprint of 3 m width for running method, total seabed disturbance of 0.02 km^2; ○ Unburial of the cables using grapnel run or similar; ○ Pulled out using clamps and cable puller towed slowly across seafloor; – Removal of offshore export cable: ○ Total length of 15.6 km and maximum footprint of 3 m width for running method, total seabed disturbance of 0.05 km^2; ○ Disconnection / cut of the export cable within the vicinity of the landfall, with some localised excavation potentially required if the export cable is buried within this area, and grabbed from the multicat vessel; and ○ Unburial of cable with a running method using a grapnel run or similar, pulled out using clamps and a cable puller. Underwater noise affecting fish and shellfish receptors: • Underwater noise to be generated by: – Pre-decommissioning geophysical surveys: ○ MBES; ○ SSS; ○ SBP; ○ Cutter suction dredger, back hoe dredger or plough dredger; – Duration / frequency: ○ Three days / max twice per year (when covering the Offshore Site only); ○ 10 days / max twice per year (when also covering the offshore export cable route); – Vessel use with dynamic positioning: ○ Survey vessel; ○ Small tugboat(s); ○ Small split hopper barge; ○ Barge equipped with plough; ○ JUB; ○ Transport barge;	

Impact	MDS	Explanation
	○ Multicat vessel; and ○ Minimum of 305 vessel trips between Offshore Site and available Irish port during Proposed Works Offshore.	
Disturbance and / or displacement of birds	• Vessel presence: – Use of around six vessels for Proposed Works Offshore: – Survey vessel; – Small tugboat(s); – Small split hopper barge; – Barge equipped with plough; – JUB; – Transport barge; – Multicat vessel; and – Minimum of 305 vessel trips between Offshore Site and available Irish port during Proposed Works Offshore. • Lighting and marking around the Sub Lease Area where Proposed Works Offshore will take place: – 12 buoys across a total length of 4.817 km and a total width of 1.605 km; – Each buoy shall be marked with a 'Yellow Special Mark' and a yellow light used in a flashing pattern, synchronised with other buoys, with a light range of 5 nm (approximately 9.2 km); and – Once the work area has been established, flashing yellow marine lanterns on the WTGs, currently used in the operation phase as described in **Volume 3, Appendix 3.7**, shall be turned off.	The main pathway for disturbance and/or displacement of birds is through vessel activity and required lighting and marking during Proposed Works Offshore.

Embedded Mitigation

5.4.6.2 As set out in **Volume 2, Chapter 1** several embedded mitigation measures have been adopted as part of the Proposed Works Offshore to reduce the potential for impacts on marine biodiversity.

5.4.6.3 Embedded mitigation includes the following measures as identified in the Institute of Environmental Management and Assessment (Institute of Sustainability and Environmental Professionals (ISEP) (formerly IEMA) Impact Assessment Guidelines (IEMA, 2024):

- "measures included as part of the project design" (also referred to as primary mitigation in IEMA, 2015); and
- "actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects" (also referred to as tertiary mitigation in IEMA, 2015).

5.4.6.4 Embedded mitigation measures have been taken into account as part of the initial assessment presented in **Section 5.4.7** (i.e., the initial determination of impact magnitude and significance of effects assumes implementation of these measures). This ensures that the measures that Arklow Energy is committed to are considered in the assessment of effects. This approach is in line with EPA guidance, which states that 'in an EIAR, it may be useful to describe avoidance measures that have been integrated into the project proposal' (EPA, 2022).

5.4.6.5 Where an assessment identifies likely significant adverse effects, additional mitigation measures may be applied. These are "actions that will require further activity to achieve the anticipated outcome", also referred to as secondary mitigation measures in IEMA (2024).

5.4.6.6 The embedded mitigation measures relevant to marine biodiversity are outlined in **Table 5.10** and will be implemented in accordance with the requirements of any planning permission granted under Section 291 of the Planning and Development Act 2000, as amended.

Table 5.10: Embedded mitigation relevant to marine biodiversity implemented as part of the Proposed Works.

Embedded mitigation reference	Description
Development and adherence to the Detailed Offshore Decommissioning Environmental Management Plan (DEMP)	**Volume 3, Appendix 3.4: Outline Offshore DEMP** presents standard industry practice and legal requirements for environmental management and mitigation that will be implemented as part of the Proposed Works Offshore. The outline Offshore DEMP also summarises any required additional mitigation identified in relevant EIAR chapters, serving as a framework for the future decommissioning contractor(s) to develop in detail before decommissioning works commence.
Development and adherence to the Detailed Vessel Management Plan (VMP)	**Volume 3, Appendix 3.5: Outline VMP** defines best-practice vessel management measures, including transit routes, speed restrictions, timing of activities, pollution prevention, and crew environmental awareness, to minimise disturbance, collision risk, and ecological harm.
	The Detailed VMP will include requirements under the International Convention for the Control and Management of Ships' Ballast Water and Sediments with the aim of preventing the spread of marine INNS (International Maritime Organisation (IMO), 2024) and the IMO Guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (IMO, 2023).
Development and adherence to the Detailed Offshore Waste Management Plan (WMP)	**Volume 3, Appendix 3.8: Outline Offshore WMP** establishes a clear framework for the identification, handling, and management of wastes arising from Proposed Works Offshore, ensuring compliance with standard industry practice and relevant waste legislation, and the principles of the waste hierarchy.

5.4.7 Assumptions and Limitations of the Assessment

5.4.7.1 Sensitivity of habitats and species vary depending on several different factors including location. Therefore, when assessing the significance of an effect, the worst-case sensitivity has been used.

5.5 Baseline Characterisation

5.5.1 Overview

5.5.1.1 This section describes the existing baseline characteristics as well as the future baseline relevant to marine biodiversity.

5.5.1.2 The baseline is split into different marine receptor groups of benthic subtidal and intertidal ecology, fish and shellfish, marine mammals and marine ornithology.

5.5.2 Intertidal and Subtidal Benthic Ecology

Intertidal Benthic Habitats

5.5.2.1 The shallow subtidal and intertidal environment where the offshore export cable makes landfall is strongly influenced by the presence of the Arklow Harbour breakwater, which supports typical rocky-shore biota such as algal growth and lichen communities on exposed rock surfaces (Uisce Éireann, 2018). Intertidal rocky shore habitat extends north of the landfall location for approximately 2 km before transitioning into coarse sand and cobbles with littoral shingle towards the lower shore (APEM, 2026e). To the south of the breakwater, the intertidal area is characterised by a sandy beach with pockets of cobble, pebble and gravel beach material interspersed with rocky shore habitat.

Subtidal Benthic Habitats

5.5.2.2 A baseline dredge sampling survey of Arklow Bank for the AWBP Phase I project took place in 2000 and 2001, followed by monitoring surveys (beam trawls, anchor dredge, and Particle Size Analysis (PSA)) between 2004 to 2011. Most recently, Remotely Operated Vehicle (ROV) video surveys were completed along the AWBP Phase I cable at areas of exposed cable and along the inter-array cables (see **Volume 3, Appendix 5.1**). For ABWP Phase II, video and grab sample surveys took place around the wider Arklow Bank region in 2011 and 2024. Information informing the benthic ecology baseline of the Proposed Works Offshore has therefore been informed by sediment sampling surveys in 2011, 2021, 2024 and 2025, and ROV video footage from 2025 and 2026 (GE Wind Energy, 2012; GE Wind Energy, 2022; Aquafact 2025; APEM, 2026f; Alpha Marine, 2026).

5.5.2.3 Regional seabed habitat distribution within and surrounding the Offshore Site was also informed by the Marine Plan Ireland Activities map of Benthic Broad Habitat Types (Department of Climate, Energy and the Environment, 2021) and indicative seabed habitat types provided on EMODnet (2023).

5.5.2.4 Subtidal habitat in the Offshore Site is largely characterised by coarse, sandy and muddy sediments, with increasing infralittoral sand and mud becoming the dominant habitat closer to the landfall (EMODnet, 2023).

5.5.2.5 The Sub Lease Area within the Offshore Site is characterised by a long subtidal sandbank (Arklow Bank), composed of offshore circalittoral sand. The seven existing WTGs and metmast are located on this sandbank, which is surrounded by a mosaic of offshore circalittoral sand and offshore circalittoral coarse sediment habitats. The seabed inshore of Arklow Bank is characterised by circalittoral coarse sediment and offshore circalittoral sand and mud, with infralittoral sand becoming the dominant habitat closer to the coastline. Further offshore, to the east of Arklow Bank, the seabed is dominated by coarse sediment and mixed sediment (Department of Climate, Energy and the Environment, 2021).

5.5.2.6 Site-specific baseline and monitoring PSA surveys suggest that the dominant sediment types across the Offshore Site have been consistent across surveys. Using Folk (1954) sediment classification, the wider Arklow Bank region is dominated by sands and gravelly sands (GE Wind Energy, 2022). Within the Sub Lease Area, the bank is classified by slightly gravelly sands. Further offshore, sediments are a mix of gravelly sands and sandy gravels. To the west of the

Sub Lease Area, further inshore, samples are a mix of gravelly sands and slightly gravelly sands. Only two samples were classified as gravel, both of which are located approximately 1 km north of the Sub Lease Area (GE Wind Energy, 2022).

5.5.2.7 Direct biotope comparisons between the initial baseline survey and subsequent monitoring surveys are difficult due to differing sampling protocols, sampling station locations and classification systems. However, high level comparisons of biotope descriptions between surveys suggests that the habitats across the Offshore Site have remained largely unchanged since the initial baseline survey, so the most recent seabed samples from the Phase II surveys provide an accurate report of the seabed (Aquafact, 2025).

5.5.2.8 The seabed samples around the Sub Lease Area have been classified as the biotope 'SS.SSa.IFiSa.IMoSa' – Infralittoral mobile clean sand with sparse fauna (European Union Network for Information System (EUNIS) code MB5231), aligning with the initial baseline study (GE Wind Energy, 2012; Aquafact, 2025). These samples had the lowest number of phyla across the survey area, with over 70% of the faunal abundance being infaunal, sediment-dwelling amphipods *Gastrosaccus spinifer* and *Pontocrates arcticus*, nematodes, and polychaete *Ophelia borealis* (Aquafact, 2025). A lack of epifaunal species was also recorded over each of the benthic surveys for ABWP Phase I and ABWP Phase II on Arklow Bank.

5.5.2.9 In contrast, the highest species diversity has been recorded in areas of mixed sediments of sandy shell, gravel and cobbles in the northwest, southwest and southeast of Arklow Bank and inshore along the offshore export cable route.

5.5.2.10 Multivariate analysis of grab sample faunal data from the AWBP Phase II survey revealed that the wider offshore survey area can be characterised by six statistically significant biotope groupings across the 26 stations sampled (Aquafact 2025). These biotopes, their respective EUNIS codes and dominant taxa are listed in **Table 5.11** and sampling stations are shown in **Figure 5.2.**

Table 5.11 Dominant biotopes from grab sample faunal analysis (Aquafact 2025)

Dominant biotope	EUNIS code	Dominant taxa
SS.SSA.IFiSa.NcirBat *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand	MB5233	Polychaetes: • *Nephtys cirrosa* • *Magelona johnstoni* • *Notomastus* sp. • *Spio goniocephala* Crustacea • *Megaluropus agilis* • *Bathyporeia* spp. • *Bathyporeia elegans* • *Gastrosaccus spinifer*
Mosaic of two biotopes: • **SS.SCS.CCS.MedLumVen** *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel • **SS.SCS.ICS.HeloMsim** *Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in Atlantic infralittoral mobile coarse sand	MC3212 and MB3234	Polychaetes: • *Sphaerosyllis hystrix* • *Protodrilus* spp. Amphipods: • *Socarnes erythrophthalmus* • *Leptocheirus hirsutimanus* Bivalves • Mytilidae
SS.SCS.CCS.MedLumVen *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel	MC3212	Polychaetes: • *Leiochone* spp. • Ampharetidae • Serpulidae • *Notomastus* Amphipods

Dominant biotope	EUNIS code	Dominant taxa
		• *Urothoe elegans* • *Ampelisca diadema* Molluscs • *Abra* spp. • *Leptochiton cancellatus*
Mosaic of two biotopes: • **SS.SMX.CMx.FluHyd** *Flustra folicacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment • **SS.SBR.PoR.SspiMx** *Sabellaria spinulosa* on stable circalittoral mixed sediment	MC4214 and MC2211	Annelids • Serpulidae • *Spirobranchus spp.* • *Spirobranchus lamarcki* • *Sabellaria spinulosa* • *Sabellaria alveolata* • *Sphaerosyllis bulbosa* • *Leiochone* • *Mediomastus fragilis* • Golfingiidae Bivalves • *Abra* spp. Nematoda
SS.SSa.IFiSa.IMoSa Infralittoral mobile clean sand with sparse fauna	MB5231	Amphipods: • *Gastrosaccus spinifer* • *Pontocrates arcticus* Nematodes Polychaetes: • *Ophelia borealis*

5.5.2.11 Along the offshore export cable route, the seabed is primarily composed of sand, shell, and pebble substrates, with minimal hard substrate present. The cable is buried beneath sediment along most of the surveyed route, and no marine growth was observed on the limited exposed sections (Alpha Marine, 2026). ROV footage indicates that habitats along the offshore export cable route are dominated by subtidal mixed sediments, transitioning to predominantly subtidal sand closer to the Sub Lease Area. This pattern is consistent with the biotope distribution shown in **Figure 5.2** and previous benthic surveys (GE Wind Energy, 2021).

5.5.2.12 ROV footage was also collected along the inter-array cables connecting the WTGs (Alpha Marine, 2026). At each turbine, cables are routed through a flexi-hose duct (part of the cable protection system) that extends 10.7 m in length. Unmanned Aerial Vehicle (UAV) footage shows that these flexi-hoses are partially buried at the base of the WTGs. In contrast to the offshore export cable, exposed sections of the inter-array cables flexi-hoses inspected were found to support blue mussels (*Mytilus edulis*), accounting for between 50% and 100% cover in some areas, and barnacles (*Balanidae* spp.). An observation log of the ROV footage is provided in **Volume 3, Appendix 5.1**.

5.5.2.13 There is also some evidence of the presence of kelp fronds (*Laminaria spp.*) growing around the WTG foundations (particularly around T3 and T7), as observed in the live cable survey (**Volume 3, Appendix 5.1**). It should be noted that marine growth / kelp has regularly been removed from the WTGs for maintenance and integrity purposes, typically over a four-year cycle.

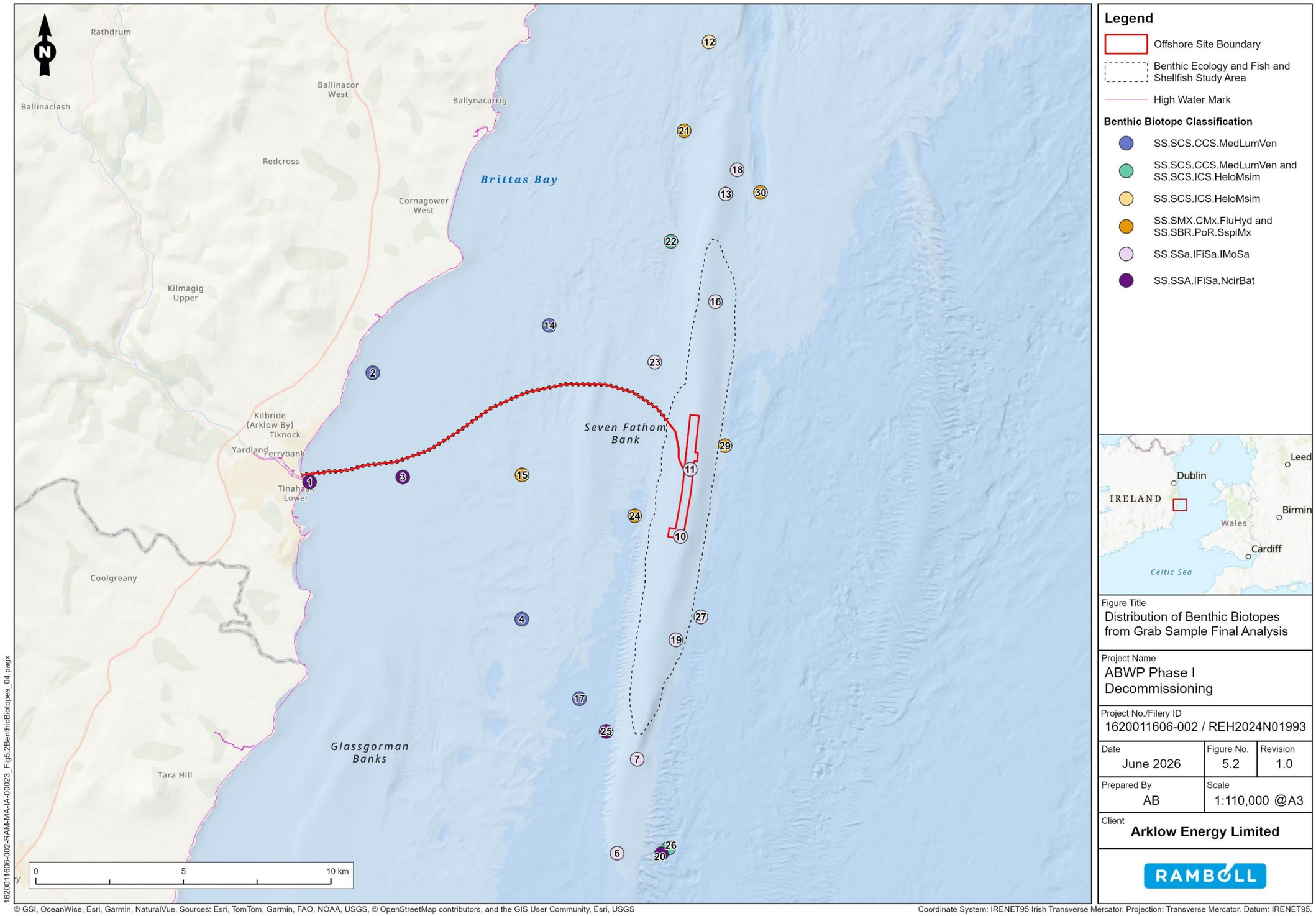


Figure 5.2: Distribution of Benthic Biotopes from Grab Sample Final Analysis

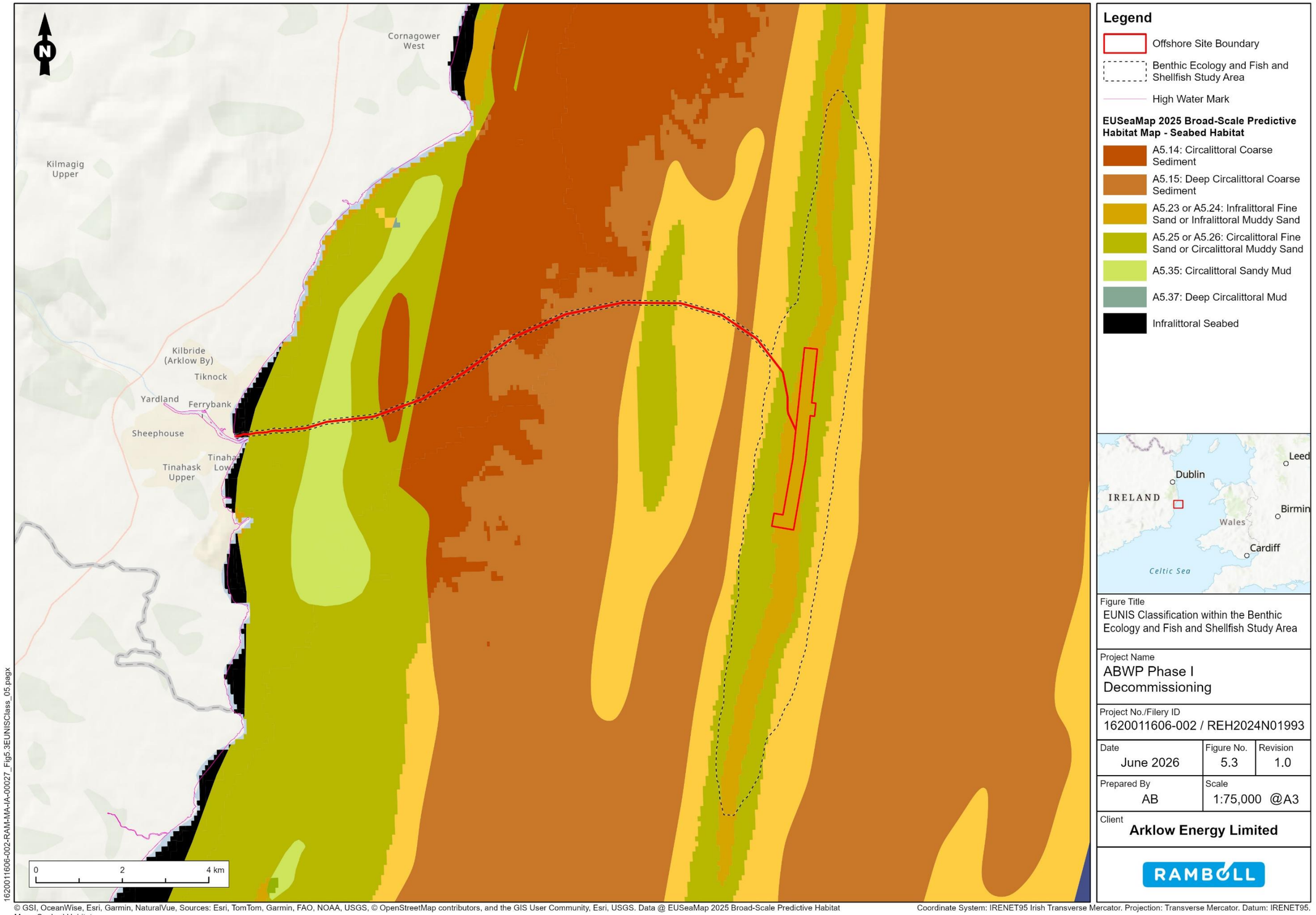


Figure 5.3: EUNIS Classification within the Marine Biodiversity Study Area

Protected Habitats and Species, and Designated Sites

5.5.2.14 *Sabellaria* spp. have been identified (likely to form the biotope '*S. spinulosa* on stable circalittoral mixed sediment' (SS.SBR.PoR.SspiMx / MC2211)) at seven distinct sampling stations around the Offshore Site since 2005, but distribution has varied between surveys (Aquafact 2025; APEM, 2026f). In 2024, *Sabellaria* was recorded scattered across the ABWP Phase II Array Area, however none of the records are directly within the footprint of the Offshore Site. Additionally, abundances of *Sabellaria* were low and the drop-down video footage did not show *Sabellaria* reef structures that would qualify as Annex I habitat under the Habitats Directive (APEM, 2026f).

5.5.2.15 The closest records of *Sabellaria* to the Offshore Site are approximately 1 km east and 1 km west of the Offshore Site (APEM, 2026f). While *Sabellaria* around the Offshore Site have the potential to form reefs, the drop-down video footage indicate that the *Sabellaria* structures present are likely to be temporary due to the inherently dynamic environment of Arklow Bank and patchy nature of *Sabellaria* spp (APEM, 2026f). This patchy distribution is characteristic of the species, as *Sabellaria* spp. are reported to be ephemeral and subject to natural fluctuations in local populations (Tillin *et al*., 2025).

5.5.2.16 The closest protected reef consisting of *Sabellaria* spp. is Wicklow Reef, which is an SAC located approximately 13 km north of the Offshore Site and therefore outside of the intertidal and subtidal Benthic Ecology Study Area. Wicklow Reef is an uncommon example of a subtidal reef formed by the honeycomb worm (*Sabellaria alveolata*) (Aquafact 2025; Department of Arts, Heritage and the Gaeltacht, 2014). *Sabellaria* reefs are known to exhibit spatially patchy distribution and temporal instability, which makes long term monitoring difficult (OSPAR Commission, 2013).

5.5.2.17 *Sabellaria* reef habitats are listed under Annex I of the EU Habitats Directive (Code 1170: Reefs), and are an OSPAR threated & declining species (OSPAR Commission, 2008). These reef-building polychaetes form loose aggregates of sand, gravel and mud tubes on the seabed, playing an important role in stabilising sediments and creating conditions that support the colonisation of species absent from nearby habitats, resulting in a rich assemblage of epifaunal and infaunal species (Holt *et al.,* 1998).

5.5.2.18 There are no European sites with benthic qualifying features which occur within the Benthic Ecology Study Area. The nearest European site with benthic qualifying features is Wicklow Reef SAC, which is 13 km north of the Offshore Site and beyond the Benthic Ecology Study Area.

5.5.2.19 Therefore, European sites and their associated benthic features have not been considered further in this EIAR chapter.

Invasive and Non-Native Species (INNS)

5.5.2.20 No INNS were recorded in the 2004 to 2011 monitoring surveys (ABWP Phase I), or the 2021 and 2024 benthic surveys (ABWP Phase II) (Aquafact, 2025; APEM, 2026f). Additionally, no INNS were identified in the ROV footage from 2025 (Alpha Marine, 2026).

5.5.2.21 There are no publicly available records of marine INNS within the Benthic Ecology Study Area. The nearest report of marine INNS was the widely distributed barnacle *Austrominius modestus* near Wicklow Head in 2022, approximately 15 km from the Proposed Works Offshore (National Biodiversity Data Centre, 2026).

Sediment Contamination

5.5.2.22 ABWP Phase II benthic characterisation (Aquafact, 2025), sediment chemistry samples collected as part of the ABWP Phase I dredge dumping at sea permit, Arklow Port dredge disposal licence and Arklow Wastewater Treatment Plant were reviewed. All organochlorines, polychlorinated biphenyls (PCB), total extractable hydrocarbons, tributyltin (TBT), dibutyltin (DBT), polycyclic aromatic hydrocarbons (PAH) and trace metals were found to be below the lower or upper-level guidance values outlined in Cronin *et al*. (2006) and Marine Institute addendum (Cronin *et al*.,

2019) with the exception of arsenic. Arsenic marginally exceeded the lower-level guidance value (20 mg/kg) at three stations within the Benthic Ecology Study Area (towards Arklow Harbour) but was well below the upper-level guidance value (70 mg/kg), which is set at the lower end of concentrations shown to have adverse effects on marine organisms (Cronin *et al*., 2006 & 2019).

5.5.2.23 Further sediment sampling was undertaken from the interior of one of the MPs (at WTG T1) within the Offshore Site (Ramboll, 2025). Across four samples, none of the measured concentrations exceeded the lower levels of the sediment quality guidelines (Cronin *et al*., 2006 & 2019).

5.5.3 Fish and Shellfish

Summary of species

5.5.3.1 The western Irish Sea surrounding the Offshore Site is characterised by a diverse range of pelagic (highly mobile species which live in the water column) and demersal (those that live on or near the seabed) fish assemblages (Parker-Humphreys, 2004) including cod (*Gadus morhua*), mackerel (*Scomber scombrus*), horse mackerel (*Trachurus trachurus*), herring (*Clupea harengus*), whiting (*Merlangus merlangus*), lemon sole (*Microstomus kitt*), sprat (*Sprattus sprattus*), boarfish (*Capros aper*) and haddock (*Melanogrammus aeglefinus*) (Ellis *et al*., 2012; Coull *etet al*., 1998; MMO, 2026; Parker-Humphreys, 2004). Other flatfish considered present in high numbers in the Fish and Shellfish Study Area include dab (*Limanda limanda*), plaice (*Pleuronectes platessa*) and sole (*Solea solea*) (APEM, 2026a). Site specific surveys undertaken as part of ABWP Phase II (APEM, 2026a) also indicated that sandeel (*Ammodytes tobianus*) and sand goby (*Pomatoschistus minutus*) are particularly abundant in the Fish and Shellfish Study Area.

5.5.3.2 Elasmobranch species are widespread through the western Irish Sea with ray species including, thornback ray (*Raja clavata*), spotted ray (*Raja montagui*), blonde ray (*Raja brachyura*), and cuckoo ray (*Leucoraja naevus*), making up a large component of the elasmobranch assemblage (Ellis *et al*., 2012; Coull *et al*., 1998; APEM, 2026a). Tope shark (*Galeorhinus galeus*), spurdog (*Squalus acanthias*), lesser spotted dogfish (*Scyliorhinus canicula*), nursehound (*Scyliorhinus stellaris*) and stary smooth hound (*Mustelus asterias*) are also widespread through the Irish Sea (APEM, 2026a).

5.5.3.3 The Fish and Shellfish Study Area includes important commercial grounds for blue mussel (*Mytilus edulis*) and whelk (*Buccinum undatum*), which are important aquaculture species in Arklow Bay (Department of Climate, Energy and the Environment, 2021). Blue mussel is also known to grow on WTGs within the Offshore Site which have been regularly removed as part of ABWP Phase I maintenance and integrity monitoring works. Other shellfish species present in the Fish and Shellfish Study Area include brown crab (*Cancer pagurus*), European lobster (*Hommarus gammarus*) and Norway lobster (*Nephrops norvegicus*) (MMO, 2026).

5.5.3.4 A deep channel (the 'Western Channel') present in the western Irish Sea is important in moulding the fish and shellfish assemblage in surrounding waters (APEM, 2026a; Mellet *et al*., 2015; Parker-Humphreys, 2004). The Western Channel reaches 150 m at its deepest point and runs north to south, creating a divide between extensive shallow water of the eastern Irish Sea and a narrower shelf of shallow water in the western Irish Sea (Parker-Humphreys, 2004). The provision of deeper water by the Western Channel allows several species, such as boarfish, to thrive in the Irish Sea which would typically live in deeper waters of the Celtic Sea and waters surrounding northwest Scotland.

Spawning and Nursery Grounds

5.5.3.5 In the Irish Sea, spawning grounds for several commercially important fish species are present. Broadscale fish sensitivity maps (Coull *et al*., 1998; Ellis *et al*., 2012) and a review of spawning ground literature in the western Irish Sea (Campanella and van der Kooij, 2021) indicate that two species spawn in the Fish and Shellfish Study Area: lemon sole and sprat (**Figure 5.4**).

Both lemon sole and sprat are broadcast spawners, meaning eggs are pelagic and are distributed through the water column. Consequently, eggs from broadcast spawners are easily influenced by ocean currents and carried away from spawning grounds and are therefore unlikely to be affected by Proposed Works Offshore.

