Arklow Bank Wind Park 2

Environmental Impact Assessment Report

Volume II, Chapter 7: Marine Water and Sediment Quality

sse Renewables

Revision	Date	Author	Reviewed by	Approved by
1.0	15/05/24	GoBe Consultants	GoBe Consultants	Sure Partners Limited

Statement of Authority

Experts	Qualifications	Relevant Experience
GoBe/ APEM: Emily Muir (Author)	BSc (Hons) Applied Bioscience and Zoology at The University of the West of Scotland (2021)	Emily joined GoBe in November 2023 and has gained a breadth of experience contributing to Scoping and EIA Reports regarding physical processes. Prior to this, Emily earned her BSc (Hons) in Applied Bioscience and Zoology (first-class distinction) from the University of the West of Scotland (UWS). During her undergraduate degree, Emily was awarded the Carnegie Vacation Scholarship to investigate the effects of Tributyltin (TBT) on RXR expression in the aquatic gastropod, *Lymnaea stagnalis*. Emily honed her skills in ecotoxicology while carrying out research that focused on the characteristics (i.e. size/shape/polymer type/colour/frequency) of microplastics collected from waterbodies across central Scotland, and subsequently went on to develop a novel exposure route to analyse their potential ecotoxicity. Emily's broad academic foundation has equipped her with a strong base-understanding of aquatic ecosystems, water chemistry, sediment dynamics and the environmental factors that influence their health.
GoBe/ APEM: Claire Hinton (Technical Reviewer)	BSc (Hons) Marine Sciences at Southampton University, Southampton (1996) Doctorate on the 'Decadal morphodynamic behaviour of the Holland shoreface' from the Flood Hazard Research Centre, Middlesex University (2000)	Dr Claire Hinton has over 18 years' experience in marine environmental consultancy, specifically in the field of physical processes and numerical modelling. As a Principal Consultant, she has acted as Project Director, Project Manager and Technical Expert for a wide range of projects within the Offshore Wind and Oil & Gas sectors. Within commercial projects, she has contributed to Environmental Impact Assessments and associated requirements, from conception through to decommissioning. She has also contributed to guidance for regulators and decision-makers.

GoBe/ APEM: Sammy Sheldon (Technical Reviewer)	MSci (Hons) Oceanography at University of Southampton (2011)	Sammy is an environmental consultant with thirteen years commercial experience, including project management, with a background in oceanography. Sammy has practical experience of field work, statistical analysis of data, report writing and mapping in ArcGIS. She has worked extensively across a range of marine sectors include renewables, oil and gas, ports and harbours and marine water quality. She has also contributed to technical chapters and reports for incorporation into Environmental Statements including physical processes, marine water and sediment quality and Water Framework Directive assessments. Furthermore, her experience of the production of post-consent compliance documentation includes drafting of pre-construction documents and environmental appraisals of revised construction methods to gain regulatory approval. In her previous employment she specialised as a numerical modeller in marine and coastal settings. This entailed the construction, calibration and application of hydrodynamic and wave models. These models were used for a range of applications including quantifying changes to physical process regimes and water quality. In addition, Sammy has undertaken numerous metocean studies for a range of marine sectors, including simple weather downtime assessments through to extreme value analysis of winds and waves.

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Glossary

Term	Meaning
Arklow Bank Wind Park 1 (ABWP1)	Arklow Bank Wind Park 1 consists of seven wind turbines, offshore export cable and inter-array cables. Arklow Bank Wind Park 1 has a capacity of 25.2 MW. Arklow Bank Wind Park 1 was constructed in 2003/04 and is owned and operated by Arklow Energy Limited. It remains the first and only operational offshore wind farm in Ireland.
Arklow Bank Wind Park 2 – Offshore Infrastructure	"The Proposed Development", Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements under the existing Maritime Area Consent.
Arklow Bank Wind Park 2 (ABWP2) (The Project)	Arklow Bank Wind Park 2 (ABWP2) (The Project) is the onshore and offshore infrastructure. This EIAR is being prepared for the Offshore Infrastructure. Consents for the Onshore Grid Infrastructure (Planning Reference 310090) and Operations Maintenance Facility (Planning Reference 211316) has been granted on 26th May 2022 and 20th July 2022, respectively. • Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements to be consented in accordance with the Maritime Area Consent. This is the subject of this EIAR and will be referred to as 'the Proposed Development' in the EIAR. • Arklow Bank Wind Park 2 Onshore Grid Infrastructure: This relates to the onshore grid infrastructure for which planning permission has been granted. • Arklow Bank Wind Park 2 Operations and Maintenance Facility (OMF): This includes the onshore and nearshore infrastructure at the OMF, for which planning permission has been granted. • Arklow Bank Wind Park 2 EirGrid Upgrade Works: any non-contestable grid upgrade works, consent to be sought and works to be completed by EirGrid.
Array Area	The Array Area is the area within which the Wind Turbine Generators (WTGs), the Offshore Substation Platforms (OSPs), and associated cables (export, inter- array and interconnector cabling) and foundations will be installed.
Bathymetry	The measurement of water depth in oceans, seas and lakes.
Cable Corridor and Working Area	The Cable Corridor and Working Area is the area within which export, inter-array and interconnector cabling will be installed. This area will also facilitate vessel jacking operations associated with installation of WTG structures and associated foundations within the Array Area.
Cable protection	External armouring applied to exposed cables or used at cable crossings, typically comprised of rock (berms or bags), ducting (polyurethane, steel, High Density Polyethylene (HDPE), cast iron or plastic) or concrete mattresses