5.5.3.6 Demersal spawners lay eggs on the seabed, making them more vulnerable to seabed disturbance. Sandeel is considered to be one of the most sensitive demersal spawners due to the requirement for specific sediment composition in spawning grounds. However, the closest spawning ground for sandeel is located approximately 20 km north of the Offshore Site and therefore outside of the Fish and Shellfish Study Area.

5.5.3.7 To the north of the Fish and Shellfish Study Area, spawning grounds for cod, ling (*Molva molva*), mackerel, sole, plaice and whiting are also present, but these species are pelagic spawners and the grounds fall outside of the ZoI.

5.5.3.8 Atlantic salmon (*Salmo salar*), river lamprey (*Lampetra fluviatilis*), sea lamprey (*Petromyzon marinus*) and twaite shad (*Alosa fallax*) are also all known to spawn in rivers that flow into the Fish and Shellfish Study Area (see **Migratory Fish**).

5.5.3.9 Nursery grounds are also present in the Fish and Shellfish Study Area for several species: sandeel, cod, mackerel, horse mackerel, herring, whiting, lemon sole, tope shark, thornback ray, spotted ray and anglerfish (Coull *et al.,* 1998; Ellis *et al*., 2012).

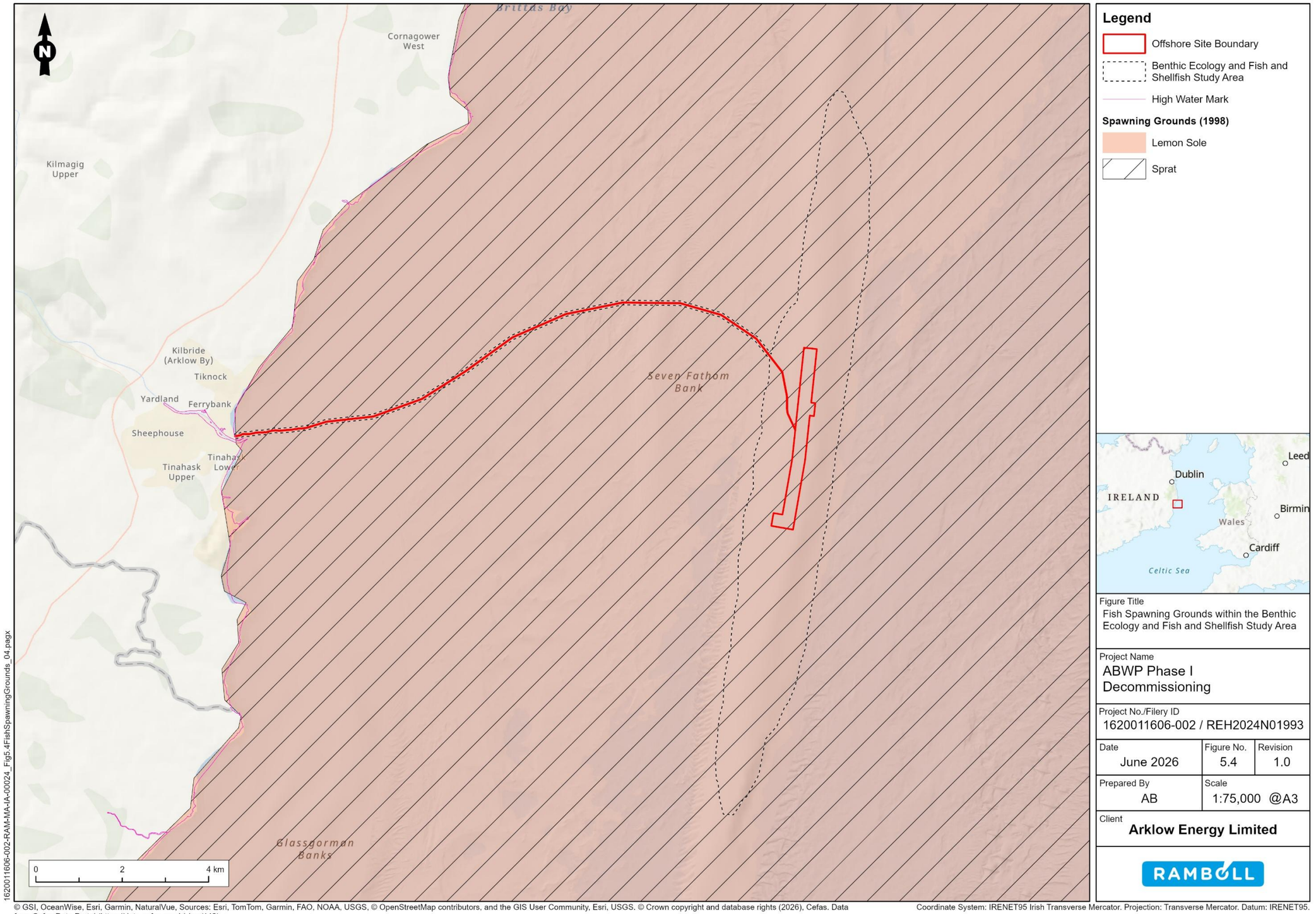


Figure 5.4: Fish Spawning Grounds within the Fish and Shellfish Study Area

Migratory Fish

5.5.3.10 Due to the position of the Offshore Site in the Irish Sea, consideration has been given to the high mobility of migratory/diadromous fish over regional areas, to ensure that any fish that may pass through the Fish and Shellfish Study Area but are protected by a site or a river which lies beyond the initial screening distance are included in the assessment. This regional approach considers potential migration routes outlined by ABPmer (2014).

5.5.3.11 Diadromous fish are those which migrate between freshwater and seawater during different life phases, for example during spawning and / or once matured. Several diadromous species are considered likely to be present in the migratory fish Study Area, particularly in the inshore waters off the coast of County Wicklow (APEM, 2026b) including Atlantic salmon, sea trout (*Salmo trutta*), river lamprey, sea lamprey and twaite shad due to several rivers flowing into the western Irish Sea which are protected by European site designations.

Atlantic salmon

5.5.3.12 Atlantic salmon is an anadromous species (migrating from the sea into freshwater to spawn), which during its lifetime use both marine and freshwater habitats (Heessen *et al*., 2015). Spawning typically occurs in November and December when water temperatures are cooler (Cefas, 2026).

5.5.3.13 Atlantic salmon is a designated feature of the Slaney River SAC which is approximately 13.9 km west of the Proposed Works Offshore in County Wexford at its closest point (although the estuary mouth is located 55 km south west of the Offshore Site). The River Slaney provides a spring spawning grounds for Atlantic salmon (APEM, 2026b). The River Barrow and River Nore SAC located 48.8 km south of the Offshore Site, also protect Atlantic salmon as a qualifying species. Atlantic salmon is largely limited to the freshwater stretches of the River Barrow and River Nore catchment where spawning is also known to occur (Department of Housing, Local Government and Heritage, 2024), but are considered likely to migrate south west out of the River Barrow and River Nore SAC away from the Offshore Site, however northerly migration cannot be ruled out (APEM, 2026b).

5.5.3.14 Atlantic salmon is also present in other rivers in the Study Area which are not protected by a European designation, including the Avoca River which flows through Arklow Harbour (where the landfall of the export cable is located) and is the closest river to the Offshore Site, the River Vartry in County Wicklow (20.76 km north of the Offshore Site) and the River Dargle (approximately 43 km north) (APEM, 2026b).

5.5.3.15 A small population of Atlantic salmon is present in the River Vartry, located 20.76 km north of the Offshore Site. Recent minimum density estimates of Atlantic salmon in the River Vartry catchment in 2022 recorded 0.062 individuals/m^2 (Gordon *et al*., 2023). Similarly, in the Avoca River, Atlantic salmon populations are considered to have greatly reduced in numbers due to pollution from mining during the 18th century, with only low numbers of juvenile Atlantic salmon now present (East Wicklow Rivers Trust, 2023). However, some Atlantic salmon spawning grounds are present in the upper Avoca River.

5.5.3.16 In comparison, Atlantic salmon in the River Slaney are more abundant, with the most recent fish counts (conducted in 2022) showing the passage of 179 Atlantic salmon during spring and 30 Atlantic salmon during summer between the river and the area around Arklow Bank (APEM, 2026a; Inland Fisheries Ireland, 2022).

5.5.3.17 Atlantic salmon is an important commercial species in the Irish Sea. However, in recent years, Atlantic salmon in Ireland has drastically declined due to marine mortality, with climate change and bycatch considered to be leading factors (Salmon Watch Ireland, 2025).

Sea / brown trout

5.5.3.18 Brown trout either complete their lifecycle in freshwater or predominantly inhabit estuarine waters (Harris *et al*.,2017). Sea trout are therefore anadromous brown trout.

5.5.3.19 Smolts typically leave rivers after one to three years and enter the sea during the spring months of March to June (Thorstad *et al*., 2016). Post-smolts can remain in the marine environment throughout the summer, returning to freshwater rivers to over-winter. Following this, adults typically spend the summer at sea and the winter in freshwater. Some adults are also known to remain at sea over winter and return to freshwater to spawn.

5.5.3.20 Sea / brown trout is not a designated feature of any European sites within the Study Area. However, they are known to spawn in rivers within the Study Area.

5.5.3.21 Brown trout are the most common fish species in the Avoca River catchment which flows into Arklow Harbour where the landfall of the export cable is located, found from the upper tributaries to the estuary albeit in low population densities (East Wicklow Rivers Trust, 2023). The trout found in the Avoca River are relatively small in size and are mostly young individuals (around one year old). Low nutrient levels in the river are considered to limit the availability of suitable food resulting in slow growth rates. Trout generally spend around one to three years in the Avoca River before migrating into the Irish Sea.

5.5.3.22 Sea trout has also been recorded in the River Vartry and the River Dargle (approximately 43 km north of the Offshore Site). Recent minimum density estimates of trout in the River Vartry (20.76 km north of the Offshore Site) catchment in 2022 recorded 0.507 individuals/m^2 (Gordon *et al*., 2023). A 2018 minimum density estimate of trout in the River Dargle catchment recorded 0.313 individuals/m^2 (Matson *et al*., 2019).

5.5.3.23 In the River Slaney, trout are relatively abundant, with the most recent fish counts (conducted in 2022) for sea trout recording the passage of 700 sea trout through the River Slaney between January and September (APEM, 2026b; Inland Fisheries Ireland, 2022).

Sea and river lamprey

5.5.3.24 Adult lamprey spawn in pairs or groups (Kelly and King, 2001). Once hatched, lamprey larvae swim downstream (or are carried by the current) to areas of finer sediment to burrow. After several years (up to eight) of larval development, metamorphosis of larvae to adults occurs between July to September. Once larvae have developed into adults, they migrate downstream away from larval habitats, typically from late summer to early winter. Following downstream migration, adults spend two to three years in the marine environment before migrating back upstream for the next spawning season. Upstream migration and spawning occur at slightly different times for sea and river lamprey. River lamprey typically migrates upstream in autumn or spring with spawning typically occurring between March and April. Sea lamprey typically migrates upstream in spring to early summer with spawning occurring from May to June.

5.5.3.25 Sea and river lamprey are both known to occur within coastal waters of County Wicklow (APEM, 2026b) in the Study Area. Sea and river lamprey are designated features of the Slaney River SAC (13.9 km south) and the River Nore and River Barrow SAC (49.7 km south west). Lamprey are thought to spawn in clean gravel area of the River Slaney over spring and summer with July marking the end of the spawning season (APEM, 2026b).

5.5.3.26 Lamprey species are also present in the Avoca River and catchment which flows into Arklow Harbour. However, the population is considered small compared to other species present in the Avoca River catchment (Corcoran *et al*., 2025).

5.5.3.27 Sea and river lamprey have also been recorded in the River Vartry (20.76 km north of the Offshore Site) in small numbers. Recent minimum density estimates of sea and river lamprey in the River Vartry catchment in 2022 recorded 0.003 individuals/m^2 (Gordon *et al*., 2023).

European eel

5.5.3.28 European eel is a catadromous (spending most of their time in freshwater but migrating into seawater to breed) migratory species, which spawns mainly in spring (Righton *et al*., 2016). Once hatched, eel larvae metamorphose into glass eels which travel across shelf seas via tidal stream transport. During spring, glass eels migrate into freshwater habitats and may continue to do so until early autumn (Heessen *et al*., 2015; ICES, 2010). Eels can remain within freshwater

habitat for between five and 15 years before becoming yellow eels and finally silver eels. Silver eels begin their downstream migration through rivers and estuaries towards spawning grounds between August and December (Behrmann-Godel and Eckmann, 2003; Tesch, 2003; Chadwick *et al*., 2007).

5.5.3.29 European eel is present in the River Slaney with annual migration out to sea and therefore into the Study Area near to the Proposed Works Offshore (APEM, 2026b).

5.5.3.30 European eel has also been recorded in the River Vartry (20.76 km north of the Offshore Site) in small numbers. Recent minimum density estimates of eel in the River Vartry catchment in 2022 recorded 0.034 individuals/m^2 (Gordon *et al*., 2023).

Twaite shad

5.5.3.31 Twaite shad is an anadromous species and spends the majority of its life cycle in offshore and coastal waters, entering freshwater to spawn in April and May (Barnes, 2008).

5.5.3.32 Twaite shad occurs in coastal waters of County Wicklow (APEM, 2026a) and therefore is expected to be present in the Study Area. The species is a designated feature of the Slaney River SAC (13.9 km south) and the River Nore and River Barrow SAC (49.7 km south west).

5.5.3.33 In the River Slaney, the population is considered to be small with few counts recorded during 2022 monitoring of the river (Gallagher *et al*., 2023). However, the River Nore and River Barrow SAC provides important spawning ground for twaite shad which is considered to be one of the only spawning locations in Ireland for twaite shad (Department of Housing, Local Government and Heritage, 2024). The main area for spawning is considered to be downstream of the St Mullins weir located in the River Barrow (Gallagher *et al*., 2023).

European smelt

5.5.3.34 European smelt (*Osmerus eperlanus*) is an anadromous species that is most commonly found in lower river reaches and upper estuarine habitats and coastal habitats (Heessen *et al*., 2015). Smelt is present in the estuarine stretches of the River Barrow and River Nore SAC (APEM, 2026a) but is not a protected feature of the site.

5.5.3.35 Before migrating into freshwater habitats in spring to spawn, smelt migrate into estuaries and congregate in large shoals to feed (Maitland, 2003). Following spawning, post-larval juveniles use nursery habitats in estuaries. Smelt are thought to return to their natal river to spawn, although the degree of fidelity may not be as strong as other species such as Atlantic salmon (Torrissen *et al*., 2013).

Table 5.12: Spawning periods of migratory species known to spawn in the Study Area

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Atlantic salmon												
Sea lamprey												
River lamprey												
Twaite shad												

Designated Sites

5.5.3.36 A summary of designated sites for marine biodiversity qualifying features is provided in **Section 5.5.5.14**. These have been included through consideration of regional movements of migratory fish as described by ABPmer (2014).

5.5.3.37 In the Study Area for migratory fish, there are two European sites for which migratory fish species are qualifying features. These are:

- Slaney River Valley SAC (13.9 km away from the Offshore Site, but estuary mouth is 55 km south west), protecting sea lamprey, river lamprey, twaite shad and Atlantic salmon; and
- River Barrow and River Nore SAC (48.4 km away from the Offshore Site), protecting sea lamprey, river lamprey, twaite shad and Atlantic salmon.

5.5.4 Marine Mammals

5.5.4.1 To recognise the highly mobile and transient nature of marine mammal species, consideration has been given to the Celtic Seas Ecoregion (which spans the northwestern European continental shelf) and the appropriate, species based Marine Mammal Management Units (MMMUs) defined by the Inter Agency Marine Mammal Working Group (IAMMWG, 2023) for cetaceans. MMMUs have been informed by the Celtic Seas Ecoregion and are defined for each of the most common cetacean species in UK waters. For pinnipeds (seals), there are currently no IAMMWG agreed MMMUs, and Seal Management Units (SMUs) defined by the Special Committee for Seals only cover UK waters (SCOS, 2025). Therefore, for seals, OSPAR Region III (Celtic Seas) (OSPAR, 2017) is also considered.

5.5.4.2 In 2024, six Important Marine Mammal Areas (IMMAs) were introduced by the IUCN Marine Mammal Protected Areas Task Force which are separate to MMMUs and highlight areas considered particularly important for different cetacean species. The Celtic Sea IMMA overlaps with the Marine Mammal Study Area (Irish Whale and Dolphin Group, 2024). The Celtic Sea IMMA covers an area of 29,663 km^2 and primarily focuses on three species of baleen whale (minke whale, fin whale and humpback whale) which are present in the Celtic Sea in small numbers during several months of the year, peaking in November. However, the Celtic Sea IMMA region also regularly includes presence of harbour porpoise, bottlenose dolphin, common dolphin, Risso's dolphin, harbour seal and grey seal.

Cetaceans

5.5.4.3 The Proposed Works Offshore are located within the ICES Celtic Seas Ecoregion, which informs the boundary of the species-specific MMMUs, published by the IAMMWG (2023).

5.5.4.4 In the Celtic Sea Ecoregion, there are 13 species of cetacean which are regular visitors (ICES, 2022). These are harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), short-beaked common dolphin (*Delphinus delphis*), white-beaked dolphin (*Lagenorhyncus albirostris*), Atlantic white-sided dolphin (*Lagenorhyncus albirostris*), long-finned pilot whale (*Globicephala melas*), minke whale (*Balaenoptera acutorostrata*), fin whale (*Balaenoptera physalus*), killer whale (*Orcinus orca*), northern bottlenose whale (*Hyperoodon ampullatus*), Sowerby's beaked whale (*Mesoplodon bidens*), Cuvier's beaked whale (*Ziphius cavirostris*) and sperm whale (*Physeter macrocephalus*).

5.5.4.5 On the basis of site-specific surveys undertaken in relation to ABWP Phase II (APEM, 2026) and a review of available online literature (e.g. Waggitt *et al*., 2019; SCANS IV survey data), the following species are expected to be most likely present in the vicinity of the Offshore Site:

- Harbour porpoise;
- Bottlenose dolphin;
- Short-beaked common dolphin;
- Risso's dolphin; and
- Minke whale.

5.5.4.6 All cetacean species are European Protected Species (EPS) under Annex IV of the Habitats Directive (see **paragraph 5.10.2.1**).

Harbour porpoise

5.5.4.7 The harbour porpoise is listed under Annex II of the Habitats Directive. There are two European sites in the Marine Mammal Study Area for harbour porpoise: Blackwater Bank SAC (29.2 km south of the Offshore Site) and Rockabill to Dalkey Island SAC (47.4 km north of the Offshore Site, just outside of the Marine Mammal Study Area).

5.5.4.8 The harbour porpoise is the most abundant cetacean species in UK waters and has been recorded throughout the Irish Sea (Evans and Waggitt, 2023; Giralt Paradell *et al*., 2024). The Marine Mammal Study Area is located within the Celtic and Irish Seas MMMU (IAMMWG, 2022) for harbour porpoise. The most recent abundance estimate for this MU is 62,517 individuals. However, it covers a large area including waters on the both the western and eastern coasts of Ireland and includes some of the western English Channel.

5.5.4.9 SCANS surveys split waters around the UK and Ireland into smaller blocks to provide abundance estimates for specific areas. The most recent summer abundance count of harbour porpoise in SCANS survey block CS-D, the block which overlaps with the Marine Mammal Study Area), undertaken in 2022, identified 9,773 individuals, with a density estimate of 0.2803 individuals/km^2 (Gilles *et al*., 2023). In the Irish Sea, summer densities of harbour porpoise are higher than during winter months (Waggitt *et al*., 2019), indicating that the SCANS data (Gilles *et al*., 2023) provides a conservative abundance estimate.

5.5.4.10 Monitoring of harbour porpoise in the Irish Sea has indicated that the species has a preference for certain habitats, particularly high tidal energy coastal areas such as those found around the Welsh coast and between County Dublin and County Waterford in Ireland (where the Marine Mammal Study Area is located) (Evans and Waggitt, 2023). Harbour porpoise presence in these areas is consistent throughout the year, however density along the coast of the western Irish Sea appears highest from July through the summer months to early autumn (Evans and Waggitt, 2023; Waggitt *et al*., 2019).

5.5.4.11 The use of the western Irish Sea by harbour porpoise is also seen in the ObSERVE 2023 survey data which indicates hotspots of harbour porpoise activity around Wicklow and south of Arklow (Giralt Paradell *et al*., 2024). Site-specific digital aerial surveys (DAS) undertaken for ABWP Phase II recorded high numbers of harbour porpoise year-round in the vicinity of the Proposed Works Offshore with a total of 263 sightings across 23 surveys (including between the Sub Lease Area and the coastline) between 2018 and 2020 but also found abundance and density to increase during the summer, with a maximum abundance of 72 individuals identified in June 2025 (APEM, 2026g; HiDEF, 2020). Therefore, harbour porpoise is expected to be present in the vicinity of the Proposed Works Offshore.

Bottlenose dolphin

5.5.4.12 Bottlenose dolphin is listed under Annex II of the Habitats Directive. The Marine Mammal Study Area is located within the Irish Sea MMMU for bottlenose dolphin, within which there are two European sites for bottlenose dolphin: Cardigan Bay SAC and Lleyn Peninsula and the Sarnau SAC (although these fall beyond the maximum Marine Mammal Study Area of 45.5 km for underwater noise).

5.5.4.13 Bottlenose dolphin is a widespread species in the Irish Sea. The most recent abundance estimate for this species in the Irish Sea MMMU is 293 individuals, with 186 of these in the UK portion of the MMMU rather than the Irish portion (IAMMWG, 2023). However, bottlenose dolphin populations in UK and Irish waters can be split into two distinct ecotypes: a wide-ranging offshore type and an inshore type which tends to remain in coastal waters (IAMMWG, 2023; APEM, 2026g). However, it has also been suggested that there could be an all-Irish coastal population which is highly mobile and could be found on both the western and eastern coasts of Ireland. There are also two distinct inshore groups of bottlenose dolphin located on the west coast of Ireland and in the Shannon Estuary. However, these do not overlap with the Study Area.

5.5.4.14 The most recent summer abundance count of bottlenose dolphin in SCANS survey block CS-D (which overlaps with the Marine Mammal Study Area) undertaken in 2022 identified 8,199 individuals, with a density of 0.2352 individuals/km^2 (Gilles *et al*., 2023). However, distribution maps of bottlenose dolphin presented by Waggitt *et al*. (2019) show relatively low densities throughout the year. Furthermore, ObSERVE survey data collected in 2023 noted that bottlenose dolphin were recorded only sporadically in the western Irish Sea sporadically, with individuals more abundant elsewhere in Irish waters (Giralt Paradell *et al*., 2024). Monitoring of bottlenose

dolphin density in the Irish Sea also indicates the western Irish Sea does not provide important habitat for the species throughout the year (Evans and Waggitt, 2023).

5.5.4.15 A site-specific DAS undertaken for ABWP Phase II recorded one group of bottlenose dolphin in the vicinity of the Proposed Works Offshore during the 2018-2020 surveys but no individuals in 2023 – 2025 surveys (APEM, 2026g). Therefore, it is considered that bottlenose dolphin could be present in the vicinity of the Proposed Works Offshore but only infrequently and in small numbers.

Short-beaked common dolphin

5.5.4.16 Short-beaked common dolphin is considered to occur in both coastal and offshore waters of the Irish Sea (APEM, 2026g), with site fidelity observed in coastal waters (Giralt Paradell *et al*., 2024).

5.5.4.17 The Marine Mammal Study Area falls within the Celtic and Greater North Sea MMMU for common dolphin. The most recent common dolphin abundance estimate for this MMMU is 102,656 individuals (IAMMWG, 2022), though it does cover a large area across the North Sea and Celtic Sea. The most recent summer abundance count of common dolphin in SCANS survey block CS-D, which overlaps with the Marine Mammal Study Area, undertaken in 2022 was 949 individuals, with a density of 0.0272 individuals/km^2 (Gilles *et al*., 2023). Modelled distribution maps of common dolphin presented by Waggitt *et al*. (2019) also show low densities throughout the year, with a small increase in density during the summer months. Monitoring of common dolphin in the Irish Sea also indicates that this species is more abundant further south in the Irish Sea compared to the Marine Mammal Study Area (Evans and Waggitt, 2023), which is also seen in ObSERVE 2023 survey data (Giralt Paradell *et al*., 2024).

5.5.4.18 Site-specific DAS undertaken for ABWP Phase II recorded a group of 22 individual common dolphins on two different occasions in the Marine Mammal Study Area in 2019-2020 surveys and a group of 26 individuals on one occasion in 2025, but abundance was generally low (APEM, 2026g). Therefore, it is considered that common dolphin could be present in the vicinity of the Proposed Works Offshore in small numbers.

Risso's dolphin

5.5.4.19 Risso's dolphin is present in the Irish Sea and is known to occur in both coastal and offshore waters (APEM, 2026g).

5.5.4.20 The Marine Mammal Study Area falls within the Celtic and Greater North Sea MMMU for Risso's dolphin, with an abundance estimate of 12,262 animals (IAMMWG, 2022). The most recent summer abundance count in SCANS survey block CS-D (which overlaps with the Marine Mammal Study Area) undertaken in 2022 was 75 individuals, with a density of 0.0272 individuals/km^2 (Gilles *et al*., 2023). Risso's dolphin occurs in low densities in the Irish Sea throughout the year (Waggitt *et al*., 2019; Evans and Waggitt, 2023). However, the species appears to be more abundant further south in the Irish Sea compared to the Marine Mammal Study Area (Waggitt *et al*., 2019). Furthermore, site-specific DAS undertaken between 2018 and 2025 for ABWP Phase II did not record any individuals in the Marine Mammal Study Area (APEM, 2026g) and ObSERVE surveys conducted in 2023 only recorded sporadic sightings in the western Irish Sea (Giralt Paradell *et al*., 2024).

5.5.4.21 Therefore, Risso's dolphin is considered unlikely in the Marine Mammal Study Area but could occasionally be present in very low numbers.

Minke whale

5.5.4.22 Minke whale is the most abundant baleen whale species in UK and Irish waters (APEM, 2026g).

5.5.4.23 The Marine Mammal Study Area is located within the Celtic and Greater North Sea MMMU for minke whale, with the most recent abundance estimate for this MMMU identifying 20,118 individuals (IAMMWG, 2022). SCANS surveys undertaken in survey block CS-D (which overlaps with the Marine Mammal Study Area) identified a summer abundance of 477 individuals with a density of 0.0137 individuals/km^2 (Gilles *et al*., 2023). Monitoring of minke whale in the Irish

Sea also indicates that there is some presence around the coast of Dublin and therefore north of the Marine Mammal Study Area during the summer months of July to September (Evans and Waggitt, 2023). However, presence elsewhere in the Irish Sea is sporadic, with localised occurrence around the Isle of Man and the southern Irish Sea (Evans and Waggitt, 2023). Minke whale appear to show a distinct seasonal distribution shift within the Irish Sea, with individuals moving inshore during the summer months and offshore during the winter (Evans and Waggitt, 2023; APEM, 2026g).

5.5.4.24 ObSERVE surveys conducted in 2023 identified minke whale in all survey locations around the Irish coast. However, presence in the western Irish sea was low (Giralt Paradell *et al*., 2024). Furthermore, there was no record of minke whale in site-specific DAS undertaken between 2018 and 2024 for ABWP Phase II, and only one individual recorded in DAS in 2025 (APEM, 2026g). Therefore, the presence of minke whale in the Marine Mammal Study Area is considered to be unlikely.

Pinnipeds

5.5.4.25 Two species of pinniped are present in the UK waters and the Irish and Celtic seas and could therefore, interact with the Proposed Works Offshore: the harbour seal (*Phoca vitulina*) and the grey seal (*Halichoerus grypus*) (ICES, 2022). Both harbour seal and grey seal are listed under Annex II of the Habitats Directive.

Harbour seal

5.5.4.26 The total harbour seal population in Irish waters is estimated to be approximately 4,000 animals (SCOS, 2025; Morris and Duck, 2019; Morris *et al*., 2025). The harbour seal is present in coastal, estuarine and marine environments around the Irish coastline. Investigations into the genetic population structure of harbour seals in Ireland and Northern Ireland have found that in Irish waters, three genetically distinct local populations exist, known as East Ireland, North-west and Northern Ireland and South-west Ireland (Steinmetz *et al*., 2023; SCOS, 2025). The distribution of the East Ireland population is considered to overlap with the Marine Mammal Study Area. However, compared to other coastal regions in Ireland, harbour seal presence in East Ireland is relatively sparse (Morris and Duck, 2019).

5.5.4.27 Harbour seal is a feature of the Slaney River Valley SAC, located 13.9 km from the Proposed Works Offshore.

5.5.4.28 Harbour seals live in discrete regional populations, usually staying within 50 km of the coast (Russell & McConnell, 2014; Russell *et al.*, 2017). Seals 'haul-out' in coastal areas for breeding, nursing, moulting and resting (SCOS,2025). The highest number of hauled-out seals are typically during the breeding and moulting seasons, which occur in the summer months in Irish waters, ending in August (Cronin *et al*., 2004). In the Marine Mammal Study Area, harbour seals are known to haul-out at Wexford Harbour, located within the Slaney River Valley SAC. Wexford Harbour is located 55 km from the Offshore Site. This haul-out site is considered to have a population of around 65 harbour seals (Morris and Duck, 2019; Morris *et al*., 2025; **Plate 5.1**).

5.5.4.29 An important haul-out site is also located at Lambay Island SAC with approximately 40-60 seals (Morris *et al*., 2025), located around 74 km from the Offshore Site. When harbour seals leave haul-out sites to forage, some individuals have been observed to travel up to 273 km, though most are expected to remain closer (Carter, *et al*., 2022). Therefore, there is potential for individuals from the Lambay Island SAC haul-out site to be present in the vicinity of the Offshore Site. However, site-specific DAS undertaken for ABWP Phase II between 2018 and 2020 only recorded two sightings of harbour seal in the Marine Mammal Study Area and only one harbour seal was recorded in the 2024 DAS (HiDef, 2020; APEM, 2026g). Updated DAS conducted between June to November 2025 and vantage point surveys for ABWP Phase II recorded no harbour seal during any of the surveys (APEM 2026g).

5.5.4.30 The mean at-sea usage (i.e., the mean count of seals in the water at any point) for harbour seals in the Irish Sea shows higher levels of seal activity at these two haul-out sites (Carter *et al*., 2022). However, elsewhere in the Irish Sea, including around the Proposed Works Offshore,

mean at-sea usage is low. Nonetheless, due to the high mobility of harbour seals and the proximity of the Wexford Harbour haul-out site to the Offshore Site, there is the potential for harbour seals to interact with the Proposed Works Offshore.

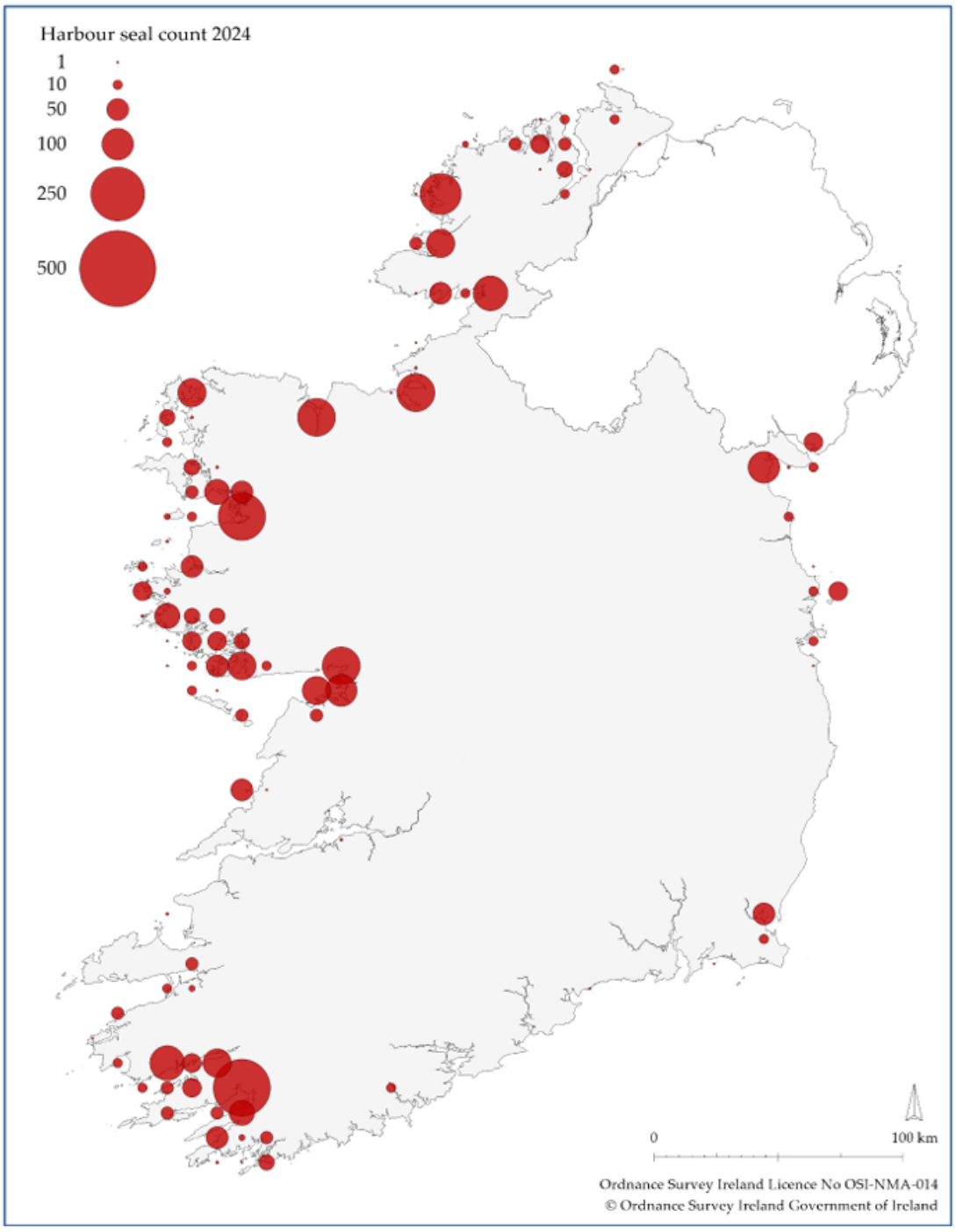


Plate 5.1: Harbour seal haul-out sites in Ireland (Morris *et al*., 2025)

Grey seal

5.5.4.31 There are no European sites for which grey seal is a protected feature within 50 km of the Offshore Site. The closest is Lambay Island SAC, located 74 km north from the Offshore Site.

5.5.4.32 The total grey seal population in Irish waters is estimated to be approximately 3,800 individuals (SCOS, 2025; Morris *et al*., 2025). Of these, approximately 418 are linked to haul-out sites on the east coast of Ireland (Morris and Duck, 2019). There is some suggestion that grey seals in

Ireland are a single inter-breeding population, which also receives migrant grey seals from the southwest England population and southern North Sea (German / Danish) population (SCOS, 2025; Steinmetz *et al*., 2024). Grey seals are known to travel over large distances to forage, with some individuals observed to travel up to 448 km in a single foraging trip (Carter *et al*., 2022).

5.5.4.33 Seals 'haul-out' in coastal areas for breeding, nursing, moulting and resting (SCOS,2025). The closest grey seal haul-out sites to the Proposed Works Offshore are located at Lambay Island SAC (74 km) and the coast of Wexford (where several smaller haul-out sites occur close together, including Saltee Islands haul-out site) (Morris and Duck, 2019; Ó Cadhla and Strong, 2007; Morris *et al*., 2025; **Plate 5.2**). Haul-out sites both at Lambay Island and off the coast of Wexford are breeding sites for grey seal (Ó Cadhla and Strong, 2007; Morris *et al*., 2025) but the Wexford haul-out sites are considered to have considerably higher numbers of individuals compared to Lambay Island (Duck and Morris, 2012). For example, population estimates undertaken at the haul-out sites in 2012 identified a population of 239 grey seals at the Wexford haul-out sites compared to a population of 62 grey seals at Lambay Island (Duck and Morris, 2012). More recent thermal imaging surveys undertaken in 2024 identified similar numbers (Morris *et al*., 2025).

5.5.4.34 The mean at-sea usage (i.e., the mean count of seals in the water at any point) for grey seals in the Irish Sea shows increased activity around these haul-out sites but lower presence in between the haul-out sites and where the Offshore Site is located (Carter *et al*., 2022).

5.5.4.35 Furthermore, during site specific DAS undertaken for ABWP Phase II between 2018 and 2020, only 15 grey seals were identified in the Marine Mammal Study Area (APEM, 2024a; HiDef, 2020). Updated vantage point surveys conducted between June to November 2025 at the ABWP Phase II landfall site (approximately 7 km north of the Offshore Site) recorded a total of 30 individual grey seals, with ten of these individuals observed hauling out at the ABWP Phase II proposed landfall site (APEM, 2026d). However, overall presence of grey seals during the ABWP Phase II surveys from June to November 2025 was still considered relatively low and suggested low usage of the wider offshore area (APEM, 2026d). Presence of grey seal is shown to be higher around Scotland and the east coast of England compared to the Irish Sea. However, due to the high mobility of grey seals and the proximity of the Wexford and Lambay Island haul-out sites to the Offshore Site, there is the potential for grey seals to interact with the Proposed Works Offshore.

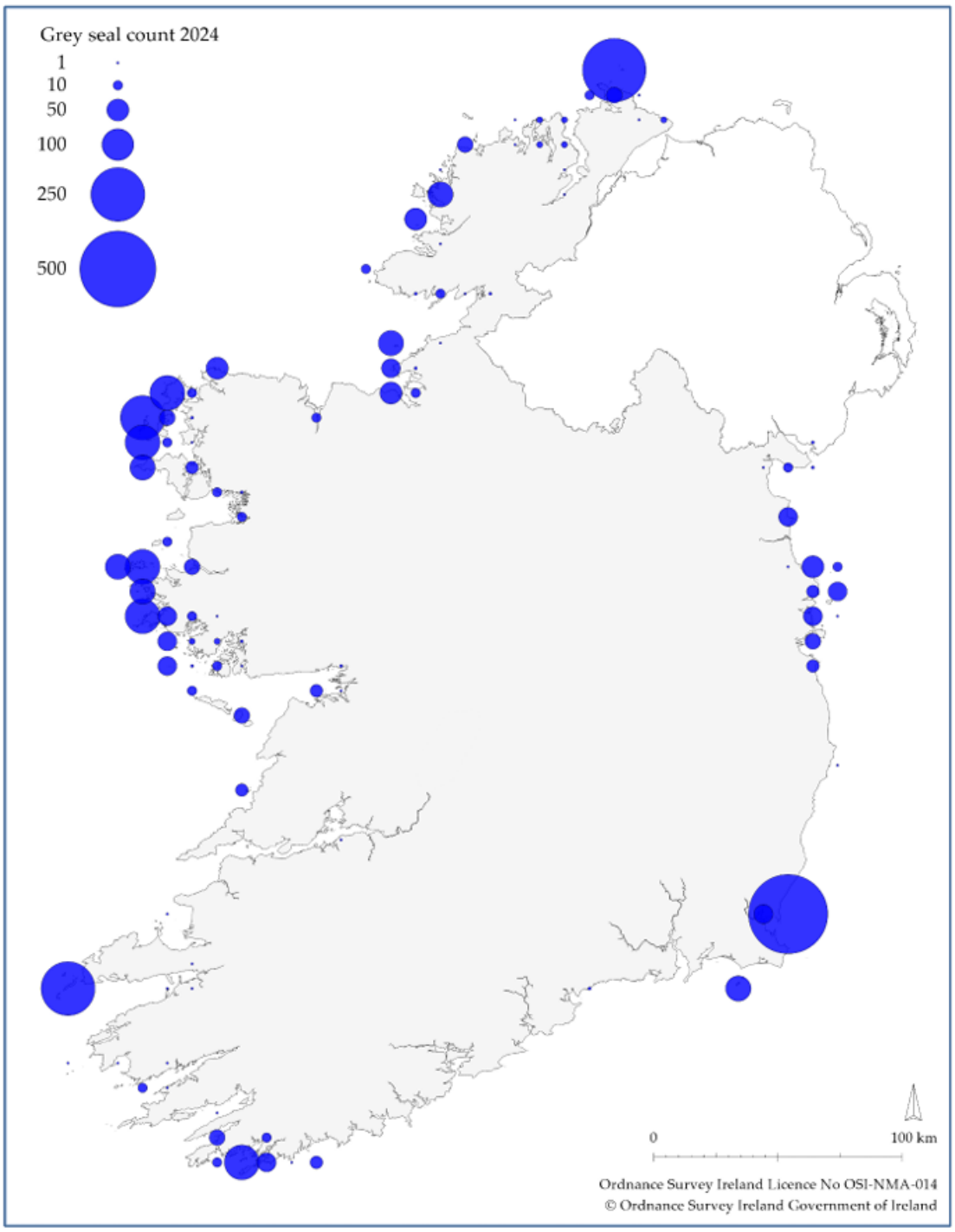


Plate 5.2: Grey seal haul-out sites in Ireland (Morris *et al.*, 2025).

Designated Sites

5.5.4.36 Due to the large foraging ranges and high mobility of marine mammals, key designated sites have initially been considered by using the relevant IAMMWG MMMUs defined for each species. The designated sites within each MMMU have been considered, based on available knowledge of species ecology and connectivity, for relevance to project activities.

5.5.4.37 However, due to the predicted localised, temporary and short-term nature of the Proposed Works Offshore, the search area has been refined. For cetaceans, the potential for disturbance

from underwater noise based on **Volume 3, Appendix 5.2** has been used to determine a preliminary screening distance.

5.5.4.38 For pinnipeds, it is acknowledged that harbour seals and grey seals can travel over large distances during foraging trips, with maximum foraging distances considered to be 273 km for harbour seals and 448 km for grey seals (Carter *et al*., 2022). Therefore, when considering these foraging ranges, it is theoretically possible for seals connected to European sites on the Welsh coast (i.e., Cardigan Bay SAC, Lleyn Peninsula and the Sarnau SAC and Pembrokeshire Marine SAC), western coast of Ireland (i.e. Roaringwater Bay and Islands SAC, Slieve Tooey/Tormore Island/Loughros Beg Bay SAC, Slyne Head Islands SAC, Inishbofin and Inishshark SAC, Horn Head and Rinclevan SAC, Duvillaun Islands SAC, Blasket Islands SAC and Inishkea Islands SAC) and Northern Irish coast (Maidens SAC) to interact with the Offshore Site (see **Figure 5.5**).

5.5.4.39 European sites in Welsh waters designated for grey seals are highly connected, with seals from these designated sites using habitat across the entire region of the Welsh coastline (Langley *et al*., 2020; Russell *et al*., 2017). Connectivity between European sites in Welsh waters and the Marine Mammal Study Area is considered less prevalent. For example, telemetry and tracking data (Russell *et al*., 2017; Langley *et al*., 2020) indicates connectivity between the Lleyn Peninsula SAC and the Dublin coastline, but this does not extend into the Marine Mammal Study Area, where at-sea usage of both harbour and grey seals is low (Carter *et al*., 2022). Telemetry data also shows no connectivity between European sites on the western coast of Ireland designated for grey seal with the Marine Mammal Study Area, despite the long foraging range of grey seals, with at-sea usage data (Carter *et al*., 2022) showing grey seal activity on the western coast of Ireland is limited to isolated areas. As a result, the Proposed Works Offshore are not expected to have an effect on the integrity of European sites for seals on the Welsh coast or western coast of Ireland, and these have not been considered further.

5.5.4.40 The Maidens SAC, located on the Northern Irish coastline (**Figure 5.5**) is also designated for grey seal and is within the foraging range of 448 km (Carter *et al*., 2022). However, grey seals are known to travel between the Maidens SAC and Scottish waters, rather than Irish waters (Russell *et al*., 2017). Therefore, this site has also not been considered further.

5.5.4.41 Therefore, in the Marine Mammal Study Area, there are five European sites for which marine mammals are qualifying interests, as summarised in **Table 5.13** and discussed further in the **AA Screening Report** and **NIS** (prepared in support of the application for planning permission of the Proposed Works).

Table 5.13 European sites with marine mammal qualifying features

European site	Distance from Offshore Site (km)	Relevant marine qualifying feature(s)
Slaney River Valley SAC	13.9	• Harbour seal (*Phoca vitulina*) [1365] (marine)
Blackwater Bank SAC	29.2	• Harbour porpoise (*Phocoena phocoena*) [1351] (marine)
Rockabill to Dalkey Island SAC	47.4	• Harbour porpoise *(Phocoena phocoena*) [1351] (marine)
Saltee Islands SAC	72	• Grey seal (*Halichoerus grypus*) [1364] (marine)
Lambay Island SAC	74	• Grey seal (*Halichoerus grypus*) [1364] (marine) • Harbour seal (*Phoca vitulina*) [1365] (marine)

5.5.5 Marine Ornithology

Summary of Species

5.5.5.1 Seabird monitoring for AWBP Phase I was undertaken between 2000 to 2010, including monthly boat surveys from 2000 to 2009 and colony counts at Wicklow Head SPA (15 km north from Offshore Site) during the breeding season from 2001 to 2010 (Barton *et al*., 2010). These

monitoring surveys took place once per month along a survey corridor around the Sub Lease Area. Additional monthly surveys using aerial video were conducted from 2018 to 2020, across the AWBP Phase II array area, which extends approximately 20 km north and south of the Sub Lease Area (APEM, 2026h).

5.5.5.2 Surveys consistently found that the Arklow Bank sandbank and wider area supports a typical Irish Sea seabird assemblage, including red-throated divers (*Gavia stellata*), fulmars (*Fulmarus glacialis*), manx shearwater (*Puffinus puffinus*), gannets (*Morus bassanus*), shags (*Gulosus aristotelis*), kittiwakes (*Rissa tridactyla*), common tern (*Sterna hirundo*), little tern (*Sterna albifrons*), guillemots (*Uria aalge*), razorbills (*Alca torda*) and several gull species (Barton *et al*., 2010). A full list of species recorded within 4 km of the ABWP Phase II array area (which encompasses the Proposed Works Offshore) during the 2018 to 2020 aerial video surveys is provided in **Table 5.14** records that seabirds were either in flight or on the sea surface, with most sightings being individuals in flight (APEM, 2026h).

5.5.5.3 A baseline vantage point (VP) survey of wintering seabirds on the coastline between Arklow Pier and Johnstown North, County Wicklow, were undertaken between 2019 and 2020 (APEM, 2024b). This coastline, which includes where the landfall for the Proposed Works Offshore is located, was dominated by common gull, black-backed gull and a small number of common guillemot, red-throated diver and cormorant (APEM, 2024b).

Seasonality

5.5.5.4 ABWP Phase I post-construction bird surveys (undertaken between 2004 and 2009) and ABWP Phase II surveys suggest that seabird presence has a strong seasonal variation, with markedly higher abundance during autumn, winter and spring migration periods (Barton *et al*., 2010, APEM, 2024b). Across five high-level species groups (Arctic / common tern, large auk species, cormorant / shag, diver species, and small gull species), abundance in the summer months (June / July / August) is very low or zero both within Sub Lease Area and in the surrounding waters (APEM, 2024b).

5.5.5.5 Additionally, an onshore breeding bird survey between Arklow Pier and Johnstown North in July 2020 concluded that the potential for breeding birds in the area is minimal, and no evidence of breeding bird activity was recorded during the survey (APEM, 2024b). Therefore, the Offshore Site and the wider area is generally of lower ornithological importance during the breeding season.

5.5.5.6 Variations in seabird breeding, migration, and nonbreeding timing are listed in **Table 5.14** (Furness, 2015; NatureScot, 2020). The species listed in **Table 5.14** were all recorded within 4 km of the ABWP Phase II array area between March 2018 and April 2020 (APEM, 2026h). All species listed in **Table 5.14** have typical foraging ranges that overlap with the Offshore Site with the exception of Arctic tern, common tern, sandwich tern and razorbill, which are beyond the mean foraging distance of the Offshore Site (Woodward *et al*., 2019; APEM, 2024b). These four species are qualifying features of the Seas off Wexford SPA, which is 26.1 km from the Offshore Site.

Table 5.14: Seabird species recorded within Marine Ornithology ZoI and their conservation status

Species	Migration – Autumn	Migration - Winter	Migration – Spring	Nonbreeding season	Birds of Conservation Concern in Ireland 2020-2026 (Gilbert *et al*., 2021)	Annex I of EU Birds Directive
Arctic skua	Aug-Oct	-	Apr-May	-	Green	✓
Arctic tern	Jul-Sep	-	Apr-May	-	Amber	✓
Black-headed gull	-	-	-	Sep-Apr	Amber	✗
Common gull	-	-	-	Sep-Apr	Amber	✗

Species	Migration – Autumn	Migration - Winter	Migration – Spring	Nonbreeding season	Birds of Conservation Concern in Ireland 2020-2026 (Gilbert *et al.*, 2021)	Annex I of EU Birds Directive
Common scoter	Sept-Dec	-	Feb-May	-	Red	✗
Common tern	Jul-	-	Apr-May	-	Amber	✓
Cormorant	Aug-Oct	-	Feb-Apr	Sep-Mar	Amber	✗
Fulmar	Sept-Oct	Nov	Dec-Mar	-	Amber	✗
Gannet	Sept-Nov	-	Dec-Mar	-	Amber	✗
Great black-backed gull	Aug-Nov	Dec	Jan-Apr	Sep-Mar	Green	✗
Great northern diver	Sep-Nov	Dec-Feb	Mar-May	Sep-May	Amber	✓
Guillemot	Jul-Oct	Nov	Dec-Feb	Aug-Feb	Amber	✗
Herring gull	Aug-Nov	Dec	Jan-Apr	Sep-Feb	Amber	✗
Kittiwake	Aug-Dec	-	Jan-Apr	-	Red	✗
Lesser black-backed gull	Aug-Oct	Nov-Feb	Mar-Apr	-	Amber	✗
Little gull	-	-	-	Aug-Apr	Amber	✓
Manx shearwater	Aug-Oct	Nov-Feb	Mar-May	Sep-Mar	Amber	✗
Puffin	Jul-Aug	Sep-Feb	Mar-Apr	Aug-Mar	Red	✗
Razorbill	Aug-Oct	Nov-Dec	Jan-Mar	-	Red	✗
Red-throated diver	Sep-Nov	Dec-Jan	Feb-Apr	-	Amber	✓
Sandwich tern	Jul-Sep	-	Mar-May	Sep-Mar	Amber	✓
Shag	Aug-Oct	Nov	Dec-Feb	Sep-Jan	Amber	✗

Designated Sites

5.5.5.7 No SPAs overlap with the Offshore Site. However, six Designated Sites are within the 50 km Marine Ornithology Study Area:

- Wicklow Head SPA, 15.0 km;
- The Murrough SPA, 18.1 km;
- Seas off Wexford SPA, 26.1 km;
- The Raven SPA, 42.0 km;
- Poulaphouca Resevoir SPA, 42.2 km; and
- Wexford Harbour and Slobs SPA, 42.9 km.

5.5.5.8 Breeding seabird surveys conducted at Wicklow Head SPA from 1999 to 2009 observed the presence of fulmar, shag, herring gull, kittiwake, guillemot and razorbill. Overall trends between 1999 and 2009 showed that numbers of fulmar, shag, guillemot and razorbill increased, while kittiwake showed a slight decline during the survey period (Barton *et al.*, 2010). However, Population Viability Analysis (PVA) of kittiwakes at Wicklow Head SPA concluded that abundance has been relatively stable, averaging around 800 pairs between 1999 to 2023 (APEM, 2024b). It was concluded that this stability might be attributed to density-dependant competition for resources between individuals, which suggests that the population is likely to remain stable in the coming decades (APEM, 2024b).

5.5.5.9 The Murrough SPA is designated for red-throated diver, black-headed gull, herring gull and little tern. The little tern colony in The Murrough SPA has significantly increased over recent decades,

rising from 15 breeding pairs in 1985 to 274 pairs in 2024. The Murrough SPA is Ireland's most important little tern colony, representing 43% of the national population (NWPS, 2024). At present, there is insufficient data to estimate population trends over the wintering season for red-throated diver, black-backed gull, and herring gull in The Murrough SPA (NWPS, 2024).

5.5.5.10 The Seas off Wexford SPA is designated for 20 seabird species, of which 18 are breeding populations of seabirds that are also qualifying interests of surrounding SPAs. Therefore, it is likely that many of these seabirds utilise the Seas off Wexford SPA as foraging grounds from nearby nesting sites within other SPAs, including Lady's Island SPA and Saltee Islands SPA (NWPS, 2024b). Non-breeding seabirds for which The Seas off Wexford SPA is designated are red-throated diver and common scoter. Both species utilise The Seas off Wexford SPA's nearshore coastal waters and regularly travel between the Seas off Wexford SPA and adjacent SPAs, including the Raven SPA (NWPS, 2024b).

5.5.5.11 The Wexford Harbour and Slobs SPA and The Raven SPA are intrinsically linked as many of the listed waterbird species use habitats that extend across both sites (NPWS, 2011). Both are designated for many wintering waterbirds, including red throated diver. Across both sites, red-throated diver population has decreased by 16% between 1995 and 2007 (NPWS, 2011).

5.5.5.12 The Poulaphouca Reservoir SPA is designated for wintering lesser black-backed gull. While insufficient data are available to estimate population trends, an estimated 651 lesser-black backed gulls were estimated to be using the SPA in the 1999 to 2000 wintering period (NPWS, 2024c)

Protected Species

5.5.5.13 The conservation status of the seabird species recorded during AWBP Phase I and AWBP Phase II surveys are provided in **Table 5.14**: . Conservation rankings follow the Birds of Conservation Concern in Ireland 2020-2026, in which species are assigned to Red, Amber, and Green categories corresponding to high, medium, and low conservation concern, respectively. The classification criteria incorporate global conservation status, European conservation status, and trends in breeding and non-breeding populations (Gilbert *et al*., 2021). Of the species recorded during the surveys, four are Red-listed: Common scoter, kittiwake, razorbill and puffin.

5.5.5.14 Seven species recorded during the AWBP Phase I and Phase II surveys are listed on Annex I of the EU Birds Directive, which identifies species requiring special conservation measures (EEA, 2019). These species are Arctic skua, Arctic tern, common tern, great northern diver, little gull, red-throated diver, and sandwich tern.

5.5.6 Summary of Marine Designated Sites

5.5.6.1 There are no European sites (SACs and SPAs) directly overlapping the Offshore Site. However, there are several European sites within the Study Areas for fish and shellfish, marine mammals and marine ornithology qualifying features (**Figure 5.5** and **Figure 5.6**). Information on SACs and SPAs within the relevant Study Areas and associated marine qualifying features is provided in **Table 5.15**:.

5.5.6.2 Only the European sites with marine qualifying features (i.e. those below the HWM) have been considered. Designated sites with terrestrial qualifying features and coastal features above the HWM are considered in the **AA Screening Report** prepared in support of the application for planning permission of the Proposed Works.

Table 5.15: European sites within the ZoI of the Proposed Works Offshore and associated qualifying features

European site	Distance from Proposed Works Offshore (km)	Relevant marine qualifying feature(s)
SACs		
Slaney River Valley SAC	13.9	• Sea lamprey (*Petromyzon marinus*) [1095] (marine / freshwater)

European site	Distance from Proposed Works Offshore (km)	Relevant marine qualifying feature(s)
		• River lamprey (*Lampetra fluviatilis*) [1099] (marine / freshwater) • Twaite shad (*Alosa fallax*) [1103] (marine / freshwater) • Atlantic salmon (*Salmo salar*) [1106] (marine / freshwater) • Harbour seal (*Phoca vitulina*) [1365] (marine)
Blackwater Bank SAC	29.2	• Harbour porpoise (*Phocoena phocoena*) [1351] (marine)
Rockabill to Dalkey Island SAC	47.4	• Harbour porpoise *(Phocoena phocoena*) [1351] (marine)
River Barrow and River Nore SAC	48.4	• Sea lamprey (*Petromyzon marinus*) [1095] (marine / freshwater) • River lamprey (*Lampetra fluviatilis*) [1099] (marine / freshwater) • Twaite shad (*Alosa fallax*) [1103] (marine / freshwater) • Atlantic salmon (Salmo salar) [1106]
Saltee Islands SAC	72	• Grey seal (*Halichoerus grypus*) [1364]
Lambay Island SAC	74	• Grey seal (*Halichoerus grypus*) [1364] (marine) • Harbour seal (*Phoca vitulina*) [1365] (marine)
SPAs		
Wicklow Head SPA	15.0	• Kittiwake (*Rissa tridactyla*) [A188]
The Murrough SPA	18.1	• Red-throated diver (*Gavia stellata*) [A001] * • Black-headed gull (*Chroicocephalus ridibundus*) [A179] • Herring gull (*Larus argentatus*) [A184] • Little tern (*Sterna albifrons*) [A195]*
Seas off Wexford SPA	26.1	• Red-throated diver (*Gavia stellata*) [A001] * • Fulmar (*Fulmarus glacialis*) [A009] • Manx shearwater (*Puffinus puffinus*) [A013] • Gannet (*Morus bassanus*) [A016] • Cormorant (*Phalacrocorax carbo*) [A017] • Shag (*Phalacrocorax aristotelis*) [A018] • Common scoter (*Melanitta nigra*) [A065]* • Mediterranean gull (*Larus melanocephalus*) [A176]* • Black-headed gull (*Chroicocephalus ridibundus*) [A179] • Lesser Black-backed gull (*Larus fuscus*) [A183] • Herring gull (*Larus argentatus*) [A184] • Kittiwake (*Rissa tridactyla*) [A188] • Sandwich tern (*Sterna sandvicensis*) [A191] • Roseate tern (*Sterna dougallii*) [A192]* • Common tern (*Sterna hirundo*) [A193] • Arctic tern (*Sterna paradisaea*) [A194] • Little tern (*Sterna albifrons*) [A195]* • Guillemot (*Uria aalge*) [A199] • Razorbill (*Alca torda*) [A200] • Puffin (*Fratercula arctica*) [A204]
The Raven SPA	42.0	• Red-throated diver (*Gavia stellata*) [A001]* • Cormorant (*Phalacrocorax carbo*) [A017]* • Common scoter (*Melanitta nigra*) [A065]*
Poulaphouca Reservoir SPA	42.2	• Lesser black-backed gull (*Larus fuscus*) [A183]
Wexford Harbour and Slobs SPA	42.9	• Cormorant (*Phalacrocorax carbo*) [A017]* • Oystercatcher (*Haematopus ostralegus*) [A130]

European site	Distance from Proposed Works Offshore (km)	Relevant marine qualifying feature(s)
		• Black-headed gull (*Chroicocephalus ridibundus*) [A179] • Lesser black-backed gull (*Larus fuscus*) [A183] • Little tern (*Sterna albifrons*) [A195]*

*Due to maximum foraging range information provided by Woodward *et al*. (2019) and British Trust for Ornithology (2026), these species from their associated sites are not expected to directly interact with the Proposed Works Offshore but may experience indirect effects.

Potential Future Marine Protected Areas

5.5.6.3 The designated sites baseline presented in this chapter is based on the current network of SACs and SPAs. However, Ireland's marine protected area framework is an evolving policy area.

5.5.6.4 In 2019, the Department of Housing, Local Government and Heritage (DHLGH) initiated a process to expand Ireland's MPA network, with ecological sensitivity analyses subsequently commissioned for the western Irish Sea and the Celtic Sea, screening for suitable areas for protection and informing decision-making on the siting of offshore renewable energy infrastructure (DHLGH, 2019; 2023; 2024). These analyses identified areas of comparatively higher ecological priority from which suitable areas for future MPAs could be selected, with network solutions to be further refined through the forthcoming legislative process. This includes a small area that may overlap or be located within close proximity to the offshore export cable route near its landfall, however, this is identified by DHLGH as low suitability in comparison to other areas identified.

5.5.6.5 It should be noted that in November 2025, the Irish Government approved preparation of the Maritime Area Planning (Marine Protected Areas) (Amendment) Bill, which will provide a legislative basis for MPA designation using the Designated Maritime Area Plans mechanism under the Maritime Area Planning Act 2021, with a national ambition to designate 30% of the maritime area as protected by 2030 (Department of Climate, Energy and the Environment, 2025). Given that there have been no MPAs designated at the time of writing of this chapter, these are not considered further.