Term	Meaning
Competent Authority (CA)	The authority designated as responsible for performing the duties arising from the EIA Directive as amended. For this application, the Competent Authority is An Bord Pleanála (ABP).
EirGrid	State-owned electric power transmission system operator (TSO) in Ireland and Transmission Asset Owner (TAO) for the Project's transmission assets.
Environmental Impact Assessment (EIA)	An Environmental Impact Assessment (EIA) is a statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council (EIA Directive).
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 including the subsoil below, and the water column above the bed and shore and extending to the 12 nautical mile limit.
Foundation	The load carrying support structure for the wind turbine generator tower or offshore substation platform topside. The foundation is the part of the structure from the interfacing flange with the turbine tower or topside-foundation interface, down to below seabed. This includes any secondary steel items associated with the structure. For the purposes of the EIAR the term 'foundation' includes the structure from the WTG tower or topside interface down to the lower end of the monopile commonly known as the 'substructure' and encompasses monopiles and transition pieces.
Intertidal area	The area between the high water mark (HWM) and the low water mark (LWM).
Landfall	The area in which the offshore export cables make landfall and is the transitional area between the offshore cabling and the onshore cabling.
Mitigation Measure	Measure which would avoid, reduce, or remediate an impact.
Permitted Maritime Usage	The construction and operation of an offshore wind farm and associated infrastructure (including decommissioning and other works required on foot of any permission for such offshore wind farm).
Rehabilitation Schedule	The Rehabilitation Schedule sets out how SPL will, before the expiration of the MAC, rehabilitate that part of the maritime area the subject of the MAC, and any other part of the maritime area adversely affected by the maritime usage the subject of the MAC.

Term	Meaning
The Application	The full set of documents that will be submitted to An Bord Pleanála in support of the consent.
The Developer	Sure Partners Ltd.
Transition Piece (TP)	Structural interface between monopile foundation and WTG tower that contains ancillary infrastructure such as boat landings, working platform and j tubes.
Trenchless techniques	Trenchless techniques include steerable direct pipe thrusting and Horizontal Directional Drilling (HDD) which allow cable ducts to be installed underground without the need to excavate trenches.

Acronyms

Term	Meaning
AA	Appropriate Assessment
AA-EQS	Annual Average – Environmental Quality Standards
ABP	An Bord Pleanála
ABWP1	Arklow Bank Wind Park 1
ABWP2	Arklow Bank Wind Park 2
ADCP	Acoustic Doppler Current Profiler
AL	Action Level
BAS	Burial Assessment Study
BGS	British Geological Survey
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
BWs	Bathing Waters
Cefas	Centre for Environment, Fisheries and Aquaculture Sciences
CFE	Controlled Flow Excavation
CIA	Cumulative Impact Assessment
CTV	Crew Transfer Vessels
DBT	Dibutyltin
DCCAE	Department of Communications, Climate Action and Environment
DECC	Department of Energy and Climate Change
DHLGH	Department of Housing, Local Government and Heritage
DP	Decommissioning Program
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment

EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EMODnet	European Marine Observation and Data Network
EMP	Environment Management Plan
EPA	Environmental Protection Agency
ERDDAP	Environmental Research Division's Data Access Program
ERM	Effects Range Median
EQS	Environmental Quality Standards
EQSD	Environmental Quality Standards Directive
FRS	Flood Relief Scheme
GIS	Geographic Information System
HABMAP	Habitat Mapping for Conservation and Management of the Southern Irish Sea
HCB	Hexachlorobenzene
HDD	Horizontal Directional Drilling
HVAC	Heating Ventilation and Air Conditioning
HWM	High Water Mark
ICCP	Impressed Current Cathodic Protection
IE	Intestinal Enterococci
IMO	International Maritime Organisation
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
LiDAR	Light Detection and Ranging
MAC	Maritime Area Consent
MAC-EQS	Maximum Allowable Concentration – Environmental Quality Standards