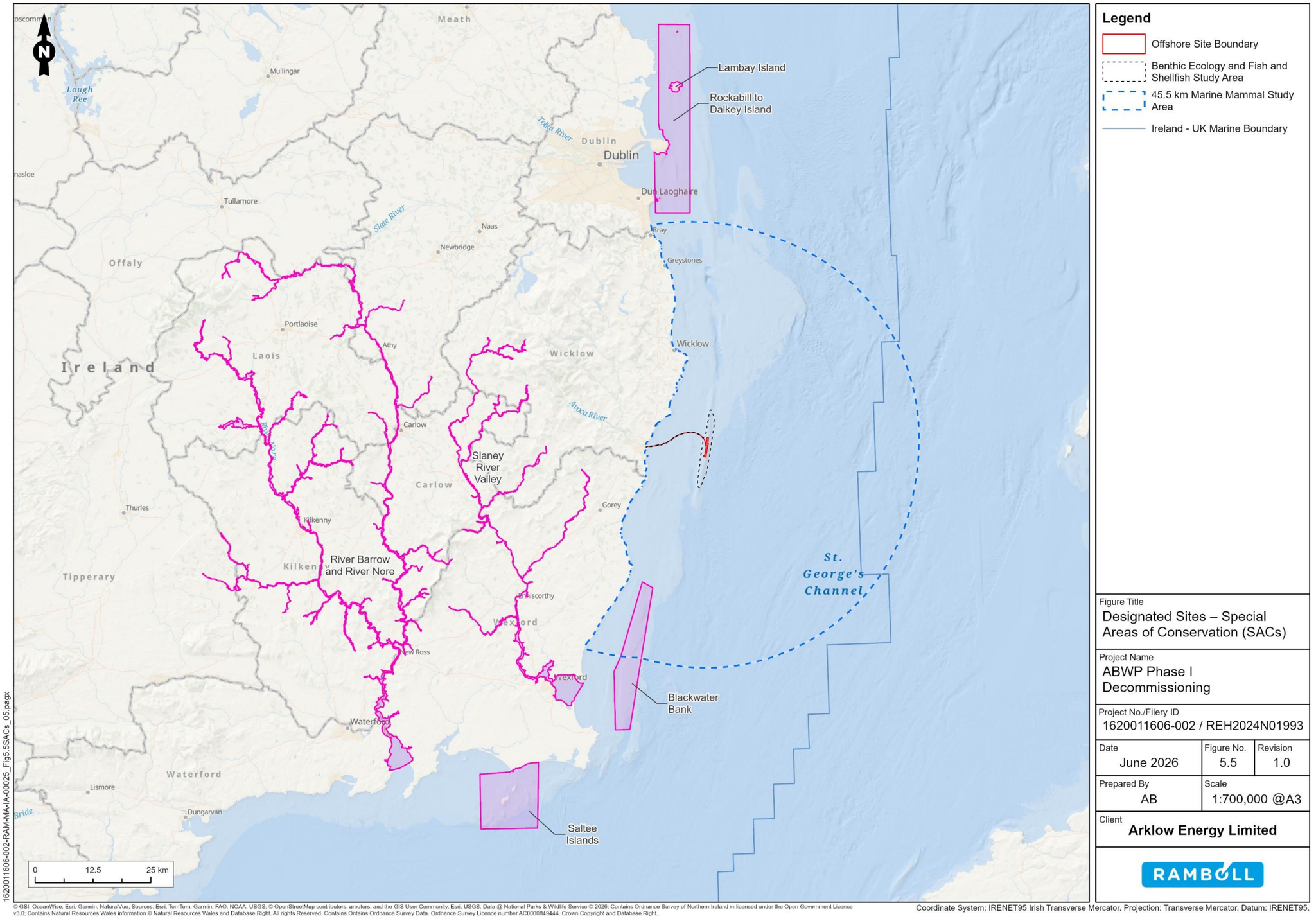


Figure 5.5: Designated Sites – SACs

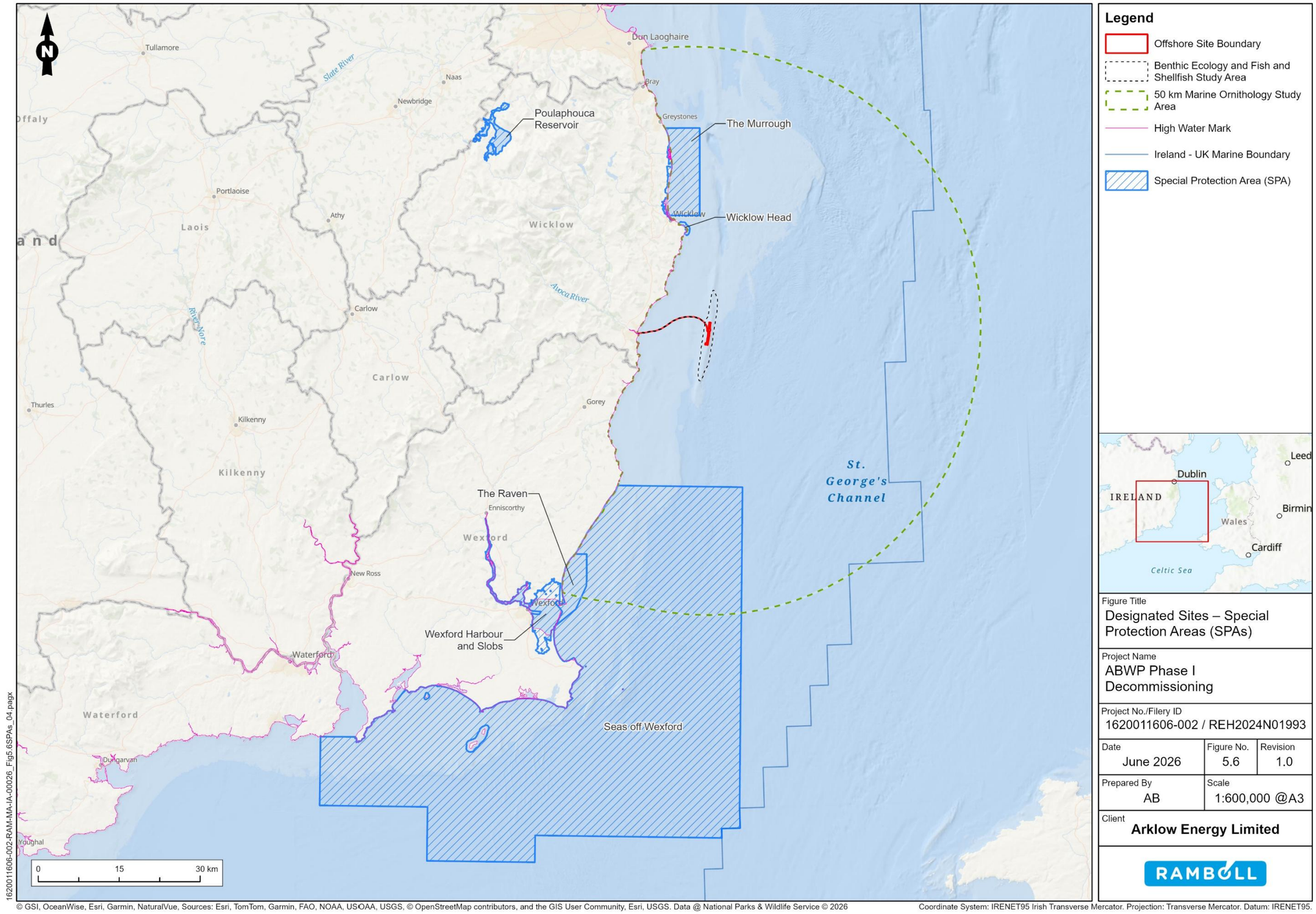


Figure 5.6: Designated Sites - SPAs

5.5.7 Summary of Sensitive Receptors

5.5.7.1 The receptors identified as sensitive to the Proposed Works Offshore are summarised, and therefore considered further, are summarised below.

Intertidal and Subtidal Benthic Ecology:

5.5.7.2 The intertidal and subtidal benthic ecology receptors that are known to occur in the Benthic Ecology Study Area and have been considered further are:

- Subtidal habitats including the biotopes:
  - Nephtys cirrosa and Bathyporeia spp. in infralittoral sand;
  - *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel;
  - *Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in Atlantic infralittoral mobile coarse sand;
  - *Flustra foliac*ea and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment;
  - *Sabellaria spp.* on stable circalittoral mixed sediment;
  - Infralittoral mobile clean sand with sparse fauna; and
- Intertidal rocky-shore habitat

Fish and Shellfish

5.5.7.3 The fish and shellfish receptors that are known to occur in the Fish and Shellfish Study Area and have been considered further are:

- Migratory fish:
  - Atlantic salmon;
  - Brown / sea trout;
  - River / sea lamprey;
  - European eel;
  - Twaite shad; and
  - European smelt.
- Demersal fish;
- Pelagic fish;
- Elasmobranchs;
- Shellfish;

Marine Mammals

5.5.7.4 The marine mammal receptors that are known to occur in the Marine Mammal Study Area and have been considered further are:

- Harbour porpoise;
- Bottlenose dolphin;
- Short-beaked common dolphin;
- Harbour seal
- Grey seal

Marine Ornithology

5.5.7.5 Based on the expected activities to be undertaken, the location of the Offshore Site and the expected impact pathways, red-throated diver is considered to be the most sensitive species which could interact with the Proposed Works Offshore, as they have particular sensitivity to disturbance and displacement (JNCC, 2022). Therefore, the assessment has used red-throated diver as a worst-case scenario, but all other bird species expected to be present in the Marine Ornithology Study Area have also been considered as a whole.

5.5.8 Future Baseline Conditions

5.5.8.1 Following the completion of Proposed Works Offshore, the marine biodiversity baseline can be expected to evolve both on a natural basis and in response to global trends such as climate change and other anthropogenic activities.

5.5.8.2 An assessment of future baseline conditions, where Proposed Works Offshore are not executed, has been undertaken and is described within this section.

5.5.8.3 Impacts of climate change on the marine environment can be direct (i.e. increase in sea temperature and sea level or decrease in pH due to ocean acidification) or indirect (i.e. increased frequency of storms), both of which can result in unpredictable and long-term changes. Range shifts of marine species in response to climate change are occurring four times faster than in terrestrial species (Martin *et al*., 2023).

5.5.8.4 For benthic ecology, the degree to which species or habitats can be affected by climatic shifts depends on vulnerability, sensitivity and magnitude (Harrison *et al*., 2001). For example, benthic species which have a planktonic phase are considered to be the most sensitive to seawater temperature rise (Hiscock *et al*., 2001; Poloczanska *et al*., 2016). However, in comparison, some *Sabellaria* species are known to benefit from warmer sea temperatures.

5.5.8.5 Evidence also suggests that a rise in seawater temperature has resulted in fish species typically found in warmer waters to be present in the southern Irish Sea, including boarfish (*Capros aper*) and anchovy (*Engraulidae* sp.) (Nolan *et al*., 2023). Similarly, northward shifts of seabirds have been observed in the Irish Sea, particularly species which feed on sandeel.

5.5.8.6 Range shifts are also being observed in marine mammals, with some species observed to be moving further northwards (Martin *et al*., 2023). Consequently, the proportion of recorded standings of warm-water adapted species in northwest UK waters is increasing, and strandings of cold water adapted species are decreasing in the same region.

5.5.8.7 Sea level rise is also expected to result in some changes in baseline conditions, including the loss of bird nesting habitat in coastal areas, impacting populations including little tern and ringer plover (Nolan *et al*., 2023). Impacts of sea level rise are now being observed around the Irish coastline.

5.5.8.8 The marine environment around the Irish coastline is also being disturbed and affected by other factors in addition to climate change, such as commercial fishing activity (Nolan *et al*., 2023). The influence of such anthropogenic impacts could intensify shifting baselines caused by climate change by affecting predator and prey abundance or availability of suitable habitat.

5.5.8.9 Lastly, Ireland's marine designated sites network is expected to expand significantly over the coming years, with a national target of 30% marine protection by 2030 (Department of Climate, Energy and the Environment, 2025). Areas in the vicinity of the project may be subject to future MPA designation during its operational lifetime and the position with regard to future designations should be reviewed at key project milestones.

5.5.8.10 A new, larger offshore wind farm (ABWP Phase II) may be built (subject to planning permission) surrounding the Offshore Works, however, this is considered separately in **Section 5.7**.

5.6 Assessment of Impacts

5.6.1 Overview

5.6.1.1 This section includes the assessment of the impacts to marine biodiversity arising from the Proposed Works Offshore. A summary of the effects is presented in **Table 5.21.**

5.6.1.2 Based on the information provided in **Section 5.5**, the impacts and associated marine ecological features that have been considered further are summarised in **Table 5.16**.

Table 5.16: Likely impacts considered further in the assessment and marine ecological features most likely to be affected by the Proposed Works Offshore

Impact	Subtidal Habitats and Species	Intertidal Habitats and Species	Fish and Shellfish	Marine Mammals	Marnie Ornithology
Temporary habitat loss / disturbance	✓	✓	✓		
Increased Suspended Sediment Concentration (SSC) and deposition	✓	✓	✓		
Disturbance / remobilisation of sediment bound contaminants	✓	✓	✓		
Alteration of seabed habitat from changes in physical processes	✓	✓	✓		
Removal of hard offshore infrastructure	✓	✓			
Injury and / or disturbance from underwater noise			✓	✓	
Injury and / or disturbance from vessels activity				✓	
Increased risk of invasive and non-native species (INNS) introduction / spread	✓				
Changes in the fish and shellfish community affecting prey resources				✓	✓
Disturbance and / or displacement of birds					✓

5.6.2 Temporary Habitat Loss / Disturbance

5.6.2.1 During the Proposed Works Offshore, temporary habitat loss / disturbance is expected to occur within the footprint of the Offshore Site where activities interact with the seabed. Activities include dredging and disposal of dredged material within the Sub Lease Area of the Offshore Site, the removal of exposed infrastructure from the seabed such as wind turbine foundations and scour protection and the interaction of vessels with the seabed i.e. JUB legs.

5.6.2.2 The majority of temporary habitat loss and disturbance will occur in subtidal waters. However, it is also currently assumed that the offshore export cable will be severed in the vicinity of the landfall and left exposed on the seabed until it is pulled in from land. Therefore, there is the potential for a small amount of habitat disturbance in the intertidal area, although this is expected to be minor. For completeness, and on a precautionary basis, intertidal habitats and species have therefore been included within this assessment.

Receptor Sensitivity

5.6.2.3 The following receptors are considered to be sensitive to temporary habitat loss / disturbance:

- Benthic intertidal habitats and species;
- Benthic subtidal habitats and species; and
- Fish and shellfish.

5.6.2.4 *Sabellaria* spp. are present in the Benthic Ecology Study Area in close vicinity to the Offshore Site. However, *Sabellaria* spp. are not present within the footprint of the Proposed Works Offshore and are not expected to be affected by temporary habitat loss or disturbance. Therefore, they have not been considered here.

Benthic Intertidal Habitats and Species

5.6.2.5 The benthic intertidal environment in the vicinity of the landfall is characterised by rocky-shore biota formed by the presence of the Arklow Harbour breakwater. Disturbance in this habitat may result in the detachment or removal of some algae from the rocky substrate. However, many algae species are able to re-grow with minimal long lasting change following physical disturbance (e.g., Perry *et al*., 2024).

5.6.2.6 Furthermore, due to the artificial formation of these rocky habitats through the placement of man-made material for the creation of a breakwater in an environment exposed to wave action, the biodiversity is unlikely to be high or important. Therefore, due to the temporary, highly localised and short-term nature of the works in the intertidal area, sensitivity is considered to be **low**.

Benthic Subtidal Habitats and Species

5.6.2.7 Subtidal habitat in the Offshore Site is largely characterised by coarse, sandy and muddy sediments, with increasing infralittoral sand and mud becoming the dominant habitat closer to the landfall.

5.6.2.8 Biotopes present within the Offshore Site include the biotopes '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand', '*Flustra folicacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment' and 'Infralittoral mobile clean sand with sparse fauna' (see **Section 5.5**). These habitats are considered to have a medium sensitivity to removal of substratum through activities such as dredging as epifauna characterising these biotopes can be removed but has a high recovery potential (Readman and Watson, 2024). Sensitivity to abrasion and disturbance can vary however, with some species more or less susceptible to damage than others resulting in higher or lower sensitivity. Therefore, overall sensitivity is **medium**.

5.6.2.9 Biotopes characterised as '*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel' and '*Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in infralittoral mobile coarse sand' were also recorded in the vicinity of the Proposed Works Offshore during baseline and monitoring surveys (Aquafact, 2025). These biotopes also have a medium sensitivity to removal of substratum as most species occurring in

this biotope are shallowly buried and therefore susceptible to removal and damage (Tillin and Watson, 2024) during dredging or disturbance. Therefore, sensitivity is considered to be **medium**.

Fish and Shellfish

Fish

5.6.2.10 Only fish and shellfish species which have a direct association with the seabed, and which are considered likely to be present within the footprint of the Offshore Site have the potential to be affected by temporary habitat loss and disturbance.

5.6.2.11 Migratory fish are pelagic and therefore are not considered to have any functional association with the seabed due to their life history strategies (i.e. found within the water column). Therefore, this receptor group has not been considered further for habitat disturbance. Similarly, pelagic spawners are also considered to have a low sensitivity to temporary disturbance due to a lack of direct association with the seabed and haven't been considered further.

5.6.2.12 Demersal fish and life stages are considered the most sensitive to temporary seabed disturbance due to their association with the seabed, with displacement considered the most likely effect. Sandeel is a demersal spawner present in the Fish and Shellfish Study Area and is particularly sensitive to removal and degradation of spawning habitat due to requirements for specific sediment types. However, sandeel habitat does not overlap with the Offshore Site and is located approximately 20 km north, therefore sandeel grounds will not be affected by temporary habitat loss and disturbance during the Proposed Works Offshore.

5.6.2.13 Sensitivity of other demersal fish species that may be present (but not spawning) is considered to vary in response to temporary habitat loss and disturbance. Several nursery grounds are present for demersal fish however these cover large areas compared to the small and limited extent of the Offshore Site. Furthermore, due to the mobile nature of fish, any affected species are expected to exhibit temporary avoidance, returning to the affected area once the short-term and localised works have been completed. Therefore, overall sensitivity is considered to be l**ow**.

Shellfish

5.6.2.14 Several shellfish species are present in the Fish and Shellfish Study Area and therefore have potential to be disturbed by temporary habitat loss within the Offshore Site. Most shellfish species are limited in mobility compared to fish and therefore they are less able to move away or avoid areas of disturbance.

5.6.2.15 The Offshore Site is located within soft sandy and muddy sediments and therefore species including whelk, brown crab and Nephrops area expected to be present.

5.6.2.16 Common whelk has limited mobility and spends a large proportion of time buried under the sediment surface or stationery on the seabed (Valentinsson, 2022). Common whelk can occur over a range of different sediment types. However, due to their limited mobility, they are expected to have a **high** sensitivity to temporary habitat loss and disturbance, particularly during activities such as dredging.

5.6.2.17 Brown crab, also known as edible crab, generally have a **low** sensitivity in terms of disturbance of habitat due to their ability to utilise different habitat types such as boulder areas and mixed coarse grounds (Neal and Wilson, 2008). Therefore, during the disturbance event, brown crab is expected to move away from the affected area to other habitats within the surrounding Irish Sea, returning once the disturbance has stopped. Berried females may be more susceptible to damage during activities such as dredging as they are relatively immobile. However, only a small number of individuals are likely to be affected.

5.6.2.18 Nephrops, also known as Norway lobster, is considered to have a relatively high intolerance to habitat loss (Hill and Sabatini, 2008). During disturbance, Nephrops typically find refuge in burrows, but these could also be removed during activities such as dredging. However, burrows can be re-established within a few days following disturbance from activities such as dredging.

Therefore, they are considered to have a **moderate** sensitivity to seabed disturbance (Hill and Sabatini, 2008).

Magnitude of Impact

5.6.2.19 During the Proposed Works Offshore, several activities occurring within the Offshore Site are expected to result in temporary habitat loss / disturbance.

5.6.2.20 Dredging is expected to occur in the Sub Lease Area only over a total area of up to 0.357 km^2 which makes up 21.3% of the Sub Lease Area, with an approximate total dredging volume of up to 38,139 m^3 for -4.5 m LAT and 86,000 m^3 for -6.5 m LAT. The removal of infrastructure from the seabed (wind turbine foundation, inter-array cables and offshore export cable) is expected to result in temporary habitat disturbance over a total area of up to 0.07 km^2, within the Offshore Site. The extent of removal of scour protection is not currently known, as this will depend on the number of scour protection sandbags exposed during the Proposed Works Offshore.

5.6.2.21 A JUB will also be required for works. It is not currently known how many jack-up events will be required during the Proposed Works Offshore, however it is assumed that the removal of each of the seven WTGs and the met mast will require one jack-up event for the removal of infrastructure. Based on a standard diameter of 2 m per spud leg, there is expected to be approximately 12.57 m^2 (12.57 $x10^{-5}$ km^2) of disturbance per jack-up event, with approximately eight jack-up events expected.

Benthic Intertidal Habitats and Species

5.6.2.22 The benthic intertidal habitats and species present at the landfall are considered widespread along the coastline of Ireland (EMODnet, 2023) and they are not associated with any Designated Site. The total area of temporary habitat loss within the intertidal area is considered to be negligible, with temporary habitat loss in the intertidal area only expected to be associated with the cutting of the cable at the landfall. However, the intertidal area surrounding the landfall is characterised by rocky shore which is expected to have a high rate of recovery from minor disturbance. It is therefore considered that the magnitude of temporary habitat loss / disturbance for benthic intertidal habitats and species from the Proposed Works Offshore is considered to be **negligible adverse**.

Benthic Subtidal Habitats and Species

5.6.2.23 The benthic subtidal habitats and species present in the Offshore Site are considered widespread across the western Irish Sea (EMODnet, 2023) and are not associated with any designated sites. The Proposed Works Offshore are occurring in predominantly sandy sediment habitats. Therefore, due to natural hydrodynamic and sediment transport processes, the backfill of disturbed habitat by sediment is expected to occur rapidly following the end of the seabed disturbance with a high rate of recovery. Any disturbance is expected to be very minor and temporary. Furthermore, the area of temporary habitat loss of such benthic habitats is considered to be small compared to the total area of available habitats in the Irish Sea.

5.6.2.24 Therefore, the magnitude of temporary habitat loss / disturbance for benthic subtidal habitats and species from the Proposed Works Offshore is considered to be **low adverse**.

Fish and Shellfish

5.6.2.25 Temporary and minor habitat loss is expected to occur within spawning grounds for demersal fish which overlap with the Offshore Site (see **Section 5.5.3**). However, the fish habitat present covers a large area compared to the limited extent of the Offshore Site and any impacts are unlikely to be measurable at a population level. Furthermore, there are no designated sites for fish qualifying features which overlap with the Offshore Site.

5.6.2.26 Therefore, the magnitude of temporary habitat loss / disturbance for fish from the Proposed Works Offshore is considered to be **low adverse**.

5.6.2.27 Any shellfish species present in the Offshore Site during the Proposed Works Offshore are expected to be directly affected by temporary habitat loss, particularly species which have limited mobility. However, the total area of temporary habitat loss expected to occur is considered to be small compared to the total available and suitable shellfish habitat in the Irish Sea. Furthermore, species such as whelk and nephrops are typically found in muddy habitat, with most disturbance expected to occur in sandy, mixed sediments. However, due to the temporary and short-term nature of the Proposed Works Offshore, only a small number of individuals are expected to be affected which is unlikely to be measurable at a population level.

5.6.2.28 Therefore, the magnitude of temporary habitat loss / disturbance for shellfish from the Proposed Works Offshore is considered to be **low adverse**.

Significance of Effect

5.6.2.29 Overall, it is considered that temporary habitat loss will be short-term and temporary with sandy habitats expected to exhibit rapid recovery due to local hydrodynamic regimes. Furthermore, the overall number of species likely to be affected is small.

5.6.2.30 Therefore, it is considered that the worst-case receptor sensitivity is **high** and the worst-case magnitude of temporary habitat loss / disturbance is **low**. Therefore, the effect of temporary habitat loss / disturbance from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.2.31 Given that effect of temporary habitat loss / disturbance from Proposed Works Offshore is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of temporary habitat loss / disturbance from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

5.6.3 Increased SSC and Associated Deposition

5.6.3.1 During the Proposed Works Offshore, the main activity expected to result in increased SSC and associated deposition is dredging and the disposal of dredged material. Works on the seabed to remove monopiles may also result in increased SSC, however, this is expected to occur on a much smaller scale compared to dredging. Dredging (if required) will be limited to the Sub Lease Area to allow safe access to the WTGs. However, due to the dispersion of sediment in the water column, the ZoI is considered to be a maximum of 48 m along the offshore export cable route during cable removal works, and maximum of 7 km in the Sub Lease Area based on modelling presented in **Volume 3, Appendix 4.2**.

Receptor Sensitivity

5.6.3.2 The following receptors are considered to be sensitive to increased SSC and associated deposition:

- Benthic subtidal habitats and species
- Benthic intertidal habitats and species
- Fish (demersal species due to their association with the seafloor) and shellfish

Benthic Subtidal Habitats and Species

5.6.3.3 Benthic subtidal habitats within the Offshore Site consist of circalittoral coarse sediment, sand and mud, with infralittoral sand becoming the dominant habitat closer to the coastline.

5.6.3.4 Benthic surveys in the Benthic Ecology Study Area also recorded '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand', '*Flustra folicacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment' and 'Infralittoral mobile clean sand with sparse fauna'. These biotopes are all associated with exposed habitats and moderate to high levels of water flow, allowing any deposited sediment to be removed rapidly (Tillin *et al*., 2023). Additionally, the majority of species noted around Arklow Bank are sediment-dwelling, further reducing their vulnerability. As such, associated species exhibit resilience to low levels of increased SSC and

associated deposition. Therefore, the overall sensitivity rating to increased SSC and associated deposition for these habitats is **negligible**.

5.6.3.5 Biotopes characterised as '*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel' and '*Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in infralittoral mobile coarse sand' were also recorded in the vicinity of the Proposed Works Offshore during the baseline and monitoring surveys (GE Wind Energy, 2012; GE Wind Energy, 2022; Aquafact, 2025; Alpha Marine, 2026). The bivalves and polychaetes associated with these habitats are adapted to coarse sand and gravel substrates and can migrate through up to 30 cm of deposited sediment (Marshall *et al*., 2023). However, the characterising species of these biotopes have lower resistance to, and are less well adapted for movement through, fine sediment and mud than through coarse sand and gravel. Burial and subsequent emergence may impose an energetic cost, while temporary cessation of feeding could adversely affect growth and reproduction. However, these effects are unlikely to result in mortality. Therefore, the overall sensitivity of these habitats to increased SSC and associated sediment deposition is considered to be **low**.

5.6.3.6 During the initial baseline and subsequent benthic monitoring surveys, '*Sabellaria spinulosa* on stable circalittoral mixed sediment' were identified in the Benthic Ecology Study Area. Sabellaria are listed under Annex I of the EU Habitats Directive and are an OSPAR threated & declining species. *Sabellaria spinulosa* are accustomed to dynamic regions with high water movement and rely on moderate levels of sediment transport for tube building and suspension feeding. The construction of tubes from sand and mud enables *Sabellaria* to withstand limited sediment burial by producing emergence tubes that extend to the sediment surface. These structures allow *Sabellaria* to tolerate short-term, periodic burial by sand to depths of up to 7 cm (Last *et al*., 2011). There is also evidence that *Sabellaria alveolata* can survive short-term burial beneath sand layers up to 2 m deep for several weeks, although prolonged burial results in mortality (Earll & Erwin 1983; Tillin *et al.,* 2025). Overall, *Sabellaria* species demonstrate an inherent resilience and rapid recovery to turbid conditions and moderate sediment burial but are more susceptible to extensive or long-term siltation events. Therefore, although *Sabellaria* are protected species, the overall sensitivity rating to increased SSC and associated deposition is **low**.

Benthic Intertidal Habitats

5.6.3.7 The benthic intertidal environment in the vicinity of the landfall is characterised by rocky-shore biota formed by the presence of the Arklow Harbour breakwater, with coarse sand beaches interspersed with cobble and shingle habitat located elsewhere in the Benthic Ecology Study Area. Such habitats are expected to have a high tolerance to increased SSC due to regular disturbance of sediment by wave action, storm events and tidal water movement. Therefore, due to the temporary, highly localised and short-term nature of the works in the intertidal area, sensitivity is considered to be **low**.

Fish and Shellfish

Demersal Fish

5.6.3.8 Although increased SSC and associated sediment deposition may alter local substrate conditions, evidence from comparable activities such as dredging suggests that these effects are generally negligible for demersal fish species due to their association with the seafloor. Demersal species are also likely to be tolerant of elevated SSC and sediment deposition because these species naturally occur in high-energy environments characterised by frequent sediment resuspension and redistribution. The overall sensitivity rating of demersal fish to increased SSC and associated deposition is **low**.

Shellfish

5.6.3.9 The blue mussel is an important aquaculture species in Arklow Bay (Department of Climate, Energy and the Environment, 2021). Blue mussels are found in regions of high suspended particulate matter which supports filter feeding, so low levels of SSC and associated deposition

is tolerated. However, blue mussels are sensitive to moderate levels of smothering and are rarely capable of emerging from sediment depths greater than 2 cm (Last *et al*., 2011). Sensitivity to increased SSC and deposition increases with finer sediment and mud, in contrast to sand and coarse sediment. Overall, it is suspected that burial under 5 cm of sediment is unlikely to result in blue mussel mortality prior to sediment removal by waves and currents, but mortality is dependent on the duration of smothering (Last *et al*., 2011). Given their commercial importance, the overall sensitivity of blue mussel to increased SSC and associated deposition is **medium**.

5.6.3.10 Common whelk are another important aquaculture species in Arklow Bay (Department of Climate, Energy and the Environment, 2021). They are broadly distributed across the Irish Sea and are found across a broad range of habitats. Common whelk exhibits burrowing behaviours, emerging at night to mate in the autumn months (Nordsieck, 2025). This burrowing behaviour, combined with their broad distribution, means they are likely to tolerate localised and short-term increases in suspended sediment concentrations and minor sediment deposition. On this basis, common whelk is assessed as having low vulnerability to temporary sediment-related disturbance, with high recoverability due to their widespread occurrence and life-history traits. Given their commercial importance, the overall sensitivity of common welk to increased SSC and associated deposition is **low**.

5.6.3.11 Brown crab, also known as the edible crab, exhibit a high tolerance for SSC and are generally considered insensitive to short-term increases in turbidity, although they may avoid areas of elevated SSC due to reliance on visual cues for predation (Neal and Wilson, 2008). Berried females are more vulnerable during the overwintering period, as they adopt a largely sedentary lifestyle while burying themselves within soft mud and sand, unlikely to move away from disturbed areas. This limited mobility increases their susceptibility to smothering, as the eggs require regular exposure to well-oxygenated water for successful development. Therefore, brown crab are considered to have medium vulnerability to temporary increases in SSC and associated deposition during the overwintering period, but high recoverability due to their widespread distribution. Given their commercial importance, the overall sensitivity rating of edible crab to increased SSC and associated deposition is **low**.

5.6.3.12 Unlike brown crab, European lobsters do not exhibit a sedentary overwintering habitat. European lobsters are generally mobile and will move away from sources of disturbance. However, berried (egg carrying) females may be more vulnerable to increased SSC and smothering impacts as the eggs carried require regular aeration (Wilson, 2008). Overall, European lobster is considered to be of medium vulnerability to increased SSC and deposition, high recoverability due to their mobility and widespread distribution. Give their commercial importance, the overall sensitivity rating of European lobster to increased SSC and associated deposition is **low**.

5.6.3.13 Nephrops depend on burrowing within soft sediments for shelter and reproduction and increases in SSC may interfere with these behaviours. Exposure to elevated SSCs has been associated with behavioural and physiological changes, including reduced feeding activity and altered respiratory responses, which may adversely affect overall health and fitness (Johnson *et al*., 2013). Therefore, Nephrops exhibit a moderate degree of vulnerability to temporary increases in SSC and localised sediment deposition. However, recoverability is considered high because of their widespread distribution and capacity to re-establish burrows once conditions return to normal. The overall sensitivity rating of nephrops to increased SSC and associated deposition is **negligible**.

Elasmobranchs

5.6.3.14 Elasmobranchs in the Irish Sea include thornback ray, spotted ray, blonde ray, cuckoo ray, tope shark, spurdog, lesser spotted dogfish, nursehound, and stary smooth hound (Ellis *et al.,* 2012; Coull *et al*., 1998; APEM, 2026a). Nursery grounds for tope shark, thornback ray and spotted ray also overlap with the Offshore Site. However, all of the identified elasmobranch species within the Benthic Ecology Study Area are mobile and widespread throughout the wider Irish

Sea. These species will therefore experience exposure to naturally high variability in SSC within their natural range, with no substrate dependence for spawning. Therefore, the overall sensitivity rating of elasmobranchs to increased SSC and associated deposition is **low**.

Pelagic-spawning Fish

5.6.3.15 Lemon sole and sprat have spawning grounds overlapping the Offshore Site, and cod, mackerel, horse mackerel, lemon sole and whiting have nursery grounds overlapping the Offshore Site (Ellis *et al*., 2012; Coull *et al*., 1998; MMO, 2026; Parker-Humphreys, 2004). These species are pelagic spawners and do not exhibit substrate dependency. Therefore, sediment deposition within these spawning grounds will not result in any potential loss of available spawning habitats. These receptors are mobile, widely distributed across the Irish Sea, and will experience exposure to naturally high variability to SSC within their natural range. The receptors are therefore considered to be broadly insensitive to increased SSC and sediment deposition, and therefore the overall sensitivity rating of pelagic-spawning fish species to increased SSC and associated deposition is **low**.

Migratory / Diadromous Fish

5.6.3.16 Diadromous species expected to be present in the Benthic Ecology Study Area are Atlantic salmon, sea trout, sea lamprey, river lamprey, European eel, twaite shad, and European smelt. These species migrate through estuarine environments, where SSC are naturally elevated, and therefore exhibit an inherent tolerance to increased SSC. Adverse effects are likely to be limited to temporary behavioural responses and are unlikely to impede migration to / from natal rivers. For example, migrating Atlantic salmon (Oncorhynchus spp.) have been observed moving away from dredging operations and successfully resuming previous distribution patterns shortly after exposure to the dredging plumes (Carlson *et al*., 2001). Therefore, the overall sensitivity rating of migratory fish species to increased SSC and associated deposition is **low**.

Magnitude of Impact

5.6.3.17 Dredging as part of the Proposed Works Offshore is expected to occur in the Sub Lease Area only over a total area of 0.357 km^2. This makes up 21.3% of the Sub Lease Area, with a total dredging volume of 38,139 m^3 for -4.5 m LAT and 86,000 m^3 for -6.5 m LAT.

5.6.3.18 Project-specific modelling (**Volume 3, Appendix 4.2**) has indicated the likely distance over which a sediment plume is expected to travel, based on different sediment types.

5.6.3.19 During the use of a running method to uncover the export cable, increase in SSC is expected to be highly localised and very minor. Any gravel disturbed during the export cable works is expected to deposit immediately adjacent to location of disturbance, with deposition of all other disturbed sediment (predominantly sand) occurring within 48 m over a total duration of approximately 24 seconds.

5.6.3.20 Within the Sub Lease Area, sediment dispersion and deposition thickness has been modelled for vessel access dredging, maintenance dredging and monopile (internal) dredging. Vessel access dredging using a backhoe dredger and sediment disposal via side casting are considered to disturb the most sediment and represent a worst-case scenario for sediment dispersion and deposition. During dredging with a backhoe dredger, suspended sediment (consisting predominantly of sand) concentrations are expected to range from 2000 mg/L (in very isolated pockets around dredged material release locations) to approximately 30 mg/L. Sediment is expected to be dispersed over a maximum of 7 km from the location of activity. Coarse sand and gravel are likely to deposit on the seabed immediately and adjacent to the area of disturbance, with less coarse sand travelling a maximum distance of 48 m and depositing within approximately 23.81 seconds. Finer sediment, such as mud, which only comprises a small proportion of sediment in the Sub Lease Area is expected to disperse over a distance of 2 km during approximately 16 minutes. Small amounts of fines such as clay and silt are predicted to travel the maximum 7 km from the area of disturbance in the Sub Lease Area, depositing over a few days.

5.6.3.21 Dredging and cable removal activities are expected to result in the following deposition levels:

- Access dredging: Maximum deposition thicknesses of 14 cm in very localised and isolated pockets around the dredged material release locations. Outside of these isolated pockets, a maximum of 5 cm or lower is predicted.
- Maintenance dredging: Maximum deposition thicknesses of 5 cm within the Sub Lease Area and 1 cm outside the boundary of the Sub Lease Area, which continuously decreases to 7 km from the area of disturbance (maximum extent of sediment deposition);
- Internal monopile dredging: Negligible deposition thicknesses, with a maximum deposition of 0.03 cm in the Sub Lease Area.
- Export cable removal: Any increase in SSC and deposition is not expected to be discernible above background sediment disturbance.

5.6.3.22 Any increase in SSC at detectable levels is expected to be highly temporary, minor and localised to the area of disturbance, both in subtidal and intertidal areas. Furthermore, as seabed disturbance moves along the length of the export cable and across the Sub Lease Area, any measurable change will be short-term in any one location. Benthic features present within the Benthic Ecology Study Area are expected to be able to withstand temporary sediment deposition thicknesses up to 30 cm over short term periods, and therefore the risk of smothering is small with no effect on benthic populations. Fish and shellfish species are also considered tolerant of short-term increases in sediment deposition and increased SSC, with no effect on fish and shellfish populations.

5.6.3.23 In both the intertidal and subtidal areas, any increase in SSC and deposition will be rapidly dispersed by wave action and local hydrodynamic conditions.

5.6.3.24 Due to the short-term, very minor and temporary nature of the impact, any affected habitats and species are expected to recover to baseline conditions rapidly.

5.6.3.25 Therefore, it is considered that the magnitude of increased SSCs and associated deposition from Proposed Works Offshore is considered to be **low adverse**.

Significance of Effect

5.6.3.26 Overall, it is considered that the worst-case receptor sensitivity is **medium** and the magnitude of increased SSCs and associated deposition is **low**. Therefore, the effect of increased SSCs and associated deposition from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.3.27 Given that effect of increased SSC and deposition from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of increased SSC and deposition from the Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

5.6.4 Disturbance / Remobilisation of Sediment Bound Contaminants

Receptor Sensitivity

5.6.4.1 The following receptors are considered to be sensitive to disturbance / remobilisation of sediment bound contaminants:

- Benthic subtidal habitats and species;
- Benthic intertidal habitats and species; and
- Fish and shellfish.

Benthic Subtidal Habitats and Species

5.6.4.2 Benthic subtidal habitats within the Offshore Site consist of circalittoral coarse sediment, sand and mud, with infralittoral sand becoming the dominant habitat closer to the coastline.

5.6.4.3 Biotopes present within the Offshore Site include biotopes '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand', '*Flustra folicacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed

sediment' and 'Infralittoral mobile clean sand with sparse fauna' (see **Section 5.5**). Sensitivity of species typically found in these habitats to increased levels of contaminants is considered to vary. Generally, contaminants are only expected to result in impacts if they exceed environmental benchmarks such as those outlined in Cronin *et al.* (2006) and Marine Institute addendum (Cronin *et al*., 2019). Heavy metal contamination could result in sub-lethal effects, morphological changes and reduced growth in hydroids (Readman and Watson, 2024). In comparison, bryozoans such as hornwrack (*Flustra foliacea*) are considered to have a very low sensitivity to heavy metal contamination (Tyler-Walters and Ballerstedt, 2007). Therefore, overall sensitivity has been defined as **medium**.

5.6.4.4 Biotopes characterised as '*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel' and '*Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in infralittoral mobile coarse sand' were also recorded in the Offshore Site during the benthic baseline and monitoring surveys (GE Wind Energy, 2012; GE Wind Energy, 2022; Aquafact, 2025; Alpha Marine, 2026). Benthic habitats characterised by marine invertebrates including bivalves are considered to have a higher sensitivity to sediment-bound contaminants due to the capacity to accumulate heavy metals in tissues (Tillin and Watson, 2024). In comparison, many polychaete species are capable of regulating metal uptake and are considered comparatively tolerant to elevated sediment metal concentrations (Williams & Tyler-Walters, 2023). Therefore, overall sensitivity has been defined as **medium**.

5.6.4.5 During the initial baseline and subsequent benthic monitoring surveys (GE Wind Energy, 2012; GE Wind Energy, 2022; Aquafact, 2025; Alpha Marine, 2026), '*Sabellaria spinulosa* on stable circalittoral mixed sediment' were identified within the Benthic Ecology Study Area. *Sabellaria* species are listed under Annex I of the EU Habitats Directive and are an OSPAR threated & declining species. Pollution is listed as a major threat to *Sabellaria* species in the Wadden Sea, but evidence on the effects of pollutants and contaminants to *Sabellaria* species is limited (UK BAP, 2016). It is predicted that certain pollutants may aid the growth of *Sabellaria*, such as in Dublin Bay, where the establishment of *Sabellaria* communities was reportedly encouraged by sludge dumping, potentially because the increased organic matter enhanced food availability (Walker *et al*., 1980; Tillin *et al*., 2025).

5.6.4.6 There is no sensitivity rating for *Sabellaria* reefs by MarESA, however Tillin *et al.* (2025) indicates that the overall sensitivity of *Sabellaria* to disturbance and remobilisation of sediment bound contaminants is **low**.

Benthic Intertidal Habitats and Species

5.6.4.7 The benthic intertidal environment in the vicinity of the landfall is characterised by rocky-shore biota formed by the presence of the Arklow Harbour breakwater, with coarse sand beaches interspersed with cobble and shingle habitat located elsewhere in the Benthic Ecology Study Area. Such habitats are considered to have a high tolerance to disturbance and remobilisation of sediment-bound contaminants due to regular disturbance of the seabed due to wave action. Furthermore, any sediment bound contaminants are expected to be diluted rapidly and dispersed. Therefore, due to the temporary, highly localised and short-term nature of the Proposed Works Offshore in the intertidal area, sensitivity is considered to be **low**.

Fish and Shellfish

5.6.4.8 Due to their increased mobility, adult fish (including diadromous and elasmobranch species) are less likely to be affected by the disturbance or remobilisation of sediment bound contaminants and are therefore not considered to be vulnerable to the release of sediment bound contaminants. Therefore, the overall sensitivity rating of adult fish to disturbance and remobilisation of sediment bound contaminants is **low**.

5.6.4.9 Fish eggs and larvae are likely to be particularly sensitive, with pollutants having potentially toxic impacts on fish eggs and larvae (Westerhagen, 1988; Kjelland *et al*., 2015). The resuspension of sediment-bound contaminants (e.g., heavy metals and hydrocarbon pollution) has been found to impact fish eggs and larvae and can include abnormal development, delayed hatching and reduced hatching success (Bunn *et al*., 2000). On this basis, the overall sensitivity

rating of eggs and larvae to disturbance and remobilisation of sediment bound contaminants is **medium**.

5.6.4.10 Filter-feeding shellfish are also considered to be sensitive to marine the release of sediment bound contaminants due to the bioaccumulation which occurs within this group. Shellfish also display limited mobility and are therefore not anticipated to flee from the impact. Therefore, the overall sensitivity rating of filter-feeding shellfish to disturbance and remobilisation of sediment bound contaminants is **medium**.

Magnitude of Impact

5.6.4.11 Disturbance and therefore remobilisation of sediment bound contaminants is expected to be limited to areas within the Offshore Site, particularly within areas subject to dredging. However, the remobilisation of sediment bound contaminants could have subsequent effects on benthic habitats and species beyond the Offshore Site due to the dispersion of contaminants by local hydrodynamic conditions. The distance over which sediment bound contaminants are expected to travel is in line with the maximum dispersion distance for increased SSC of 48 m for export cable route works and 7 km for dredging in the Sub Lease Area, described by sediment plume modelling (**Volume 3, Appendix 4.2**).

5.6.4.12 Sediment chemistry samples previously collected in the Study Area (see **Section 5.5.2**) indicate that organochlorines, PCB, TBT, DBT, PAH and trace metals are below the lower or upper-level guidance values outlined in Cronin *et al*. (2006) and Marine Institute addendum (Cronin *et al*., 2019) with the exception of arsenic. Arsenic marginally exceeded the lower-level guidance value of 20 mg/kg at three stations within the intertidal area (towards Arklow Harbour) but was well below the upper-level guidance value (70 mg/kg), which are set at the lower end of concentrations shown to have adverse effects on marine organisms (Cronin *et al*., 2006 & 2019).

5.6.4.13 Further sediment sampling was undertaken at one of the monopiles within the Offshore Site in November 2025 (Ramboll, 2025). Across four samples, none of the measured concentrations exceeded the lower levels of the sediment quality guidelines (Cronin *et al.*, 2006 & 2019).

Benthic Intertidal Habitats and Species

5.6.4.14 The cable removal works will be occurring within rocky foreshore habitat with limited excavation close to the HWM. Furthermore, during previous sediment sampling (Aquafact, 2025), areas within the intertidal area of Arklow Harbour were found to have marginally elevated levels of arsenic above the lower-level guidance value of 20 mg/kg (see **Section 5.5.2**). However, previous studies near Arklow have also found arsenic levels in sediment to be above lower-level action level of 20 mg/L (Cronin *et al*., 2019), suggesting generally elevated background levels in the area. As such, seabed disturbance is not anticipated to increase contaminant levels above existing background levels. Intertidal habitats and species are also subject to frequent disturbance by wave action and local currents which would naturally disturb any sediment bound contaminants, if present. Therefore, it is considered that the magnitude of disturbance / remobilisation of sediment bound contaminants from Proposed Works Offshore in intertidal habitats and species is considered to be **negligible adverse**.

Benthic Subtidal Habitats and Species

5.6.4.15 During previous sediment sampling, no sediments within the subtidal area of the Offshore Site, including within the Sub Lease Area, were found to have elevated levels of sediment-bound contaminants (Aquafact, 2025). Therefore, the potential for disturbance of sediment bound contaminants during the Proposed Works Offshore in subtidal waters is considered very minor. In the event that sediment bound contaminants are disturbed, elevated levels are only expected to be disturbed and remobilised for the duration of seabed disturbance within the Offshore Site.

5.6.4.16 Therefore, it is considered that the magnitude of disturbance / remobilisation of sediment bound contaminants from Proposed Works Offshore in subtidal habitats and species is considered to be **negligible adverse**.

Fish and Shellfish

5.6.4.17 Marginally elevated levels of contaminants were only identified in intertidal sediments near Arklow Harbour (see **Section 5.5.2**). However, the limited intertidal works will be carried out in the rocky foreshore area of Arklow Harbour where no contaminants have been identified. Furthermore, as fish do not use intertidal habitats, they are not expected to be affected by elevated contaminant levels which may be disturbed during the work, with any contaminants expected to be diluted and dispersed quickly before reaching subtidal waters. There is the potential for some shellfish species using intertidal habitats to be exposed to elevated levels of contaminants during the Proposed Works Offshore. However, works at the landfall are expected to be highly temporary, very minor and short-term and elevated levels of contaminants will be short-lived due to the anticipated rapid dispersion and dilution.

5.6.4.18 Therefore, it is considered that the magnitude of disturbance/remobilisation of sediment bound contaminants from Proposed Works Offshore for fish and shellfish is considered to be **negligible adverse**.

Significance of Effect

5.6.4.19 Overall, the disturbance of any sediment bound contaminant is expected to be limited and will be rapidly diluted and dispersed.

5.6.4.20 Therefore, it is considered that the worst-case receptor sensitivity is **medium** and the magnitude of disturbance / remobilisation of sediment bound contaminants is **negligible**. Therefore, the effect of disturbance / remobilisation of sediment bound contaminants from Proposed Works Offshore is considered to be **Negligible**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.4.21 Given that effect of disturbance / remobilisation of sediment bound contaminants from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of disturbance / remobilisation of sediment bound contaminants from Proposed Works Offshore is considered to be **Negligible**, which is not significant in EIA terms.

5.6.5 Alteration of Seabed Habitat from Changes in Physical Processes

5.6.5.1 During decommissioning, the removal of infrastructure from the seabed and alteration in seabed conditions due to maintenance dredging is expected to result in changes in physical processes (i.e. a potential reduction in scour effects and changes in sediment transport). Changes in physical processes could alter the current condition of the seabed habitat.

5.6.5.2 Due to the nature of the Proposed Works Offshore, effects from the alteration of seabed habitat from changes in physical processes are expected to be highly localised and limited to habitats under the footprint of the Offshore Site and surrounding waters in close proximity.

Receptor Sensitivity

5.6.5.3 The following receptors are considered to be sensitive to alteration of seabed habitat from changes in physical processes:

- Benthic subtidal habitats; and
- Benthic intertidal habitats.

5.6.5.4 As the Offshore Site do not directly intersect any designated sites, these have not been considered further.

Benthic Subtidal Habitats and Species

5.6.5.5 Subtidal habitat in the Offshore Site is largely characterised by coarse, sandy and muddy sediments, with increasing with infralittoral sand and mud becoming the dominant habitat closer to the landfall.

5.6.5.6 Biotopes present within the Offshore Site include biotopes *'Nephtys cirrosa* and *Bathyporeia spp.* in infralittoral sand'*, 'Flustra folicacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment*'* and 'Infralittoral mobile clean sand with sparse fauna' (see **Section 5.5**). Habitats such as these are often found in areas of differing water flow, and the habitat topography can be shaped by the hydrodynamic regime. These biotopes are considered to have a high resilience, with **negligible** sensitivity to changes in water flow and hydrodynamic regime (e.g. Readman and Watson, 2024).

5.6.5.7 Biotopes characterised as '*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel' and '*Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in infralittoral mobile coarse sand' were also recorded in the vicinity of the Proposed Works Offshore during the benthic baseline and monitoring surveys. These habitats also exist in varying water flow and are considered able to adapt to changing hydrodynamic regime (e.g. Tillin and Watson, 2024) and therefore have **negligible** sensitivity to changes in water flow.

5.6.5.8 During the initial baseline and subsequent benthic monitoring surveys (Aquafact, 2025), protected *Sabellaria* reefs (*Sabellaria spinulosa* and *Sabellaria alveolata*) were identified, scattered across the Offshore Site (see **Section 5.5.2**). *Sabelleria* spp. are small tube-building polychaete worms typically occurring in subtidal and lower intertidal waters, which can form reefs when occurring in high densities (Jackson and Hiscock, 2008). In some locations, tube do not protrude from the surface of substratum, forming sheets or crusts (Gubbay, 2007). In locations where there are significant elevations, the tubes can form reefs. Therefore, sensitivity to alteration of seabed is likely dependent on location. However, *Sabellaria* spp. are typically found in area of high water flow (Jackson and Hiscock, 2008). The removal of structures from the seabed is expected to result in increased water flow and reduced scour effects due to the removal of obstructions. The dredging of material may result in localised changes in water flow and sediment but these are expected to be very minor. *Sabellaria* spp. are considered to have a **low sensitivity** due to their occurrence in high flow areas.

Benthic Intertidal Habitats and Species

5.6.5.9 The benthic intertidal environment in the vicinity of the landfall is characterised by rocky-shore biota formed by the presence of the Arklow Harbour breakwater. There is the potential for minor alteration to the substrate during cutting of the export cable at the HWM resulting changes in physical processes. However, intertidal habitat is expected to be altered on a regular basis due to wave action and anthropogenic disturbance. Therefore, due to the temporary, highly localised and short-term nature of the works in the intertidal area, sensitivity is considered to be **negligible**.

Magnitude of Impact

Benthic Intertidal and Subtidal Habitats and Species

5.6.5.10 Changes in the seabed morphology due to removal of infrastructure and maintenance dredging could modify physical processes such as hydrodynamic regime and sediment transport, resulting in alterations to seabed habitat. Dredging is expected to occur in the Sub Lease Area only over a total area of 0.357 km^2. This makes up 21.3% of the Sub Lease Area, with a total dredging volume of 38,139 m^3 for -4.5 m LAT and 86,000 m^3 for -6.5 m LAT.

5.6.5.11 The removal of infrastructure from the seabed (wind turbine foundation, inter-array cables and export cable) is expected to occur over a total area of 0.07 km^2, from the HWM to the Sub Lease Area. The export cable and inter-array cables will be removed using a running method. The extent of removal of scour protection is not currently known, as this will depend on the number of scour protection sandbags exposed during the Proposed Works Offshore.

5.6.5.12 A JUB will also be required for Proposed Works Offshore. It is not currently known how many jack-up events will be required during the Proposed Works Offshore but it assumed that each of the seven WTGs will require one jack-up event for removal of infrastructure. Based on a

standard diameter of 2 m per spud leg, there is expected to be approximately 12.57 m^2 (12.57 $x10^{-5}$ km^2) per jack-up event.

5.6.5.13 Due to the small area over which changes in seabed morphology are expected to occur due to the removal of infrastructure and dredging, any changes in physical processes are expected to be very minor and limited to the footprint of seabed disturbance. Therefore, any subsequent alteration to seabed habitat is expected to be highly localised. Furthermore, the local tidal regime is considered to be sufficiently strong to mobilise seabed sediments. The seabed in the Offshore Site is largely characterised by coarse and sandy sediment which is highly mobile (see **Section 5.5.2**). Therefore, the seabed is expected to recover due to natural processes of sediment infill and mobility of sand after the activity with no lasting effects to benthic habitats and species, with timescales expected to vary depending on current speeds and depth. Additionally, the removal of infrastructure would result in a return to the normal physical conditions through natural processes.

5.6.5.14 Therefore, it is considered that the magnitude of alteration of seabed habitat from changes in physical processes from Proposed Works Offshore is considered to be **negligible adverse**.

Significance of Effect

5.6.5.15 Overall, the removal of infrastructure will result in the return of the Offshore Site to baseline conditions with natural physical processes and hydrodynamic regime.

5.6.5.16 Therefore, it is considered that the receptor sensitivity is **low** and the magnitude of alteration of seabed habitat from changes in physical processes is **negligible**. Therefore, the effect of alteration of seabed habitat from changes in physical processes from Proposed Works Offshore is considered to be **Negligible**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.5.17 Given that effect of alteration of seabed habitat from changes in physical processes from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of alteration of seabed habitat from changes in physical processes from Proposed Works Offshore is considered to be **Negligible**, which is not significant in EIA terms.

5.6.6 Removal of Hard Offshore Infrastructure

5.6.6.1 All hard infrastructure within a 30 m radius of the turbines / met mast that is visible at the time of decommissioning will be removed, with the exception of scour protection which is buried and not visible. This could have a direct effect on the benthic environment through the permanent removal of colonised infrastructure and the return of the seabed to predominantly soft sediment in localised areas.

Receptor Sensitivity

5.6.6.2 The effect of the removal of hard offshore infrastructure on colonising species is considered to be limited to the footprint of the Offshore Site where hard offshore infrastructure is exposed within the water column (i.e. predominantly the wind turbine foundations). Therefore, the following receptor is considered to be sensitive to removal of hard offshore infrastructure:

- Benthic subtidal species.

Benthic Subtidal Species

5.6.6.3 Regular monitoring and removal of colonising species on the ABWP Phase I wind turbine infrastructure indicate that the dominant colonising species present is the blue mussel, found on both the foundations and inter-array cables (see **Section 5.5.2**). The blue mussel is typically found attached to rocky or hard substrata such as rocky shores, piers and offshore infrastructure (Tyler-Walters, 2008). Therefore, the removal of all hard exposed infrastructure during the Proposed Works Offshore in an area otherwise characterised by soft sandy sediments on Arklow

sand bank will result in complete removal of this species from the area. Recruitment of blue mussel is considered to be sufficient for good recovery. However, with a lack of hard infrastructure left in situ in the Offshore Site, recovery is not considered possible. Therefore, blue mussel is considered to have **high** sensitivity to removal of hard offshore infrastructure.

5.6.6.4 ROV footage collected in the Offshore Site (Alpha Marine, 2026) also identified barnacles growing on the flexi hoses which house inter-array cables. Barnacles are considered to have a **moderate** sensitivity to loss of hard substratum (White, 2008) as they are removed with the surface of the hard substrate. However, they are considered to have a high recoverability, dependent on environmental factors such as current speed.

5.6.6.5 A live cable survey (**Volume 3, Appendix 5.1**) also identified the presence of kelp fronds growing around two of the turbine foundations. As kelp grows on hard substrates, the removal of hard substrate result in the removal of the kelp plants themselves which cannot re-attach once removed. Therefore, kelp is considered to have a **moderate** sensitivity to removal of hard offshore infrastructure (Tyler-Walters, 2007).

Magnitude of Impact

Benthic Subtidal Species

5.6.6.6 The removal of exposed hard offshore infrastructure from the seabed (i.e. wind turbine foundations, met mast and cables) is expected to result in a minor loss of colonised species and habitat over a maximum total area of 0.07 km^2. The surrounding seabed is characterised by soft sandy sediment with no presence of rocky substrate which could support blue mussel, barnacles or kelp. Therefore, the removal of hard offshore infrastructure represents a permanent change to the habitat which will not support recovery of blue mussel populations, barnacles and kelp. However, as part of monitoring of the wind farm infrastructure, regular removal of colonised species from hard surfaces has occurred. The most recent removal of colonised species occurred in 2019 and therefore approximately six years of growth of blue mussels and other species will be present at the time of decommissioning.

5.6.6.7 Therefore, it is considered that the magnitude of removal of hard offshore infrastructure from Proposed Works Offshore is considered to be **low adverse**.

Significance of Effect

5.6.6.8 Overall, the removal of hard substrate will result in the return of the Offshore site to baseline conditions with soft sediment habitats.

5.6.6.9 Therefore, it is considered that the receptor sensitivity is **high** and the magnitude of the removal of hard offshore infrastructure is **low**. Therefore, the effect of the removal of hard offshore infrastructure from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.6.10 Given that effect of the removal of hard offshore infrastructure from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of the removal of hard offshore infrastructure from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

5.6.7 Injury and / or Disturbance from Underwater Noise

5.6.7.1 During the Proposed Works Offshore, several activities are expected to produce underwater noise, particularly during pre-decommissioning surveys and vessel use.

Receptor Sensitivity

5.6.7.2 The following receptors are considered to be sensitive to underwater noise:

- Fish and shellfish; and

- Marine mammals.

5.6.7.3 Underwater sound can be characterised as either impulsive sound, with high peak sound pressure, short duration, fast rise-time and broad frequency content, or non-impulsive (also referred to as continuous or steady state sounds) (NMFS, 2024; see **Volume 3, Appendix 5.2**).

5.6.7.4 The sound sources produced by the Proposed Works Offshore, with their assumed sound intensity and operating frequency are provided in **Table 5.17** below (see **Volume 3, Appendix 5.2**), together with details of which sources have been scoped into the assessment for fish and marine mammals.

Table 5.17: Sound source levels relevant to fish and marine mammals

Proposed Works Offshore Activity	Sound Type	Operating Frequency (kHz)	Sound Pressure Level*	Scoped in?
SBP Chirp	Impulsive	0.2 – 14	197	**Yes** – SBP operating frequency is within the hearing range of fish and marine mammals.
MBES	Non-impulsive	170 – 450	221	**No** – MBES operates at a frequency which is outside of the hearing range for both fish and marine mammals and therefore does not pose any risk of injury or disturbance.
SSS	Non-impulsive	300 – 600	210 – 226	**No** – SSS operates at a frequency which is outside of the hearing range for both fish and marine mammals and therefore does not pose any risk of injury or disturbance.
USBL	Impulsive	21 – 31	181	**Yes for marine mammals** – USBL operates at a frequency which is within the hearing range for marine mammals. **No for fish** – USBL operates at a frequency beyond the hearing range of even the most hearing sensitive fish species.
Support vessels	Non-impulsive	0.005 – 3.2	160 – 184	**Yes** – the operating frequency for support vessels is within the hearing range for fish and marine mammals
Dredging	Non-impulsive	0.1 – 2	179	**Yes** - the operating frequency for dredging is within the hearing range for fish and marine mammals
Dynamic Positioning (DP)	Non-impulsive	0.1 – 1	175	**Yes** - the operating frequency for DP is within the hearing range for fish and marine mammals
Jet lancing	Non-impulsive	0.1 – 10	175	**Yes** - the operating frequency for jet lancing is within the hearing range for fish and marine mammals
Underwater mechanical cutting	Non-impulsive	0.1 – 2	175	**Yes** - the operating frequency for jet lancing is within the hearing range for fish and marine mammals
Vibratory Extraction Tool	Non-impulsive	0.002 – 0.004	185	**Yes** - the operating frequency for vibratory extraction tool is within the hearing range for fish and marine mammals
Vessel noise from use of JUB	Non-impulsive	0.14 – 0.17	160 – 184	**Yes** - the operating frequency for vessel noise from the JUB is within the hearing range for fish and marine mammals
*All sound source levels given as SPLrms unless otherwise stated. Units for all SPL values are dB re 1µP a@1m.				

Fish and shellfish

5.6.7.5 Fish rely on underwater sound for a variety of functions including locating prey and predators, and communication (Fay and Popper, 2000). Underwater sound can potentially have a negative impact on fish and shellfish species ranging from behavioural impacts to physical injury / mortality. In general, physical injury in fish (e.g. barotrauma) is primarily associated with exposure to a high intensity sound even if the sound is of short duration. In contrast, longer-duration or non-impulsive sound exposures are more likely to result in auditory effects, which are related to the sound source level and duration of exposure. While cumulative sound exposure is important, most fish are able to move away and avoid long-term sound exposure. Fish and shellfish are also considered to be sensitive to the particle motion element of

underwater sound; an impact considered more important than sound pressure for many species, particularly invertebrates. However, research into this impact on fish and shellfish populations is scarce, representing a source of uncertainty in the assessment process.

5.6.7.6 The effects of underwater sound in fish are described by Popper *et al*. (2014):

- **Behavioural effects**: substantial change in behaviour for the animals exposed to a sound. This may include long-term changes in behaviour and distribution, such as moving from preferred sites for feeding and reproduction, or alteration of migration patterns. This behavioural criterion does not include effects on single animals, or where animals become habituated to the stimulus, or small changes in behaviour such as a startle response or small movements;
- **Masking**: impairment of hearing sensitivity by greater than 6 dB, including all components of the auditory scene, in the presence of sound;
- **Temporary threshold shift (TTS)**: Short term changes in hearing sensitivity may, or may not, reduce fitness and survival;
- **Recoverable injury**: tissue injuries including hair cell damage, minor internal or external hematoma etc., which are not likely to result in mortality; and
- **Mortality and potential mortal injury**: either immediate mortality or delayed mortality due to tissue and / or damage, such as barotrauma, that is sufficiently severe that death occurs sometime later due to decreased fitness.

5.6.7.7 Popper *et al*. (2014) present a range of sound-pressure thresholds for different noise sources. Despite a lack of thresholds for particle motion, Popper *et al*. (2014) currently remains the best available, and industry supported guidance to inform the assessment of underwater sound impacts to fish and shellfish (Popper and Hawkins, 2021). Thus, underwater sound modelling has been undertaken, using the thresholds defined for marine fish in Popper *et al.* (2014) (See **Volume 3, Appendix 5.2**).

5.6.7.8 Sensitivity between fish species varies depending on the frequency range that can be detected. Fish have been categorised according to their underwater noise sensitivity into functional hearing groups of high hearing sensitivity, medium hearing sensitivity and low hearing sensitivity by Popper and Hawkins (2019):

- **Group 1: Low hearing sensitivity fish** – this group lack a swim bladder or other gas chamber. They detect only particle motion and are less prone to barotrauma. Species in this category include lamprey.
- **Group 2: Medium hearing sensitivity fish** – includes fish with swim bladders that do not aid in hearing. These species can detect particle motion but not sound pressure, and while still susceptible to barotrauma, they are sensitive to a narrower frequency range. Qualifying features present in the European sites within the Fish and Shellfish Study Area include Atlantic salmon; and
- **Group 3: High hearing sensitivity fish** – this group use a swim bladder or other gas volume to detect sound, perceiving both sound pressure and particle motion. These fish are vulnerable to barotrauma and sensitive to a broad frequency range (several kHz). Species in this category within the Fish and Shellfish Study Area include twaite shad;
- **Fish eggs and larvae** – vulnerable to underwater noise due to reduced mobility and small size.

5.6.7.9 Thresholds for mortal auditory injury and impairment for the functional hearing groups provided by Popper *et al*. (2014) for impulsive and non-impulsive and SBP are provided in **Volume 3, Appendix 5.2.**

Group 1 Fish

5.6.7.10 Group 1 fish that have the potential to be present within the Offshore Site include sandeel, lemon sole, elasmobranchs, river lamprey, and sea lamprey.

5.6.7.11 Sandeel spawning areas overlap with the Offshore Site (Coull *et al*., 1998; Ellis *et al*., 2012). Sandeel are considered static receptors, due to their burrowing nature, substrate dependence, and demersal spawning behaviours (Holland *et al.,* 2005). While sandeel may be affected by vibration through the seabed, particularly when buried during hibernation, any small-scale mortality in the affected area is expected to be mitigated at the population level through immigration from suitable spawning habitats located outside of the impacted zone. Therefore,

the sensitivity of sandeel to injury and / or disturbance from underwater noise from Proposed Works Offshore is considered to be low.

5.6.7.12 Lemon sole spawning grounds also overlap with the Offshore Site. Unlike sandeel, lemon sole spawn pelagically, and are therefore not static receptors to underwater noise (Geffen *et al*., 2021). Lemon sole are therefore likely to move away from disturbance and quickly recover, returning to affected areas shortly after impact. Considering this mobility and the widespread populations of lemon sole in the Irish sea, the sensitivity of lemon sole to injury and / or disturbance from underwater noise from Proposed Works Offshore is considered to be low.

5.6.7.13 Elasmobranchs, river lamprey and sea lamprey are highly mobile and expected to flee from disturbance. It is therefore anticipated that these species will recolonise disturbed areas quickly, and the sensitivity of all other Group 1 species to injury and/or disturbance from underwater noise from Proposed Works Offshore is considered to be low.

5.6.7.14 Overall, the sensitivity of Group 1 Fish to injury and / or disturbance from underwater noise from Proposed Works Offshore is considered to be **low**.

Group 2 Fish

5.6.7.15 The presence of a swim bladder makes Group 2 receptors more sensitive to underwater noise than Group 1 species. Group 2 fish that have the potential to be present within the Offshore Site are Atlantic salmon and brown / sea trout.

5.6.7.16 Atlantic salmon and sea trout are diadromous, with a transient, migratory presence around the Offshore Site. Due to this mobility, both species are expected to flee quickly from disturbance and show fast recovery. While both species are of commercial and conservation importance, their transient nature and mobility demonstrate a low sensitivity to underwater noise.

5.6.7.17 Overall, the sensitivity of Group 2 Fish to injury and / or disturbance from underwater noise from Proposed Works Offshore is considered to be **low**.

Group 3 Fish

5.6.7.18 Group 3 receptors are considered to be of highest sensitivity to underwater sound, as their swim bladder is linked to their inner ear and is directly involved in hearing. As such, individuals have detection of sound pressure in addition to particle motion in the water column. Group 3 fish that have the potential to be present within the Offshore Site include twaite shad, herring, sprat and haddock.

5.6.7.19 Twaite shad are present in the coastal waters of County Wicklow, migrating to rivers between April to June to spawn. Near the Offshore Site, important spawning grounds include the River Nore and the River Barrows (Department of Housing, Local Government and Heritage, 2024). Twaite shad have been found to exhibit avoidance behaviour to underwater sound transmitted at 200 kHz, choosing not to pass monitoring sites when sound was transmitted at this frequency (Gregory and Clabburn, 2003). Therefore, there is risk of twaite shad avoiding areas due to underwater sound disturbance. Therefore, the sensitivity of twaite shad to underwater sound is considered to be high.

5.6.7.20 Herring are highly vulnerable to underwater sound in the spawning season, depositing their eggs on the seabed and remaining in the area throughout the spawning season. However, the Offshore Site does not overlap with herring spawning grounds (Coull *et al*., 1998; Ellis *et al*., 2012). Adult herring within the Fish and Shellfish Study Area exhibit higher mobility, capacity to flee from disturbance and recolonise areas soon after disturbance. Therefore, the sensitivity of herring to underwater noise is considered to be low.

5.6.7.21 Sprat spawning grounds overlap with the Offshore Site (see **Section 5.5.3**). However, sprat are broadcast spawners, releasing pelagic eggs into the water column. Consequently, eggs are easily influenced by ocean currents and carried away from spawning grounds. As such, any sprat within the vicinity of the Offshore Site exhibit higher mobility, capacity to flee from disturbance and recolonise areas soon after disturbance. Therefore, the sensitivity of sprat to underwater noise is considered to be low.

5.6.7.22 All other Group 3 fish species either have nursery grounds overlapping with the Offshore Site or are not of commercial or conservation importance. All species exhibit high mobility and are therefore expected to recover quickly and recolonise areas soon after disturbance.

5.6.7.23 Overall, the sensitivity of Group 3 Fish to injury and / or disturbance from underwater noise from Proposed Works Offshore is considered to be **high**.

Marine Mammals

5.6.7.24 Marine mammals are highly reliant on underwater sound for a number of ecological functions. Exposure to underwater sound, depending on intensity, duration and frequency of the sound source, can result in several effects for marine mammals:

- Auditory injury (AUD INJ)– includes, but not limited to, a permanent threshold shift (PTS), which is a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level resulting in auditory injury, most commonly the result of exposure to intense and / or long-term noise;
- Temporary threshold shift (TTS) – a recoverable and reversible increase in the threshold of audibility, resulting from long-term exposure to noise but not at the extent at which auditory injury would occur;
- Behavioural responses – includes increased alertness, temporary avoidance of habitat, changes in foraging patterns and / or interruption of social interaction. Behavioural responses can be highly variable; and
- Masking – where anthropogenic underwater sound partially or entirely reduces the audibility of signals used for communication and prey detection.

5.6.7.25 Underwater sound effects to marine mammals depend on the nature of the sound source (impulsive or non-impulsive), the frequency of the sound source, and the sound source level which can be referred to as the intensity of the sound. Impulsive sound sources for the Proposed Works Offshore are SBP and USBL activities, while non-impulsive sounds include vessel engine noise, and activities such as dredging, dynamic positioning, mechanical cutting, and jet lancing.

5.6.7.26 The frequency of the sound source is important as some activities can generate sounds that occur outside the hearing range of marine mammals. Where activities generating underwater sound operate at a frequency that is within the hearing range of a species of interest, the intensity and duration of the sound source will be key determinants of the potential impacts to individual animals.

5.6.7.27 The most up-to-date sound exposure criteria for auditory injury in marine mammals have been published by the United States National Marine Fisheries Service (NMFS) (NMFS, 2024). The hearing groupings for marine mammals were refined in Southall *et al.* (2019) and updated in NMFS (2024). For impulsive sounds, thresholds for auditory injury are based on dual metrics of peak sound pressure level (SPL_{peak}) and M-weighted cumulative sound exposure level (SEL_{cum}). For non-impulsive sounds, thresholds are provided for SEL_{cum} only. An overview of the four marine mammal hearing groups and their respective hearing ranges and thresholds are provided in **Table 5.18**.

Table 5.18 Sound exposure criteria for auditory injury in marine mammals, using criteria provided by NMFS (2024) (see Appendix 5.2)

Species group	Generalised hearing range	Impulsive sound				Non-impulsive sound	
		SPL_{peak}		SPL_{cum}		SEL_{cum}	
		PTS	TTS	PTS	TTS	PTS	TTS
Very high frequency cetaceans such as harbour porpoise	200 Hz – 165 kHz*	202	196	159	144	181	161
High frequency cetaceans such as bottlenose dolphin	150 Hz – 160 kHz	230	224	193	178	201	181

Species group	Generalised hearing range	Impulsive sound				Non-impulsive sound	
		SPL_{peak}		SPL_{cum}		SEL_{cum}	
		PTS	TTS	PTS	TTS	PTS	TTS
Low frequency cetaceans such as minke whale	7 Hz – 36 kHz	222	216	183	168	197	177
Phocid seals in water such as harbour seal	40 Hz – 90 kHz*	223	217	183	168	195	175

*Updated NMFS Guidance (2024) gives a revised hearing range for VHF cetaceans of 200 Hz to 165 kHz and for seals in water of 40 Hz to 90 kHz, updated from hearing ranges provided by Southall *et al*. (2019)
NB. Units for SPL are dB re. 1µPa and units for SEL are dB re. 1µPa2s.

5.6.7.28 There are no widely agreed quantitative thresholds for behavioural disturbance (Southall *et al*., 2019; NMFS, 2024), reflecting a high variability in behavioural responses between both species and individuals (Gomez *et al*., 2016). A lack of dose-related responses reflects the context of exposure, including factors such as movement and depth of the sound source, the ratio of signal to background noise, as well as the species, sex, age, reproductive state, behavioural state prior to sound exposure, prior experience, motivation, and behavioural conditioning (Gomez *et al*, 2016).

5.6.7.29 The sound characteristics associated with each activity of the Proposed Works Offshore sound sources are provided in **Table 5.17** and **Volume 3, Appendix 5.2**.

5.6.7.30 When considering the importance of underwater sound for marine mammals, in conjunction with their conservation status, the receptor sensitivity for all marine mammal species in Irish waters is considered to be **very high**.

Magnitude of Impact

5.6.7.31 To understand the magnitude of underwater sound and the effects to fish and shellfish and marine mammals in the Irish Sea, project-specific underwater noise modelling has been undertaken, as reported in **Volume 3, Appendix 5.2**. Sound attenuates as it propagates away from the source, with attenuation dependent upon local factors such as water depth and bathymetric conditions, the nature of the seabed and the structure of the water column. The modelled sound levels are then compared to the dual threshold criteria to determine the distance to which the criterion is exceeded, and the effect that can potentially occur.

Fish and Shellfish

5.6.7.32 Impacts to fish and shellfish from underwater noise have been assessed using criteria developed by Popper *et al*. (2014), and behaviour response considerations from Hawkins *et al.* (2014) for both impulsive and non-impulsive noise sources. The only impulsive noise source associated with the Proposed Works Offshore that are within fish hearing range (<1 kHz) are SBP activities associated with the pre-decommissioning activities (**Table 5.17**). Non-impulsive noise sources within fish hearing range are support vessels, dredging, dynamic positioning, jet lancing, underwater mechanical cutting, vibratory extraction tools and vessel noise from the JUB, as shown in **Table 5.17**.

5.6.7.33 For all non-impulsive sound sources associated with the Proposed Works Offshore, the potential impact range for all fish hearing groups for both stationary and mobile fish are highly localised, within 10 m of the source. Mortality and potential mortal injury of eggs and larvae is also predicted to be restricted to within 10 m of the source (**Volume 3, Appendix 5.2**).

5.6.7.34 For impulsive noise sources, disturbance impact ranges were only modelled for Group 2 and 3 fish as these are the only groups for which quantitative threshold criteria are available. For SBP activities, the impact range for both Group 2 and Group 3 fish is localised to within 10 m of the source. Therefore, all fish, including migratory species such as twaite shad, will not be subject to impacts from underwater sound beyond the immediate vicinity of the Proposed Works Offshore.

5.6.7.35 Therefore, only a very small degree of disturbance to fish and shellfish is possible during the Proposed Works Offshore. The majority of these activities (with the exception of SBP) are non-

impulsive, and will only cause disturbance within the immediate vicinity of the vessels / instrumentation. Pre-decommissioning surveys are anticipated to last 10 days, with the subsequent decommissioning works (including vessel transit and removal works) are expected to last up to seven months (**Volume 2, Chapter 3)**.

5.6.7.36 Therefore, it is considered that the magnitude of injury and / or disturbance from underwater sound to fish and shellfish from Proposed Works Offshore is **Negligible Adverse**.

Marine Mammals

5.6.7.37 Impacts to marine mammals from underwater noise have been assessed using auditory injury ranges based on the thresholds set out in NMFS (2024) and NOAA (2005) for behavioural disturbance (**Volume 3, Appendix 5.2**).

5.6.7.38 Several activities happening as part of the Proposed Works Offshore, both impulsive and non-impulsive, occur within the hearing range of all marine mammal functional hearing groups (see **Table 5.17**).

5.6.7.39 For LF cetaceans, such as minke whale, AUD INJ is not predicted to occur for any activity associated with the Proposed Works Offshore and TTS effects beyond the immediate vicinity of the source is predicted only for the operation of the USBL during pre-decommissioning surveys and vibratory extraction tool, which have a potential impact distance of 800 m and 1,000 m, respectively.

5.6.7.40 For HF cetaceans, which includes most dolphin species, AUD INJ is not predicted beyond the immediate vicinity of the sound source (<10 m). There is potential for TTS in proximity of the USBL, with a potential impact distance of 800 m.

5.6.7.41 Harbour porpoise are the only VHF cetacean species found in Irish waters. For all non-impulsive noise sources and SBP activities, potential AUD INJ and TTS impact ranges are less than 10 m from the sound source. The only activity associated with the Proposed Works Offshore that has potential for effects beyond the immediate vicinity of the sound source is the USBL. For AUD INJ and TTS effects, potential impact ranges were 400 m and 900 m from the sound source, respectively.

5.6.7.42 A potential AUD INJ is predicted for the PCW seals group in the immediate proximity of the USBL, and TTS only to a maximum of 100 m from the sound source.

5.6.7.43 Behavioural disturbance impact ranges for all marine mammal hearing groups were greatest for the vibratory extraction tool, with impacts predicted up to 45,500 m from the sound source. Behavioural disturbance was also predicted to 32,000 m for dredging, 14,000 m for Dynamic Positioning, between 13,000 m and 14,000 m for jet lancing and underwater mechanical cutting, and 6,500 m for support vessels and vessel noise from the JUB. However, these distances are based on the National Oceanographic and Atmospheric Administration (NOAA) 2005 threshold of 120 dB SPL_{rms} and there is a considerable degree of uncertainty and variability in the onset of disturbance and therefore any disturbance ranges should be treated as potentially over precautionary. Another important consideration is that the majority of the sound produced by the Proposed Works Offshore will be either temporary or transitory, as opposed to permanent and fixed. These important considerations cannot be taken into account in the noise modelling. For the USBL acoustic positioning system, which is an impulsive sound source, behavioural disturbance was predicted to 200 m.

5.6.7.44 Therefore, it is considered that the magnitude of injury and / or disturbance from underwater noise to marine mammals from Proposed Works Offshore is **low adverse**.

Significance of Effect

Fish and Shellfish

5.6.7.45 Overall, it is considered that the sensitivity of fish and shellfish receptors is **medium** and the magnitude of injury and / or disturbance from underwater noise is **negligible**. Therefore, the

effect of injury and / or disturbance to fish and shellfish from underwater noise from Proposed Works Offshore is considered to be **Negligible**, which is not significant in EIA terms.

Marine Mammals

5.6.7.46 Overall, it is considered that the sensitivity of marine mammal receptors is **very high** and the magnitude of injury and / or disturbance from underwater noise is **low**. Therefore, the effect of injury and / or disturbance to marine mammals from underwater noise from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

Marine Mammals

5.6.7.47 The Irish National Parks and Wildlife Service has established guidance to manage the risk to marine mammals from man-made sound sources in Irish waters (NPWS, 2014), which, in conjunction with JNCC draft guidelines for minimising risks of injury to marine mammals from geophysical surveys (JNCC, 2025), inform the Marine Mammal Mitigation Protocol for the Proposed Works Offshore (**Volume 3, Appendix 5.3**).

5.6.7.48 Given that effect of injury and / or disturbance from underwater noise from Proposed Works Offshore, is considered not significant in EIA terms, and the Marine Mammal Mitigation Protocol will be followed, no additional mitigation measures are proposed. Therefore, the residual effect of injury and / or disturbance from underwater noise from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Effects on Annex IV Species

5.6.7.49 All cetaceans are Annex IV species and are considered present in the Marine Mammal Study Area. No other Annex IV species are expected to occur in the Study Area. All potential effects on cetacean species from underwater sound disturbance are considered to be minor adverse and not significant. Furthermore, measures set out in **Volume 3, Appendix 5.3** and **Volume 3, Appendix 3.5** will be adhered to, to further minimise potential effects. Therefore, an Annex IV Risk Assessment has not been considered further for this impact pathway.

5.6.8 Injury from Vessels Activity

5.6.8.1 During the Proposed Works Offshore, several vessels will be operating within the vicinity of the Offshore Site which could cause injury to marine mammals. Injury to marine mammals from vessel activity is most likely to result from collision between vessels and marine mammals.

Receptor Sensitivity

5.6.8.2 The following receptors are considered to be sensitive to injury and / or disturbance from vessels activity:

- Marine Mammals.

Marine Mammals

5.6.8.3 Although collisions between marine mammals and vessels do occur, it is considered to primarily happen with large whales rather than small cetaceans and pinnipeds (IAMMWG, 2015). Where collisions do occur, this often results in physical injury which can impair foraging ability and individual health / fitness (Moore *et al*., 2013).

5.6.8.4 Smaller cetaceans are highly mobile animals which are able to make fast movements in avoidance of vessels when required. For example, harbour porpoise have been observed making quick reactions to oncoming vessels with normal behaviour resuming within less than 50 seconds (Hao *et al*., 2024).

5.6.8.5 In many cases, collision between marine mammals and vessels result in physical injury which they can recover from, and not all collisions are necessarily lethal (Van Waerebeek *et al.,* 2007)

Their ability to avoid vessels, particularly when vessels are slow moving, is considered advantageous for reducing risk of collision.

5.6.8.6 For seals collision risk is considered to be lower compared to cetaceans (Jones *et al.,* 2017). Seals have also been observed to easily avoid vessel movements during slow-moving dredging operations (Todd *et al*., 2014), such as those occurring within the Sub Lease Area. Additionally, seals have shown avoidance behaviour and tended to remain at least 20 m away from vessels operating in Moray Firth waters (Onoufriou *et al*., 2016).

5.6.8.7 However, due to the importance of marine mammals internationally, sensitivity is considered to be **medium**.

Magnitude of Impact

Marine Mammals

5.6.8.8 The Proposed Works Offshore will require the deployment of different vessel types. Some, of these vessels may be operating simultaneously.

5.6.8.9 Collision risk is expected to be increased when small vessels are travelling at higher speeds which results in a strong impact upon collision due to reduced time available for avoidance and a lower likelihood of marine mammal detection during operation (Wang *et al*., 2007; Schoeman *et al.*, 2020). However, larger vessels travelling at lower speeds and emitting low frequency sound can also result in an increased collision risk as some large cetaceans on the surface may not hear the approaching vessel (Schoeman *et al*., 2020).

5.6.8.10 Vessels used for the Proposed Works Offshore will be relatively small and are expected to travel at a maximum speed of 6 knots (see **Volume 2, Chapter 3**) but will be operating at much lower speeds during dredging and pre-decommissioning surveys.

5.6.8.11 Increased mortality is typically associated with larger vessels which travel at speeds above 14 knots (Laist *et al*., 2001). However, the correlation of lethal injury of marine mammals with vessels speed is known to vary between species (Schoeman *et al*., 2020).

5.6.8.12 It is anticipated that decommissioning vessels will mobilise from a European port, with a transit duration of approximately 15 days. All infrastructure will be transported by vessel to an Irish port (Rosslare, Waterford, Greenore or Dublin), which shall be confirmed once the decommissioning contractor is appointed. With transit speeds of up to 6 knots, transit times are expected to take between 9 hours and 22 hours for one trip (see **Volume 2, Chapter 3**). There is expected to be a maximum of 353 vessel trips between port and the Offshore Site, considering a single campaign. The risk of collision between marine mammals and vessels is considered to be higher in areas where animal density is high and where vessel density is higher (Schoeman *et al*., 2020). Marine mammal density in the Marine Mammal Study Area is generally considered to be low for most species. There are no anticipated hot spots for marine mammal activity within the Offshore Site for cetaceans. Seal haul-out sites are located nearby but at-sea activity shows seal movement is concentrated around haul-out sites rather than within the vicinity of the Offshore Site (Carter *et al*., 2022). As a result, only a small number of individuals are likely to be affected, if any.

5.6.8.13 Furthermore, the Irish Sea is characterised by a high baseline level of vessel activity (ABPmer, 2017). This includes vessels transiting in and out of ports including Dublin and Wicklow. Therefore, it is considered that the magnitude of injury from vessels activity from Proposed Works Offshore is considered to be **low adverse**.

Significance of Effect

5.6.8.14 Overall, there will be a small number of vessels operating which are associated with the Proposed Works Offshore compared to the baseline levels of vessel traffic in the Irish Sea. Furthermore, marine mammals are expected to be able to exhibit avoidance behaviour.

5.6.8.15 Therefore, it is considered that the receptor sensitivity is **medium** and the magnitude of injury from vessels activity is **low**. Therefore, the effect of injury from vessels activity from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.8.16 Given that effect of injury from vessels activity from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of injury from vessels activity from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Effects on Annex IV Species

5.6.8.17 All cetaceans are Annex IV species and are considered present in the Marine Mammal Study Area. No other Annex IV species are expected to occur in the Study Area. Potential effects on cetacean species are considered to be minor adverse as a result of injury from vessels activity and not significant. Furthermore, measures set out in **Volume 3, Appendix 5.3: MMMP** and **Volume 3, Appendix 3.5: VMP** will be adhered to, to further minimise potential effects. Therefore, an Annex IV Risk Assessment has not been considered further for this impact pathway.

5.6.9 Increased Risk of Invasive and Non-native Species Introduction / spread

5.6.9.1 During the Proposed Works Offshore, the use of vessels could lead to an increased risk of invasive and non-native species introduction / spread. In particular, INNS could be transported on vessel hulls or via the release of ballast water.

Receptor Sensitivity

5.6.9.2 Sensitivity to the introduction and spread of INNS can vary between habitats and species based on their specific vulnerabilities and resistance. Some non-native species can out-compete native species resulting in a decrease of suitable habitat and food availability. However, only some non-native species become invasive. There is also a risk of increased disease introduction which could lead to mortality and population structure changes for native species. The increased risk and spread of INNS are considered to be largely limited to the restricted area within which vessels will be operating (see **Volume 2, Chapter 3**).

5.6.9.3 The introduction and spread of INNS are considered to be largely concerned with intertidal habitats rather than subtidal habitats (OSPAR, 2023). However, vessels will not be operating within the intertidal area and works in the intertidal area will be limited. INNS could become present within the subtidal areas of the Offshore Site by dispersal of larvae or transit of vessels between port, although this is considered highly unlikely.

5.6.9.4 Therefore, following receptors are considered to be sensitive to increased risk of INNS introduction / spread:

- Benthic subtidal habitats and species.

Benthic Subtidal Habitats and Species

5.6.9.5 Subtidal habitat in the Offshore Site is largely characterised by coarse, sandy and muddy sediments, with increasing with infralittoral sand and mud becoming the dominant habitat closer to the landfall. Biotopes present within the Offshore Site include biotopes '*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel', and '*Flustra folicacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment' (see **Section 5.5**). Such habitats appear to have differing sensitivities to INNS depending on the type of INNS present. For example, gravelly, sandy and mixed soft sediment habitats are considered sensitive to the American slipper limpet (*Crepidula fornicata*) due to its ability to form dense carpets that can smother the seabed (Readman and Watson, 2024), particularly where suitable substrate such as gravel and shells is present to allow larval settlement.

Contrastingly, sensitivity to INNS which prefer hard substrate is lower in these habitats. Therefore, on the basis that it is not known which INNS could be introduced during the Proposed Works Offshore, the worst-case sensitivity for benthic subtidal habitats is **high**.

5.6.9.6 During the initial baseline and subsequent benthic monitoring surveys, protected *Sabellaria* reefs (*Sabellaria spinulosa* and *Sabellaria alveolata*) were identified, scattered across the Offshore Site (see **Section 5.5.2**). *Sabelleria* spp. are small tube-building polychaete worms typically occurring in subtidal and lower intertidal waters, which can form reefs when occurring in high densities (Jackson and Hiscock, 2008). *Sabellaria* reefs support high biodiversity of species and stable communities. Some species found within *Sabellaria* reefs may be more vulnerable to colonisation of INNS, however there are few records of INNS presence in such habitats (OSPAR, 2023). Therefore, sensitivity is considered to be **low** for *Sabellaria* reefs.

Magnitude of Impact

Benthic Subtidal Habitats and Species

5.6.9.7 During the Proposed Works Offshore, different vessels may be required for pre-decommissioning survey works, dredging works, decommissioning of infrastructure and transportation of decommissioned infrastructure to port. It is anticipated that decommissioning vessels will mobilise from a European port, with a transit duration of approximately 15 days. All infrastructure will be transported by vessel to an Irish port (e.g. Rosslare, Waterford, Greenore or Dublin), which shall be confirmed once the decommissioning contractor is appointed. With transit speeds of up to 6 knots, transit times are expected to take between 9 hours and 22 hours for one trip (see **Volume 2, Chapter 3**).

5.6.9.8 However, all project vessels will adhere to the IMO Guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines 2011), and the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention). Furthermore, as part of **Volume 3, Appendix 3.5,** control measures will be implemented to minimise INNS.

5.6.9.9 No INNS were identified in the Benthic Ecology Study Area during benthic surveys conducted for ABWP Phase I or ABWP Phase II. Furthermore, national records identified the closest INNS species 15 km away from the Offshore Site (see **Section 5.5.2**).

5.6.9.10 Therefore, it is considered that the magnitude of increased risk of invasive and non-native species introduction / spread from Proposed Works Offshore is considered to be **negligible adverse**.

Significance of Effect

5.6.9.11 Overall, based on the limited opportunity for the introduction and spread of INNS, and the short-term, temporary nature of the works, it is considered that the worst-case receptor sensitivity is **high** and the magnitude of increased risk of INNS introduction / spread is **negligible**. Therefore, the effect of increased risk of INNS introduction / spread from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.9.12 Given that effect of increased risk of INNS introduction / spread from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of increased risk of INNS introduction / spread from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

5.6.10 Changes in the Fish and Shellfish Community Affecting Prey Resources

5.6.10.1 Proposed Works Offshore which disturb the seabed and / or produce underwater sound could impact fish and shellfish species which serve as prey items for marine mammals and marine birds. Sandeel and benthic fish are particularly important prey items for both marine mammals

and birds and they are particularly sensitive to seabed disturbance due to demersal spawning activity. The presence of sandeel and demersal fish spawning grounds in the Marine Ornithology Study Area therefore indicates that these species may be affected by the Proposed Works Offshore and this could result in a reduction of prey availability for marine mammals and marine birds.

Receptor Sensitivity

5.6.10.2 The following receptors are considered to be sensitive to changes in the fish and shellfish community affecting prey resources:

- Marine mammals; and
- Marine ornithology.

Marine Mammals

5.6.10.3 Sandeel and demersal fish species represent important prey resources for marine mammals, including harbour porpoise, harbour seal and grey seal which are all considered to be present around the Offshore Site. However, marine mammals are highly mobile species and exhibit long foraging ranges, for example harbour seal and grey seal are known to travel 273 km and 448 km from haul-out sites to forage respectively (Carter *et al*., 2022). Therefore, in the unlikely event that the Proposed Works Offshore result in reduced prey resources, marine mammals are expected to easily find alternative foraging grounds elsewhere in the Irish Sea and surrounding waters. As a result, sensitivity is considered to be **low**.

Marine Ornithology

5.6.10.4 Sandeel and demersal fish species represent important prey resources for marine birds, including red-throated diver which could be present in the Marine Ornithology Study Area in small numbers. Sandeel is considered to be one of the most sensitive fish to disturbance and habitat loss in the Marine Ornithology Study Area. However, temporary habitat loss and disturbance will not occur directly within sandeel habitat, with the closest sandeel habitat is located approximately 20 km north of the Offshore Site. Effects on other less sensitive prey species are also considered to be highly localised and limited. Furthermore, the highly mobile nature of marine birds suggests that alternative foraging grounds elsewhere in the Irish Sea and surrounding waters can be used. Therefore, sensitivity is considered to be **low**.

Magnitude of Impact

5.6.10.5 Habitat loss and disturbance during the Proposed Works Offshore will be temporary, short term (i.e. six weeks duration) and highly localised. The total area of temporary habitat loss is anticipated to be 0.357 km^2 for dredging and removal of infrastructure. The Offshore Site does not overlap with any spawning grounds for key prey species (**Section 5.5.3**).

5.6.10.6 Furthermore, underwater sound effects on fish are also expected to be limited, with project-specific underwater sound modelling indicating that effects on fish will not extend beyond 10 m for all sound sources (see **Volume 3, Appendix 5.2**). This includes the most sensitive fish species such as herring and sprat which are key prey items for marine mammals and marine birds.

5.6.10.7 Both marine mammals and marine birds have large foraging ranges, with potential foraging habitat available across the Irish Sea and beyond. Furthermore, marine mammal presence in the Marine Mammal Study Area is considered to be much lower compared to marine mammal populations elsewhere around the Irish coast (see **Section 5.5.4**). Therefore, changes to prey resources are not anticipated to affect marine mammals or marine birds at a population level.

5.6.10.8 In addition, effects of temporary habitat loss and underwater sound effects on fish are minor.

5.6.10.9 Therefore, it is considered that the magnitude of changes in the fish and shellfish community affecting prey resources for marine mammals and marine ornithological receptors from Proposed Works Offshore is considered to be **negligible adverse**.

Significance of Effect

5.6.10.10 Overall, considering the minor effects of the Proposed Works Offshore on the fish and shellfish community, and the temporary, short-term nature of the works, it is considered that the receptor sensitivity is **low** and the magnitude of changes in the fish and shellfish community affecting prey resources for marine mammals and marine ornithological receptors is **negligible**. Therefore, the effect of changes in the fish and shellfish community affecting prey resources from Proposed Works Offshore is considered to be **Negligible**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.10.11 Given that effect of changes in the fish and shellfish community affecting prey resources from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of changes in the fish and shellfish community affecting prey resources from Proposed Works Offshore is considered to be **Negligible**, which is not significant in EIA terms.

Effects on Annex IV Species

5.6.10.12 All cetaceans are Annex IV species and are considered present in the Marine Mammal Study Area. No other Annex IV species are expected to occur in the Study Area. All potential effects on cetacean species from changes in prey resources are considered to be negligible and not significant. Furthermore, measures set out in **Volume 3, Appendix 5.3** and **Volume 3, Appendix 3.5** will be adhered to, to further minimise potential effects. Therefore, an Annex IV Risk Assessment has not been considered further for this impact pathway.

5.6.11 Disturbance and / or Displacement of Birds

5.6.11.1 Several activities conducted during the Proposed Works Offshore are expected to cause potential disturbance and / or displacement of birds, predominantly in offshore waters within the Offshore Site where vessels are operating. These activities include:

- Pre-decommissioning surveys;
- Removal of WTGs and met mast;
- Presence and use of vessels for dredging and turbine foundation removal; and
- Cable removal using grapnel run and grabs.

5.6.11.2 The use of additional lighting, particularly during hours of darkness, may also result in disturbance.

Receptor Sensitivity

5.6.11.3 The following receptors are considered to be sensitive to disturbance and / or displacement effects:

- Marine ornithology.

Marine Ornithology

5.6.11.4 The red-throated diver is considered to be the most sensitive bird species to disturbance and displacement from activities within the Offshore Site (JNCC, 2022), particularly when overwintering in waters surrounding the UK. Red-throated diver tends to form groups on the sea, which means that if a vessel passes through or close to a group, it has the potential to disturb and displace many individuals at once. Therefore, sensitivity is considered to be high.

5.6.11.5 However, guidance from the joint Statutory Nature Conservation Body (SNCB) indicates that for offshore wind farm activities, a precautionary buffer of 10 km should be considered for potential displacement effects of red-throated diver (JNCC, 2022). The closest European site for which red-throated diver is a qualifying feature is the Murrough SPA which is located 18.1 km from the Offshore Site. Red-throated diver is considered to have a maximum foraging range of 9 km

(mean range of 4.5 km) (Woodward *et al*., 2019). Therefore, there is the potential for a small overlap with the Marine Ornithology Study Area.

5.6.11.6 There is also the potential for other, less sensitive bird species to be present in the Marine Ornithology Study Area and experience disturbance from vessel activity, particularly during foraging and loafing.

5.6.11.7 However, the Proposed Works Offshore and associated vessel activity are expected to be largely restricted to a very small area around the Offshore Site. Therefore, the potential for disturbance of red-throated diver and other bird species from vessels operating in the Offshore Site is minimal and limited, although sensitivity of the species remains **high**.

Magnitude of Impact

5.6.11.8 During the Proposed Works Offshore, it is proposed to establish a restricted zone around the Sub Lease Area where only decommissioning vessels associated with the Proposed Works Offshore will be permitted to enter. This restricted area will be marked out by 12 buoys across a total length of 4,817 m and a total width of 1,605 m (see **Volume 3**, **Appendix 3.7**). Each buoy shall be marked with a 'Yellow Special Mark' and a yellow light used in a flashing pattern, synchronised with other buoys, with a light range of 5 NM (approximately 9.2 km). Once the restricted vessel area has been established, flashing yellow marine lanterns on the WTGs, currently used in the operation phase as described in **Volume 3, Appendix 3.7**, shall be turned off. Therefore, flashing yellow lights on buoys and flashing yellow lights on the WTGs / met mast will not be operational at the same time and baseline levels of lighting will remain.

5.6.11.9 The Irish Sea, including the area of the Offshore Site is characterised by a high baseline level of vessel activity (ABPmer, 2017). This includes vessels transiting in and out of ports including Dublin and Wicklow. Therefore, the addition of a small number of vessels and associated activity for the Proposed Works Offshore is not expected to result in a perceivable change in baseline conditions. Furthermore, vessels will be transient and required to travel at low speeds of up to 6 knots. There is the potential for several different bird species, including breeding and non-breeding birds, to be present in the Offshore Site. However, vessels will be operating in a very small area and are not expected to result in the loss of key foraging habitat or disturbance to populations, particularly considering the large area of alternative foraging habitat in the Irish Sea.

5.6.11.10 Therefore, it is considered that the magnitude of disturbance and / or displacement of birds from the Offshore Site is considered to be **low adverse**.

Significance of Effect

5.6.11.11 Overall, considering the small numbers of vessels, short-term and temporary nature of the works, the availability of alternative bird habitat, it is considered that the receptor sensitivity is **high** and the magnitude of disturbance and / or displacement of birds is **low**. Therefore, the effect of disturbance and / or displacement of birds from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.6.11.12 Given that effect of disturbance and / or displacement of birds from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed. Therefore, the residual effect of disturbance and / or displacement of birds from Proposed Works Offshore is considered to be **Minor Adverse**, which is not significant in EIA terms.

5.7 Cumulative Effects

5.7.1.1 As indicated in **Volume 2, Chapter 1**, cumulative effects result from the addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects (EPA, 2022).

5.7.1.2 The assessment of cumulative effects on marine biodiversity presented in this section has followed the methodology set out in **Volume 2, Chapter 1**, which, in summary comprises:

- **Stage 1: Establish the long list of other developments to consider**, based on the location of other plans and projects (other developments) located within the cumulative Zone of Influence (ZoI), defined as follows for each marine biodiversity receptor:
  - Intertidal and Subtidal Benthic ecology and Fish and Shellfish - 14 km from the Offshore Site, corresponding to the distance within which increased SSC and deposition (affecting benthic ecology, fish and shellfish) from Proposed Works Offshore and other plans and projects could take place. It should be noted that disturbance / underwater noise impact pathways on fish are only anticipated within 10 m from the Offshore Site, and therefore only plans and projects located within the immediate vicinity would introduce pathways for cumulative effects;
  - Marine Mammals – 91 km from the Offshore Site if considered in combination with other plans and projects of relevance (corresponding to twice the maximum behavioural disturbance impact range (45.5 km) of Proposed Works Offshore alone for marine mammals from underwater sound sources); and
  - Marine Birds - Not applicable. As noted below, no pathways for potential cumulative effects on marine birds are considered likely.

- **Stage 2: Establish the short list of other developments to consider**, gathering key information on the other developments that is publicly available, considering the presence of potential pathways for cumulative effects and applying the Stage 2 screening criteria outlined in **Table 5.19**;

Table 5.19: Stage 2 screening criteria

Stage 2 Screening Criteria	
1	Development expected to be constructed / operational before commencement of Proposed Works is to be included as part of the baseline and hence screened out of the assessment.
2	Development not anticipated to temporally overlap or not anticipated to introduce potential for sequential cumulative effects and hence screened out of the assessment.
3	Development not anticipated to introduce physical effect-receptor pathway overlap and hence screened out of the assessment.
4	Development not anticipated to introduce non-physical effect-receptor pathway overlap and hence screened out of the assessment.
5	Low data confidence / low certainty that development will be realised and hence screened out of the assessment.
6	Potential pathway for cumulative effects exists and hence screened into the assessment.

- **Stage 3: Information gathering**. Gathering additional publicly available information on shortlisted developments to inform the assessment of the potential cumulative effects in more detail; and

- **Stage 4: Assessment**. Applying the same methodology used to assess the potential environmental effects of Proposed Works alone.

5.7.1.3 Stages 1 and 2 are presented in **Volume 3, Appendix 1.2: Cumulative Screening**, and the short list i.e. the other developments screened into the assessment of potential cumulative effects on marine biodiversity are outlined in **Table 5.20**, and those located within 50 km are also shown on **Figure 5.7**.

5.7.1.4 A number of the impacts considered for the Proposed Works Offshore alone, as outlined in **Table 5.3**, have not been considered within the assessment of potential cumulative effects due to reasons outlined below:

- **Disturbance / remobilisation of sediment-bound contaminants** – results from sediment sampling at one of the MPs within the Offshore Site found no samples with concentrations exceeding lower levels of sediment quality guidelines (Ramboll, 2025). Previous benthic surveys for AWBP Phase II indicate that arsenic levels marginally exceed lower-level guidance values of 20 mg/L across the AWBP Phase II study area, but levels were below concentrations shown to have adverse effects on marine organisms of 70 mg/L (Aquafact, 2025). Therefore, cumulative effects beyond natural background variation in the Irish Sea are considered unlikely and have not been considered further;

- **Alteration of seabed habitat from changes in physical processes** - changes in physical processes are expected to be minor and highly localised, with limited effect on benthic ecology and fish and shellfish receptors above background conditions. Therefore, this pathway has not been considered further;

- **Removal of hard offshore infrastructure** – effects resulting from removal of hard offshore infrastructure will be highly localised and limited to the Offshore Site. Species affected will also be limited to those which have colonised the offshore infrastructure in the Offshore Site such as blue mussel, barnacles and kelp. Therefore, this pathway has not been considered further;

- **Injury from vessels activity** – A variety of vessels will be required during the Proposed Works Offshore. The number of vessels required for these works is expected to be low compared to the baseline level of shipping traffic in the Irish Sea, with vessels only operating within a specific location of the Offshore Site for a temporary period of time. The Irish Sea is characterised by a high level of shipping traffic, and therefore, cumulative effects beyond baseline numbers of vessels operating within the Irish Sea are considered unlikely and have not been considered further;

- **Increased risk of INNS introduction / spread** – no INNS have been identified in the Benthic Ecology Study Area during surveys conducted for ABWP Phase I or ABWP Phase II (Aquafact, 2025; Alpha Marine, 2026). All vessels, including those used for the Proposed Works Offshore and for other developments are expected to adhere to the IMO Guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines 2011), and the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention). Additionally, as part of **Volume 3, Appendix 3.5**, control measures will be implemented to minimise INNS. Therefore, this pathway has not been considered further;

- **Changes in the fish and shellfish community affecting prey resources –** During the Proposed Works Offshore, any indirect effects to prey species are expected to be minimal as a result of the distance to key prey aggregations (for example, the nearest sandeel spawning ground is located 20 km north of the Offshore Site) and a lack of key prey areas within the Offshore Site. Any seabed impacts will be highly localised and temporary. Therefore, any cumulative effects beyond natural baseline disturbance to prey species are considered unlikely. Therefore, this pathway has not been considered further; and

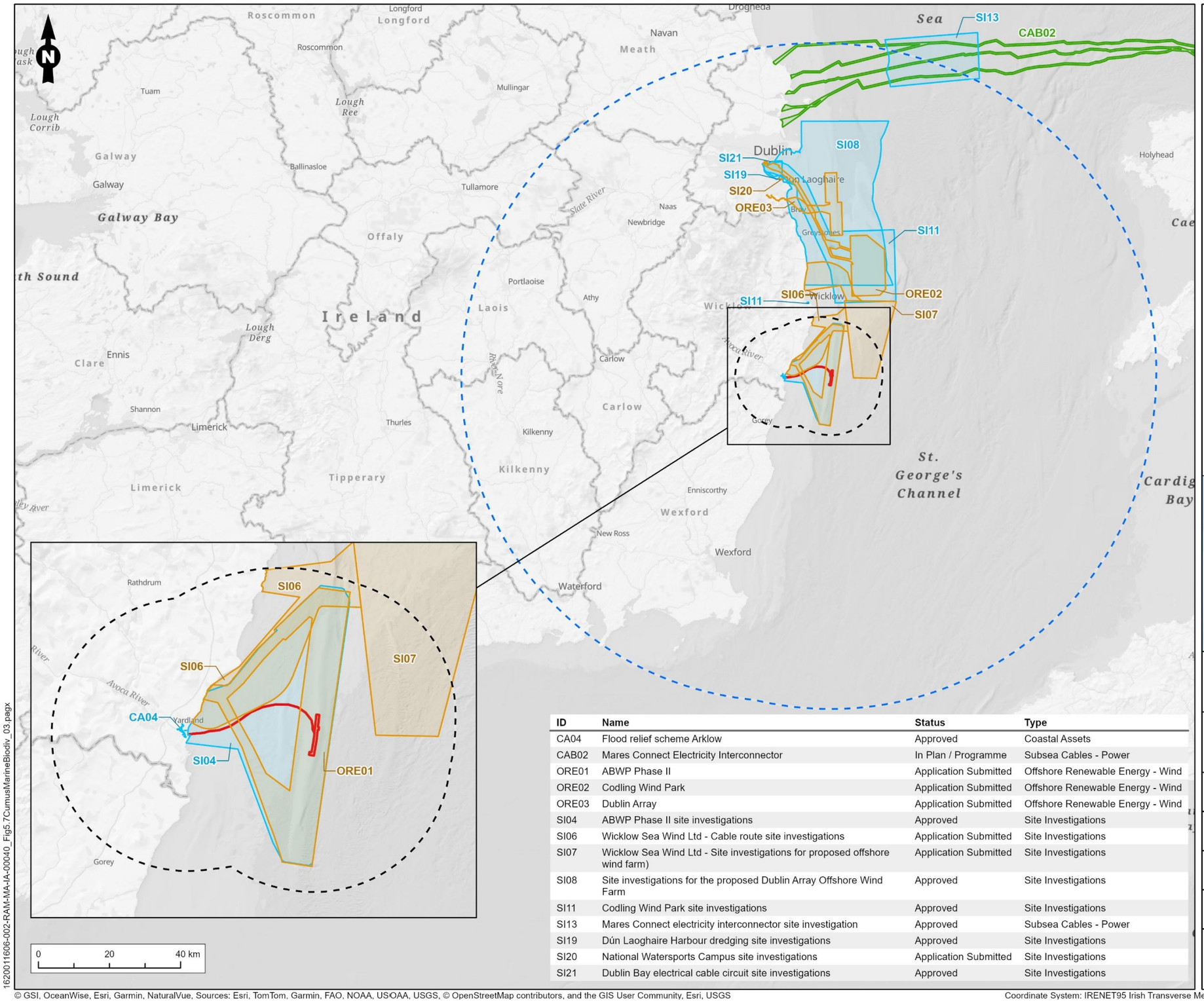
- **Disturbance and / or displacement of birds -** During the Proposed Works Offshore, any disturbance effects to birds are expected to be minimal due to the distance of the Offshore Site from SPAs and a lack of key prey aggregations in the Offshore Site. Furthermore, the Proposed Works Offshore will only require a small number of vessels compared to the high level of baseline vessel traffic in the Irish sea. Therefore, any cumulative effects beyond natural baseline disturbance to birds are considered unlikely. Therefore, this pathway has not been considered further in this section.

Table 5.20: Other developments screened into the assessment of potential cumulative effects on marine biodiversity

Other developments shortlisted (ID)	Type	Tier and status	Distance (km)	Pathway for Cumulative Effect
Arklow Bank Wind Park Phase II Site Investigations (SI04)	Site investigations	Tier 1 Approved (valid to July 2029)	0	Project falls within cumulative ZoI including for temporary habitat loss/disturbance, increased SSC and deposition on benthic and fish and shellfish habitats, and underwater noise
ABWP Phase II (ORE01)	Offshore wind farm	Tier 1 Planning application submitted	0	Project falls within cumulative ZoI including for temporary habitat loss/disturbance, increased SSC and deposition on benthic and fish and shellfish habitats, and underwater noise
Wicklow Sea Wind Ltd - Cable Route Site Investigations. Site investigations for an export cable corridor from a Celtic Sea offshore windfarm (OWF) to the Wicklow coast (SI06)	Site investigations	Tier 1 Application submitted	0.11	Project falls within cumulative ZoI including for increased SSC and deposition on benthic and fish and shellfish habitats, and underwater noise
Flood relief scheme Arklow (CA04)	Coastal asset	Tier 1 Approved	0.27	Project falls within cumulative ZoI for several impact pathways including increased SSC and deposition on benthic and fish and shellfish habitats, and underwater noise
Wicklow Sea Wind Ltd., Site Investigations for the proposed Wicklow Project offshore wind farm, off County Wicklow (SI07)	Site investigations	Tier 1 Application submitted	5.53	Project falls within cumulative ZoI for several impact pathways including increased SSC and deposition on benthic and fish and shellfish habitats, and underwater noise
Site Investigations to inform the location and detailed design of the proposed Codling Wind Park OWF (SI11)	Site investigations	Tier 1 Approved, undergoing Judicial Review	19.89	Project falls within cumulative ZoI for underwater noise
Codling Wind Park (ORE02)	Offshore wind farm	Tier 1 Application submitted	21.54	Project falls within cumulative ZoI for underwater noise
Site Investigations for the proposed Dublin Array Offshore Wind Farm (SI08)	Site investigations	Tier 1 Approved (valid to January 2028)	22.93	Project falls within cumulative ZoI for underwater noise
Dublin Array Offshore Wind Farm (ORE03)	Offshore wind farm	Tier 1 Application submitted	36.97	Project falls within cumulative ZoI for underwater noise
Site investigation to inform detailed engineering design for the Greater Dublin Drainage Project (SI15)	Site investigations	Tier 1 Approved	50	Project falls within cumulative ZoI for underwater noise
Environmental survey and ground investigation works in order to inform the design of proposed Point Bridge and Tom Clarke Widening Project (SI16)	Site investigations	Tier 1 Approved	51.4	Project falls within cumulative ZoI for underwater noise

Other developments shortlisted (ID)	Type	Tier and status	Distance (km)	Pathway for Cumulative Effect
Rosslare Euro Port (Rosslare Offshore Renewable Energy Hub), including rock blasting, capital dredging, reclamation works and piling (SHP04)	Port	Tier 1 Planning application submitted	52.5	Project falls within cumulative ZoI for underwater noise
Construction of a new Ro-Ro Jetty, works on berths, and construction of passenger terminal building, including dredging and ancillary site works (CA29)	Coastal asset	Tier 1 Approved / Operational	55.66	Project falls within cumulative ZoI for underwater noise
Dún Laoghaire Harbour dredging site investigations (SI19)	Site investigations	Tier 1 Approved	55.72	Project falls within cumulative ZoI for underwater noise
National Watersports Campus site investigations (SI20)	Site investigations	Tier 1 Application submitted	55.88	Project falls within cumulative ZoI for underwater noise
Dublin Bay electrical cable circuit site investigations (SI21)	Site investigations	Tier 1 Approved	56.41	Project falls within cumulative ZoI for underwater noise
Development at Howth Fishery Harbour Centre (Dredging of harbour, land reclamation and landscaping and coastal works) (CA14)	Coastal asset	Tier 1 Approved	63.41	Project falls within cumulative ZoI for underwater noise
North Irish Sea Array Offshore Wind Farm (ORE04)	Offshore wind farm	Tier 1 Application submitted	65.1	Project falls within cumulative ZoI for underwater noise
Codling Wind Park Ltd. Site Investigations for proposed Offshore Wind Farm, off Counties Wicklow and Dublin (SI25)	Site Investigations	Tier 1 Approved	67.1	Project falls within cumulative ZoI for underwater noise
Mares Connect Electricity Interconnector, part of ENTSO-E Ten-Year Development Plan 2024 (CAB02)	Cable	Tier 3 Project in Plan / Programme	68	Project falls within cumulative ZoI for underwater noise
Site investigation activities to inform the development of the North Irish Sea Array (NISA) offshore windfarm (OWF) and export cable, off the coasts of counties Dublin, Meath and Louth (SI28)	Site investigations	Tier 1 Approved	78.5	Project falls within cumulative ZoI for underwater noise
Mares Connect Electricity Interconnector Site Investigation (SI13)	Site investigations	Tier 1 Approved	81.06	Project falls within cumulative ZoI for underwater noise
Geotechnical investigation required to support the design of a proposed 250m Offshore Renewable Energy (ORE) capable quay extension in the River Suir at the Port of Waterford, Belview, Co. Kilkenny (SI33)	Site investigations	Tier 1 Application submitted	83.6	Project falls within cumulative ZoI for underwater noise

Other developments shortlisted (ID)	Type	Tier and status	Distance (km)	Pathway for Cumulative Effect
Geophysical survey and localised site investigation to define a route for a proposed submarine fibre optic cable (SI34)	Site investigations	Tier 1 Approved	85.1	Project falls within cumulative ZoI for underwater noise
Lir Offshore Array Ltd., Site Investigations for the proposed Lir Offshore Array, off Counties Louth, Meath and Dublin (SI35)	Site investigations	Tier 1 Application submitted	87.2	Project falls within cumulative ZoI for underwater noise
East Celtic Offshore Wind Park - RWE Renewables. SI for East Celtic Offshore Wind Park off Wexford & Waterford (geophysical, geotechnical, environmental & metocean) (SI36)	Site investigations	Tier 1 Application submitted	87.26	Project falls within cumulative ZoI for underwater noise
Offshore Renewable Energy Capable Terminal (Belview), including reclamation works and piling (SHP05)	Port	Tier 1 Planning application submitted	88.8	Project falls within cumulative ZoI for underwater noise



ID	Name	Status	Type
CA04	Flood relief scheme Arklow	Approved	Coastal Assets
CAB02	Mares Connect Electricity Interconnector	In Plan / Programme	Subsea Cables - Power
ORE01	ABWP Phase II	Application Submitted	Offshore Renewable Energy - Wind
ORE02	Codling Wind Park	Application Submitted	Offshore Renewable Energy - Wind
ORE03	Dublin Array	Application Submitted	Offshore Renewable Energy - Wind
SI04	ABWP Phase II site investigations	Approved	Site Investigations
SI06	Wicklow Sea Wind Ltd - Cable route site investigations	Application Submitted	Site Investigations
SI07	Wicklow Sea Wind Ltd - Site investigations for proposed offshore wind farm)	Application Submitted	Site Investigations
SI08	Site investigations for the proposed Dublin Array Offshore Wind Farm	Approved	Site Investigations
SI11	Codling Wind Park site investigations	Approved	Site Investigations
SI13	Mares Connect electricity interconnector site investigation	Approved	Subsea Cables - Power
SI19	Dún Laoghaire Harbour dredging site investigations	Approved	Site Investigations
SI20	National Watersports Campus site investigations	Application Submitted	Site Investigations
SI21	Dublin Bay electrical cable circuit site investigations	Approved	Site Investigations

Figure Title
Other Developments Screened into the Assessment of Potential Cumulative Effects on Marine Biodiversity (within 50 km)

Project Name
ABWP Phase I Decommissioning

Project No./Filery ID
1620011606-002 / REH2024N01993

Date	Figure No.	Revision
August 2026	5.7	1.0

Prepared By	Scale
AB	1:1,000,000@A3

Client
Arklow Energy Limited

RAMBOLL

1620011606-002-RAM-MA-IA-00040_Fig5.7CumusMarineBiodiv_03.pagx

Coordinate System: IRENET95 Irish Transverse Mercator. Projection: Transverse Mercator. Datum: IRENET95.

Figure 5.7: Other projects, plans and activities screened into Marine Biodiversity CEA

Temporary Habitat Loss / Disturbance

5.7.1.5 Any cumulative effects resulting from temporary habitat loss / disturbance are limited to any other developments which directly overlap with the footprint of the Proposed Works Offshore. Therefore, there are two Tier 1 projects which have been considered for temporary habitat loss / disturbance, based on their spatial and temporal overlap with the Proposed Works Offshore (**Figure 5.7**). There are no Tier 2 or Tier 3 projects which overlap spatially with the Proposed Works Offshore and therefore Tier 2 and Tier 3 projects have not been considered further in relation to this impact pathway.

Receptor Sensitivity

5.7.1.6 The following receptors are considered to be sensitive to temporary habitat loss / disturbance:

- Benthic intertidal habitats and species (**low**)
- Benthic subtidal habitats and species (**medium**)
- Fish (**low**)
- Shellfish (**high** as a worst-case)

5.7.1.7 Justification for receptor sensitivity to temporary habitat loss / disturbance is provided in **Section 5.6.2.**

Magnitude of Cumulative Impact

5.7.1.8 Temporary habitat loss / disturbance is considered to be a highly localised impact restricted to habitats under the footprint of the activities. Therefore, cumulative impacts may occur where another development crosses or directly overlaps with the Proposed Works Offshore during the same time period.

5.7.1.9 There are two Tier 1 projects which directly overlap with the Proposed Works Offshore which are the construction of ABWP Phase II and site investigations related to ABWP Phase II. The timeframes for these activities are currently not confirmed but it is anticipated, as a worst case that there could be overlap.

5.7.1.10 ABWP Phase II Site Investigations will require the creation of boreholes which may be up to 80 m deep in the Array Area and vibrocores, both requiring a JUB, with grab samples also taken at up to 200 locations (RPS, 2023). However, it is not known how many of these samples will be taken within the footprint of the Offshore Site. The deployment of five marine mammal acoustic monitoring devices (click detectors, CPODS) on the seabed is also expected.

5.7.1.11 The ABWP Phase II construction is expected to result in a maximum of 9.929 km^2 of temporary habitat loss / disturbance resulting from sandwave clearance, boulder clearance and cable installation (APEM, 2026e).

5.7.1.12 In comparison, the Proposed Works Offshore are expected to result in a total of 0.357 km^2 of temporary habitat loss due to dredging in the Sub Lease Area, 0.07 km^2 of temporary habitat loss / disturbance due to infrastructure removal and a further 12.57 m^2 (12.57 x 10^{-5} km^2) per jack-up event (see **Section 5.6.2**).

5.7.1.13 Magnitude for each receptor group has been discussed in further detail below.

Benthic Intertidal Habitats and Species

5.7.1.14 The landfall for ABWP Phase II is located approximately 4 km north of ABWP Phase I landfall, and therefore during construction, there is expected to be no overlap with the Proposed Works Offshore. However, Site Investigations for ABWP Phase II are expected to overlap with the Offshore Site as the survey area extends up to the HWM and includes the ABWP Phase I landfall (RPS, 2023).

5.7.1.15 Any temporary habitat loss in the intertidal area is expected to occur in rocky habitat over a very small area compared to the total available intertidal habitat in the western Irish Sea. Furthermore, intertidal habitat such as the habitat present in Arklow is expected to have an elevated baseline of temporary disturbance due to local hydrodynamic conditions and wave action.

5.7.1.16 Therefore, it is considered that the cumulative magnitude of temporary habitat loss / disturbance on intertidal habitats and species with Tier 1 projects and plans, from the Proposed Works Offshore, is **negligible**.

Benthic Subtidal Habitats and Species

5.7.1.17 It is assumed that the majority of temporary habitat loss / disturbance for the Tier 1 projects considered will occur in subtidal habitat. The Proposed Works Offshore are located in an area characterised by coarse, sandy sediments with some small contributions of mud, with increasing infralittoral sand and mud becoming the dominant habitat closer to the landfall. Such sediments are considered highly mobile and susceptible to local hydrodynamic conditions resulting in a high rate of recoverability. Furthermore, these habitats are considered widespread across the Irish Sea and the total amount of cumulative temporary habitat loss is expected to be negligible compared to the wider availability. Any cumulative impact to subtidal benthic species in these habitats is also expected to be minor compared to widespread distribution across the Irish Sea. In the event that the Tier 1 projects considered occur in the same location whilst the Proposed Works Offshore are ongoing, any cumulative impact will be short-term and highly localised.

5.7.1.18 Therefore, it is considered that the cumulative magnitude of temporary habitat loss / disturbance on subtidal habitats and species with Tier 1 projects and plans, from the Proposed Works Offshore, is **negligible**.

Fish and Shellfish

5.7.1.19 The construction of ABWP Phase II and site investigations related to ABWP Phase II overlap spatially and temporally with the Proposed Works Offshore in demersal fish spawning grounds (see **Section 5.5.3**). However, these spawning grounds are large and widespread within the Irish Sea (see **Figure 5.4**). The cumulative total temporary habitat loss / disturbance expected to occur within fish spawning grounds is considered small compared to the total area over which the spawning grounds are present. Furthermore, any disturbance of fish spawning grounds is considered to be highly localised and short-term, with habitats expected to recover rapidly via natural sediment transport processes.

5.7.1.20 Furthermore, the construction of ABWP Phase II and site investigations related to ABWP Phase II and the Proposed Works Offshore do not overlap with spawning grounds for sandeel and herring which are considered to be the most sensitive to seabed disturbance due to their preference for specific sediment types.

5.7.1.21 Therefore, it is considered that the cumulative magnitude of temporary habitat loss / disturbance on fish with Tier 1 projects and plans, from Proposed Works Offshore, is **negligible**.

5.7.1.22 Several shellfish species are expected to occur in the Offshore Site and therefore may be affected by the cumulative effect of temporary habitat loss / disturbance. Some shellfish species present may have limited mobility and unable to avoid direct disturbance. However, the cumulative effect of temporary habitat loss / disturbance is expected to be small compared to the total available and suitable shellfish habitat in the Irish Sea.

5.7.1.23 Blue mussel are known to grow on infrastructure that is to be removed from the Offshore Site. However, assuming ABWP Phase II is constructed, hard infrastructure (i.e. WTG foundations) will be added back into the marine environment. Therefore, temporary habitat loss for blue mussel is also expected to remain as minor, with the ability to recover once hard infrastructure has been replaced.

5.7.1.24 Therefore, it is considered that the cumulative magnitude of temporary habitat loss / disturbance on fish with Tier 1 projects and plans, from Proposed Works Offshore, is **negligible**.

Significance of Cumulative Effect

5.7.1.25 Overall, it is considered that the worst-case receptor sensitivity is **high** and the cumulative magnitude of temporary habitat loss / disturbance is **negligible**. Therefore, the worst-case cumulative effect of temporary habitat loss / disturbance with Tier 1 projects and plans, from

Proposed Works Offshore, is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.7.1.26 Given that the cumulative effect of temporary habitat loss / disturbance from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed.

5.7.1.27 Therefore, the residual cumulative effect of temporary habitat loss / disturbance from Proposed Works Offshore and Tier 1 projects, is considered to be **Minor Adverse**, which is not significant in EIA terms.

Increased SSC and Deposition

5.7.1.28 Any cumulative effects resulting from increased SSC and deposition is limited to any other developments which are located up to 14 km from the Proposed Works Offshore, based on a 7 km tidal excursion distance. Therefore, five Tier 1 projects have been considered further for increased SSC and deposition due to their spatial and temporal overlap with the Proposed Works Offshore. There are no Tier 2 or Tier 3 projects within 14 km with the Proposed Works Offshore and therefore Tier 2 and Tier 3 projects have not been considered further in relation to this impact pathway.

Receptor Sensitivity

5.7.1.29 The following receptors are considered to be sensitive to increased SSC and deposition:

- Benthic intertidal habitats and species (**low**);
- Benthic subtidal habitats and species (**low**);
- Fish (**low**); and
- Shellfish (**medium**).

5.7.1.1 Justification for receptor sensitivity to temporary habitat loss/disturbance is provided in **Section 5.6.3.**

Magnitude of Cumulative Impact

5.7.1.2 Based on sediment plume modelling, the maximum distance over which disturbed sediment could travel from the Offshore Site as a plume and deposit on the seabed is 48 m for activities occurring along the offshore export cable route and a maximum of 7 km for activities in the Sub Lease Area. Therefore, cumulative effects could occur where another project or development has a sediment dispersion distance that could overlap with the sediment plume from the Proposed Works Offshore.

5.7.1.3 There are two Tier 1 projects which directly overlap with the Proposed Works Offshore which are the construction of ABWP Phase II and site investigations related to ABWP Phase II. The maximum distance travelled by a sediment plume produced during ABWP Phase II construction is 8 km (APEM, 2026e). For ABWP Phase II site investigations, any sediment disturbance is expected to be extremely limited compared to background conditions with any small sediment plume not exceeding 5 km from the disturbance (APEM, 2026e). Any sediment plume produced by the Proposed Works Offshore is expected to settle and deposit on the seabed rapidly, with sediment disturbance along the offshore export cable route predicted to be very minor and settle rapidly. In the Sub Lease Area, disturbed gravel is predicted to deposit on the seabed immediately and adjacent to the area of disturbance. Sand and mud are expected to travel further (up to 7 km) with the majority of sediment settling over several hours following disturbance.

5.7.1.4 Similarly, cable route and site investigations for the Wicklow Wind Farm is also expected to result in very minor, small and localised disturbance of sediment with any resulting sediment plume expected to be negligible compared to natural sediment transport.

5.7.1.5 Sediment plume modelling has not been undertaken for the Arklow Flood Relief Scheme. Dredging undertaken as part of the flood relief works, within the Avoca River channel (Arup,

2021), is expected to result in some increased SSC and subsequent deposition of sediment. However, dredging for the flood relief works will be timed so that they do not occur within important migratory periods of lamprey and Atlantic salmon using the Avoca River (i.e. approximately October to April). It is also expected that any increase in SSC as a result of the flood relief works will be short-lived and in line with baseline turbid conditions of the Avoca River.

5.7.1.6 Magnitude for each receptor group has been discussed in further detail below.

Benthic Intertidal Habitats and Species

5.7.1.7 The landfall for ABWP Phase II is located approximately 4 km north of the ABWP Phase I landfall and therefore during construction, there is expected to be no overlap with the Offshore Site. However, site investigations for ABWP Phase II are expected to overlap with the Offshore Site as the survey area extends up to the HWM and includes the ABWP Phase I landfall (RPS, 2023). Any sediment plume resulting from both the ABWP Phase II site investigations and the offshore export cable route works of the Offshore Site are predicted to be highly localised, temporary and small with sediment expected to deposit rapidly back to the seabed.

5.7.1.8 The intertidal area may be affected by sediment plumes resulting from dredging works related to the Arklow Flood Relief Scheme. However, this is expected to be in line with baseline turbid conditions of the Avoca River and be shortlived.

5.7.1.9 Furthermore, the intertidal area is expected to have an elevated baseline of increased SSC and deposition due to local hydrodynamic conditions and wave action.

5.7.1.10 Therefore, it is considered that the cumulative magnitude of increased SSC and deposition on intertidal habitats and species with Tier 1 projects and plans, from the Proposed Works Offshore, is **negligible**.

Benthic Subtidal Habitats and Species

5.7.1.11 In subtidal habitat, dredging of the Sub Lease Area is expected to result in the largest volume of increased SSC. The Sub Lease Area is located in substrate consisting of approximately 95% sand (see **Volume 3, Appendix 4.2**) which is expected to deposit rapidly following disturbance. Furthermore, sandy substrates are highly mobile and susceptible to local hydrodynamic conditions resulting in regular sediment disturbance. Consequently, species and habitats which could be affected by increased SSC and deposition from cumulative disturbance are expected to have some tolerance.

5.7.1.12 In the event that the Tier 1 projects considered can occur in the same location whilst the Proposed Works Offshore are ongoing, any cumulative impact of increased SSC and deposition is considered to be short-term and highly localised, with deposition thicknesses not expected to affect the normal functioning of an ecosystem.

5.7.1.13 Therefore, it is considered that the cumulative magnitude of increased SSC and deposition on subtidal habitats and species with Tier 1 projects and plans, from the Proposed Works Offshore, is **negligible**.

Fish and Shellfish

5.7.1.14 The construction of ABWP Phase II and site investigations related to ABWP Phase II overlap spatially and temporally with the Proposed Works Offshore, with both located in demersal fish spawning grounds (see **Section 5.5.3**) and shellfish habitat. However, demersal fish and shellfish have a high association with the seabed and therefore are considered to have a high level of tolerance to turbid conditions resulting from sediment suspension and subsequent deposition. Furthermore, any cumulative sediment plume is expected to stay relatively localised to the areas of disturbance, which are considered small compared to the total area over which the spawning grounds and suitable shellfish habitat are present.

5.7.1.15 Therefore, it is considered that the cumulative magnitude of increased SSC and deposition on fish and shellfish with Tier 1 projects and plans, from Proposed Works Offshore, is considered to be **negligible**.

Significance of Cumulative Effect

5.7.1.16 Overall, it is considered that the worst-case receptor sensitivity is **medium** and the cumulative magnitude of increased SSC and deposition is **negligible**. Therefore, the cumulative effect of increased SSC and deposition with Tier 1 projects and plans, from Proposed Works Offshore, is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.7.1.17 Given that the cumulative effect of increased SSC and deposition from Proposed Works Offshore, is considered not significant in EIA terms, no additional mitigation measures are proposed.

5.7.1.18 Therefore, the residual cumulative effect of increased SSC and deposition from Proposed Works Offshore and Tier 1 projects, is considered to be **Minor Adverse**, which is not significant in EIA terms.

Injury and/or Disturbance from Underwater Noise

Receptor sensitivity

5.7.1.19 The following receptors are considered to be sensitive to injury and/or disturbance from underwater noise:

- Group 1 fish (**low**);
- Group 2 fish (**low**);
- Group 3 fish (**medium**); and
- Marine Mammals (**very high**)

5.7.1.20 Justification for receptor sensitivity to injury and/or disturbance from underwater noise is provided in **Section 5.6.7**.

Magnitude of Cumulative Impact

Fish and Shellfish

5.7.1.21 Impacts to fish species from both impulsive (SBP) and non-impulsive sources of underwater sound are anticipated to only cause disturbance within the immediate vicinity (<10 m) of the vessels/instrumentation associated with the Proposed Works Offshore. Therefore, only plans/projects that are within the immediate vicinity of the Proposed Works Offshore are considered to have potential for cumulative effects for underwater noise/disturbance of fish receptors.

5.7.1.22 Two Tier 1 projects have been considered for cumulative effects of underwater noise on fish receptors, based on the information provided in **Table 5.20**. There are no Tier 2 or Tier 3 plans or projects within the immediate vicinity of the Proposed Works Offshore, and therefore these have not been considered further.

5.7.1.23 The two Tier 1 projects considered for cumulative effects of underwater noise are associated with the ABWP Phase II project, comprising site investigations (including borehole drilling and geophysical surveys) and subsequent construction activities. While confirmed timelines for these works are not available, there is potential for temporal overlap with the Proposed Works Offshore. As such, geophysical survey and construction activities associated with ABWP Phase II may coincide with survey and decommissioning activities of the Proposed Works Offshore.

5.7.1.24 The greatest risk of cumulative effects from underwater sound on fish would arise during concurrent geophysical survey activities associated with the Proposed Works Offshore and the site investigation and construction activities of ABWP Phase II. However, the sound levels generated by the Proposed Works Offshore are expected to be low relative to those associated with construction works for ABWP Phase II. In addition, it is unlikely that these activities will overlap temporally, as the geophysical surveys for the Proposed Works Offshore are anticipated

to take place over 10 days. Therefore, if any temporal overlap in underwater sound generating activities occurs, it will take place over a very short period of time.

5.7.1.25 Therefore, the cumulative magnitude of injury and/or disturbance from underwater noise with Tier 1 projects and plans, from Proposed Works Offshore, is considered to be **negligible**.

Marine Mammals

5.7.1.26 Behavioural disturbance impact ranges for all marine mammal hearing groups were greatest for the vibratory extraction tool, with impacts predicted up to 45.5 km from the sound source. Behavioural disturbance was also predicted to 32 km for dredging, 14 km for dynamic positioning, between 13 km and 14 km for jet lancing and underwater mechanical cutting, and 6.5 km for support vessels and vessel noise from the JUB. Therefore, projects were screened in where they fall within 91 km of the Proposed Works Offshore, based on twice the maximum behavioural disturbance impact range (45.5 km) for marine mammals from underwater sound sources.

5.7.1.27 A total of 26 Tier 1 projects has been considered for cumulative effects of underwater sound on marine mammal receptors, based on the information provided in **Table 5.20**.

5.7.1.28 AUD INJ effects to marine mammals from the Proposed Works Offshore are generally highly localised. For LF and HF cetaceans, injury effects are restricted to within 10 m of the sound source, while VHF cetaceans (harbour porpoise) may experience AUD INJ effects up to 400 m from impulsive (USBL) activities. TTS effects extend further but remain spatially limited, with the largest impact range being 1 km from USBL activities. Therefore, AUD INJ and TTS effects are considered highly localised and are only expected to cause cumulative effects when there is direct spatial and temporal overlap of impulsive geophysical survey activities, most notably in relation to site investigations for ABWP Phase II.

5.7.1.29 Although highly unlikely, there is possibility for the geophysical survey works of the Proposed Works Offshore and site investigations and construction for AWBP Phase II to overlap temporally. For impulsive sources such as SBP and USBL, marine mammals are expected to move away from sudden and intense underwater sound sources, limiting accumulated exposure. As such, it is considered unlikely that cumulative exposure to impulsive sound sources associated with geophysical survey activities will result in auditory injury to marine mammals. The sound levels generated by the Proposed Works Offshore are also expected to be low relative to those associated with construction works for ABWP Phase II. For example, when considering effects of underwater sound generation on harbour porpoise, the worst-case impact ranges for instantaneous AUD INJ and TTS onset resulting from the ABWP Phase II construction works are 680 m and 1,600 m respectively (APEM, 2026), compared to 400 m and 900 m respectively for the Proposed Works Offshore.

5.7.1.30 Cumulative behavioural disturbance effects from underwater noise may extend up to 91 km from the Proposed Works Offshore. Although 26 Tier 1 projects fall within this range, it is considered unlikely that the majority will overlap temporally with the Proposed Works Offshore, as many have not yet received planning consent and/or do not have confirmed construction or delivery programmes. Where temporal overlap with geophysical surveys or decommissioning activities associated with the Proposed Works Offshore does occur, any behavioural disturbance is expected to be temporary, intermittent, and spatially limited to a highly localised area of overlap.

5.7.1.31 Therefore, it is considered that the cumulative magnitude of injury and/or disturbance from underwater noise with Tier 1 projects and plans, from Proposed Works Offshore, is considered to be **low**.

5.7.1.32 One additional Tier 3 project has been considered for cumulative effects of underwater sound on marine mammal receptors, the Mares Connect Electricity Interconnector, is located 68 km from the Offshore Site. This is outside the predicted impact range for cumulative TTS or AUD INJ to marine mammals. Therefore, behavioural disturbance is the only potential cumulative effect for

this Tier 3 project. Temporal overlap with this project is unlikely. However, if project timings coincide, any overlapping disturbance would be temporary, intermittent, and spatially limited.

5.7.1.33 Therefore, it is considered that the cumulative magnitude of injury and/or disturbance from underwater noise with Tier 3 projects and plans, from Proposed Works Offshore, is considered to be **low**.

Significance of Cumulative Effect

Fish and shellfish

5.7.1.34 Overall, it is considered that the worst case receptor sensitivity is **medium** and the cumulative magnitude of injury and/or disturbance from underwater sound is **negligible**. Therefore, the cumulative effect of injury and/or disturbance from underwater sound with Tier 1 projects and plans, from Proposed Works Offshore, is considered to be **Negligible**, which is not significant in EIA terms.

Marine Mammals

5.7.1.35 For Tier 1 projects and plans, it is considered that the receptor sensitivity for marine mammals is **very high** and the cumulative magnitude of injury and/or disturbance from underwater sound is **low**. Therefore, the cumulative effect of injury and/or disturbance from underwater sound with Tier 1 projects and plans, from Proposed Works Offshore, is considered to be **Minor Adverse**, which is not significant in EIA terms.

5.7.1.36 For Tier 3 projects and plans, it is considered that the receptor sensitivity is **very high** and the cumulative magnitude of injury and/or disturbance from underwater sound is **low**. Therefore, the cumulative effect of injury and/or disturbance from underwater sound with Tier 3 projects and plans, from Proposed Works Offshore, is considered to be **Minor Adverse**, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

5.7.1.37 Measures will be in place throughout the Proposed Works Offshore to mitigate impacts of underwater sound on marine mammals, as outlined in **Volume 3, Appendix 5.3**. Mitigation requirements include the presence of a qualified MMOb for the Proposed Works Offshore, employing a 500m observation zone during relevant Proposed Works Offshore activities. Within this zone, the MMOb will ensure the area is clear of marine mammals prior to commencing the relevant activity. Additionally, a soft-start procedure will be implemented for SBP activities, whereby a gradual increase in sound source occurs to allow individuals to move away from the immediate area.

5.7.1.38 Therefore, the residual effect of underwater noise, from Proposed Works Offshore, is considered to be **Minor Adverse**, which is not significant in EIA terms.

5.8 Transboundary Effects

5.8.1.1 **Volume 3, Appendix 1.3: Transboundary Screening** presents the screening of potential transboundary effects on marine biodiversity using PINS screening criteria (PINS, 2025) using information contained within this EIAR chapter.

5.8.1.2 As stated in **Volume 3, Appendix 1.3**, the approximate distance between the Offshore Site and the nearest maritime boundary is 33 km to the UK (Wales), which is within the Study Area for some marine biodiversity receptors, namely fish, marine mammals and marine birds.

5.8.1.3 Given the mobile nature of fish and potential migratory routes, there is potential for fish from other states to be present within the ZoI of Proposed Works Offshore, which extend into UK waters. However, as described in **Sections 5.6** and **5.7**, potential effects are anticipated to be highly localised, even for migratory fish, and unlikely to become significant for fish distributed within or outside Irish waters.

5.8.1.4 Given the mobile nature of marine mammals, there is also potential for marine mammals from other states, besides the UK, to be present within the ZoI of Proposed Works Offshore, and

accordingly, this chapter also considers the wider Celtic Seas Ecoregion and appropriate MMMUs to account for the mobile nature of cetaceans. For pinnipeds (seals), the OSPAR Region III (Celtic Seas) has also been considered. However, overall, potential effects on marine mammals are considered unlikely to become significant for marine mammals distributed within or outside Irish waters, as described in **Sections 5.6** and **5.7**.

5.8.1.5 Given the mobile nature of marine birds, there is also potential for marine birds from other states to be present within the ZoI of Proposed Works Offshore. However, potential effects are anticipated to be highly localised and unlikely to become significant for marine birds distributed within or outside Irish waters, as described in **Sections 5.6** and **5.7**.

5.8.1.6 Overall, transboundary effects are not expected to occur for marine biodiversity receptors.

5.9 Marine Strategy Framework Directive (MSFD) Summary

5.9.1.1 The MSFD requires that Member States achieve "Good Environmental Status" (GES) of their marine waters by assessing ecosystem conditions, setting targets and implementing monitoring and management measures.

5.9.1.2 GES is defined under Article 3(5) of the MSFD as "the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations".

5.9.1.3 Discussion of the Proposed Works Offshore in relation to achieving GES for each of the MSFD descriptors relevant to marine biodiversity is provided below, see also **Volume 3, Appendix 4.5: MSFD Assessment.**

5.9.2 D1 Biodiversity

5.9.2.1 The following MSFD criteria, as described in **Volume 3, Appendix 4.5,** are relevant to biodiversity:

- D1C2 Abundance;
- D1C3 Population Demographic;
- D1C4 Distribution;
- D1C5 Habitat; and
- D1C6 Pelagic habitat condition.

5.9.2.2 The Proposed Works Offshore are not expected to have significant effects on the abundance, population demographic, distribution, habitat or pelagic habitat condition of biodiversity in the Benthic Ecology Study Area. The Proposed Works Offshore will not result in permanent habitat loss, and any temporary habitat loss will be highly localised (0.357 km^2) representing a small proportion of the total available habitat in the Irish Sea (**Figure 5.3**).

5.9.2.3 The benthic subtidal habitats and species present in the Offshore Site are considered widespread across the western Irish Sea (EMODnet, 2023) and are not associated with any designated site. The Offshore Site is located in predominantly sandy sediment habitats on a mobile and dynamic sand bank. Therefore, due to natural hydrodynamic and sediment transport processes, the backfill of disturbed habitat by sediment is expected to occur rapidly following the end of the seabed disturbance with a high rate of recovery. Furthermore, the area of temporary habitat loss of such benthic habitats is considered to be small compared to the total area of available habitats in the Irish Sea.

5.9.2.4 The Proposed Works Offshore are highly localised and short-term in nature and therefore they are not expected to result in changes to the distribution, abundance and population demographic of fish and shellfish, marine mammals and marine birds (see **Section 5.6**).

5.9.2.5 Overall, the Proposed Works Offshore are not anticipated to affect the achievement of Favourable Conservation Status with respect to abundance, population demographic, distribution, habitat or pelagic habitat condition or GES in Ireland in relation to biodiversity.

5.9.3 D2 Non-indigenous species (NIS)

5.9.3.1 The following MSFD criteria are relevant to non-indigenous species, referred to in **Section 5.6** as INNS:

- D2C1 Newly introduced NIS.

5.9.3.2 The Proposed Works Offshore are not anticipated to increase the risk of introduction and spread of NIS (see **Section 5.6.9**) due to the short-term and temporary nature of the works and the limited opportunity for INNS introduction. No NIS were identified in the Benthic Ecology Study Area during benthic surveys conducted for ABWP Phase I or ABWP Phase II (Aquafact, 2025; Alpha Marine, 2026. Furthermore, all project vessels will adhere to the IMO Guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines 2011), and the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention), see **Volume 3, Appendix 3.5**.

5.9.3.3 Therefore, the Proposed Works Offshore are not expected to affect GES in Ireland in relation to NIS.

5.9.4 D3 Population of commercial fish and shellfish

5.9.4.1 The following MSFD criteria are relevant to the population of commercial fish and shellfish, as described in **Volume 3, Appendix 4.5:**

- D3C1 Commercially exploited fish: death;
- D3C2 Commercially exploited fish: spawning stock biomass; and
- D3C3 Commercially exploited fish: distribution of age / size.

5.9.4.2 The Proposed Works Offshore are not anticipated to result in the mortality or alteration of the distribution of the age or size of commercial fish and shellfish species in the Fish and Shellfish Study Area due to the limited extent and short-term nature of the works. Potential impact pathways assessed for commercial fish include:

- Temporary habitat loss/disturbance;
- Increased SSC and deposition;
- Disturbance / remobilisation of sediment bound contaminants;
- Alteration of seabed habitat from changes in physical processes;
- Removal of hard offshore infrastructure;
- Injury and / or disturbance from underwater sound; and
- Changes in the fish and shellfish community affecting prey resources.

5.9.4.3 None of the assessed pathways are anticipated to have a significant effect on fish and shellfish populations in the Fish and Shellfish Study Area. While the Proposed Works Offshore are within spawning grounds for lemon sole and sprat, these species are broadcast spawners meaning their eggs are not deposited on the seabed and are easily influenced by ocean currents and carried away from spawning grounds and are unlikely to be affected by Proposed Works Offshore. Therefore, an adverse effect on the spawning stock biomass of these species is not anticipated due to the relatively small area of the Proposed Works Offshore compared to the wider available spawning area for these species (**Figure 5.4**).

5.9.4.4 Therefore, the Proposed Works Offshore are not expected to affect GES in Ireland in relation to populations of commercial fish and shellfish.

5.9.5 D4 Marine food webs

5.9.5.1 The following MSFD criteria are relevant to marine food webs, as described in **Volume 3, Appendix 4.5:**

- D4C1 Trophic guild species diversity;

- D4C2 Abundance across trophic guilds;
- D4C3 Trophic guild size distribution; and
- D4C4 Trophic guild productivity.

5.9.5.2 The Proposed Works Offshore are not anticipated to significantly affect the trophic guild species diversity, abundance, size distribution or productivity.

5.9.5.3 Sandeel and demersal fish species represent important prey resources for marine mammals and marine birds. However, temporary habitat loss and disturbance will not occur directly within sandeel habitat, with the closest sandeel grounds located approximately 20 km north of the Offshore Site. Effects on other less sensitive prey items are also considered to be highly localised and limited. Furthermore, the highly mobile nature of marine mammals and marine birds suggests that alternative foraging grounds elsewhere in the Irish Sea and surrounding waters can be used. Effects on benthic habitat and species which contribute to the trophic guild are also not expected to be significantly affected, due to the short-term and highly localised nature of the Proposed Works Offshore.

5.9.5.4 Therefore, the Proposed Works Offshore are not expected to affect GES in Ireland in relation to marine food webs.

5.9.6 D6 Sea floor integrity

5.9.6.1 The following MSFD criteria are relevant to sea floor integrity, as described in **Volume 3, Appendix 4.5:**

- D6C2 Physical disturbance to the seabed, no thresholds specified;
- D6C3 Adverse effects from physical disturbance, extent of habitat disturbance to be below 25% the spatial extent of each benthic broad habitat type;
- D6C4 Habitat extent, amount of seabed loss below 2% of each benthic broad habitat type; and
- D6C5 Benthic habitat condition, adverse effect on any benthic broad habitat type is less than 25% of habitat extent, of which no more than 2% is habitat loss.

5.9.6.2 The Proposed Works Offshore are not expected to result in any permanent habitat loss. Any habitat disturbance is expected to be temporary and highly localised to the footprint of the Proposed Works Offshore with negligible effects. The benthic subtidal habitats and species present in the Offshore Site are considered widespread across the western Irish Sea (EMODnet, 2023) and are not associated with any designated site. The Offshore Site is also located in predominantly sandy sediment habitats which are highly mobile and dynamic. Therefore, due to natural hydrodynamic and sediment transport processes, the backfill of disturbed habitat by sediment is expected to occur rapidly following the end of the seabed disturbance with a high rate of recovery. Furthermore, the area of temporary habitat loss of such benthic habitats is considered to be small compared to the total area of available habitats in the Irish Sea.

5.9.6.3 Therefore, the Proposed Works Offshore are not expected to affect GES in Ireland in relation to sea floor integrity.

5.9.7 D11 Underwater sound

5.9.7.1 The following MSFD criteria are relevant to underwater sound, as described in **Volume 3, Appendix 4.5**:

- D11C1 Anthropogenic impulsive sound; and
- D11C2 Anthropogenic non-impulsive low-frequency sound.

5.9.7.2 The Proposed Works Offshore are expected to produce both impulsive and non-impulsive sound during geophysical surveys and other activities, as described in **Section 5.6.7**.

5.9.7.3 However, underwater sound modelling provided in **Volume 3, Appendix 5.2** and **Section 5.6.7** show that for all non-impulsive and impulsive (SBP) sound sources associated with the Proposed Works Offshore, the potential impact range for all fish hearing groups for both

stationary and mobile fish are highly localised, within 10 m of the source. Mortality and potential mortal injury of eggs and larvae is also predicted to be restricted to within 10 m.

5.9.7.4 For marine mammals, the largest impact range for TTS resulting from non-impulsive sound is 800 m from the sound source (for vibratory extraction tool, for LF hearing cetaceans). The largest impact range for AUD INJ is less than 10 m (for all hearing groups). For impulsive sound, the largest impact range for TTS is 1,000 m (for the use of USBL, for LF hearing cetaceans) and the largest impact range for AUD INJ is 400 m (for VHF cetaceans).

5.9.7.5 For behavioural disturbance of all marine mammal hearing groups, the largest impact range is 45.5 km, resulting from the use of the vibratory extraction tool. However, these distances are based on the NOAA 2005 threshold of 120 dB SPL_{rms} and there is a considerable degree of uncertainty and variability in the onset of disturbance and therefore any disturbance ranges should be treated as potentially over precautionary.

5.9.7.6 Overall, the spatial extent, short-term nature, and low level of non-impulsive and impulsive sound sources do not exceed levels that adversely affect populations of marine animals. The total extent of underwater noise disturbance is minor compared to the extensive distribution of fish and marine mammals in the Irish Sea.

5.9.7.7 As a result, the Proposed Works Offshore are not expected to affect GES in Ireland in relation to underwater noise.

5.10 Summary

5.10.1 Summary of Effects

5.10.1.1 This chapter has assessed the potential impacts on marine biodiversity from Proposed Works Offshore. Impacts from the Proposed Works Offshore were assessed across intertidal and subtidal benthic ecology, fish and shellfish, marine mammals and marine ornithology receptor groups. For all impact pathways assessed in **Section 5.6**, it was concluded that residual effects would be minor adverse or negligible.

5.10.1.2 **Table 5.21** presents a summary of impacts and confirms the residual effects.

5.10.2 Summary of Additional Mitigation and Monitoring

5.10.2.1 No additional mitigation or monitoring has been proposed in relation to marine biodiversity beyond the implementation of a MMMP (**Volume 3, Appendix 5.3**).

5.10.3 Summary of Effects on Annex IV Species

5.10.3.1 No significant effects on Annex IV species have been identified as likely to occur during the Proposed Works Offshore. Therefore, it is considered that further assessment of Annex IV species is not required and therefore they have not been considered further.

Table 5.21: Summary of potential impacts and residual effects

Impact	Embedded mitigation	Worst-case sensitivity of receptor	Magnitude of impact	Significance of impact	Additional mitigation and monitoring	Residual effect
Temporary habitat loss/disturbance	Development and adherence to the Detailed Offshore DEMP (see outline version in **Volume 3, Appendix 3.4**). Development and adherence to the Detailed VMP (see outline version in **Volume 3, Appendix 3.5**). Development and adherence to the Detailed WMP (see outline version in **Volume 3, Appendix 3.8**).	High	Low	Minor adverse (not significant)	No	Minor adverse (not significant)
Increased SSC and deposition		Medium	Low	Minor adverse (not significant)	No	Minor adverse (not significant)
Disturbance/remobilisation of sediment bound contaminants		Medium	Negligible	Negligible (not significant)	No	Negligible (not significant)
Alteration of seabed habitat from changes in physical processes		Low	Negligible	Negligible (not significant)	No	Negligible (not significant)
Removal of hard offshore infrastructure		High	Low	Minor adverse (not significant)	No	Minor adverse (not significant)
Injury and/or disturbance from underwater noise		Very high	Low	Minor adverse (not significant)	Implementation of MMMP (see **Volume 3, Appendix 5.3**)	Minor adverse (not significant)
Injury and/or disturbance from vessels activity		Medium	Low	Minor adverse (not significant)	No	Minor adverse (not significant)
Increased risk of INNS introduction / spread		High	Negligible	Minor adverse (not significant)	No	Minor adverse (not significant)
Changes in the fish and shellfish community affecting prey resources		Low	Negligible	Negligible (not significant)	No	Negligible (not significant)
Disturbance and/or displacement of birds		High	Low	Minor adverse (not significant)	No	Minor adverse (not significant)

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