MPCP	Marine Pollution Contingency Plan
MSFD	Marine Strategy Framework Directive
MW&SQ	Marine Water and Sediment Quality
NIS	Natura Impact Statement
NMPF	National Marine Planning Framework:
NPWS	National Parks and Wildlife Service
NVZ	Nitrate Vulnerable Zone
O&M	Operational and Maintenance
OGI	Onshore Grid Infrastructure
OMF	Onshore Maintenance Facility
OMF	Operations and Maintenance Facility
OPW	Office of Public Works
OREDP	Offshore Renewable Energy Development Plan
OSP	Offshore Substation Platform
OWF	Offshore Windfarm
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
PEL	Probable Effects Level
PSA	Particle Size Analysis
RBMP	River Basin Management Plan
rBWD	Revised Bathing Water Directive
RS	Rehabilitation Schedule
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment

SF6	Sulphur hexafluoride
SFWs	Shellfish Waters
SOLAS	Safety of Life at Sea
SPA	Special Protection Area
SPM	Suspended Particulate Matter
SSC	Suspended Sediment Concentration
SWISS	Southwest Irish Sea Survey
TBT	Tributyltin
TP	Transition Piece
TSHD	Trailing Suction Hopper Dredger
UHRS	Ultra High-Resolution Survey
UK	United Kingdom
UKTAG	UK Technical Advisory Group
UNCLOS	United Nations Convention on the Law of the Sea
UPS	Uninterruptible Power Supply
USV	Unmanned Surface Vehicles
UV	Ultra-Violet
UWWTD	Urban Wastewater Treatment Directive
UXO	Unexploded Ordnance
VMP	Vessel Management Plan
WFD	Water Framework Directive
WHO	World Health Organisation
WROV	Work-class Remotely Operated Vehicle
WTG	Wind Turbine Generator

WWTP	Wate Water Treatment Plant
ZoI	Zone of Influence

Units

Unit	Description
m^3	Cubic metre
°C	Degree Celsius
g/kg	Gram per kilogram
kg	Kilogram
km	Kilometres
<	Less than
l	litres
MW	Megawatt
m	Metre
mT	Metric Ton
µg/kg	Microgram per kilogram
µm	Micrometre
mg/kg	Milligram per kilogram
mg/l	Milligrams per litre
mm	Millimetre
nm	Nautical Mile (distance; equal to 1.852 km)
%	Percentage
psu	Practical Salinity Units
m^2	Square metre

7 Marine Water and Sediment Quality

7.1 Introduction

7.1.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) presents the assessment of the potential impacts of the Arklow Bank Wind Park 2 (ABWP2) Offshore Infrastructure (hereafter referred to as 'the Proposed Development') on Marine Water and Sediment Quality (MW&SQ). Specifically, this chapter considers the potential impact of the Proposed Development below the High-Water Mark (HWM) during the construction, Operational and Maintenance (O&M), and decommissioning phases. Where required, mitigation is proposed, and the residual impacts and their significance are assessed. Potential cumulative and transboundary impacts are also considered. In this report, MW&SQ includes the following elements:

- Water quality (including changes in compliance of Water Framework Directive (WFD) Water Bodies and Protected Areas, Bathing Waters (BWs), Shellfish Waters (SFWs), Nutrient Sensitive Areas); and
- Sediment quality (including sediment type, suspended sediment concentration and sediment contamination).

7.1.1.2 This chapter draws upon information contained within Volume II, Chapter 6: Coastal Processes and Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling. Notably, MW&SQ is not just a receptor in its own right, but also provides impact pathways (i.e., changes to water or sediment quality) for other receptors (e.g., marine ecological features). Moreover, this chapter should be read in conjunction with the following documents due to the interactions between technical aspects.

- Volume II, Chapter 4: Description of Development;
- Volume II, Chapter 6: Coastal Processes;
- Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology; and
- Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology.

7.2 Regulatory background

7.2.1.1 The assessment of potential impacts upon MW&SQ has been made in compliance with the relevant legislation, plans and policies (Table 7.1). Full details are provided in Volume II, Chapter 2: Policy and Legislation.

7.2.1.2 In addition, a number of other guidance documents specific to the consideration of MW&SQ are available from jurisdictions with established offshore renewable energy sectors where comprehensive guidance has been developed. This guidance will be used to inform the assessment of the potential impacts and is also listed in Table 7.1 below.

Table 7.1: Summary of regulatory background for MW&SQ

Publisher	Name of document incl. reference	Key provisions
Statutory		
Legislation		
European Commission, 2011	European Communities (Marine Strategy Framework) Regulations 2011 (S.I. No. 249 of 2011) Subsequently amended: European Communities (Marine Strategy Framework) (Amendment) Regulations 2017 (S.I. No. 265 of 2017) Subsequently amended: European Communities (Marine Strategy Framework) (Amendment) Regulations 2018 (S.I. No. 648 of 2018)	Transposes EU Directive 2008/56/EC (Marine Strategy Framework Directive: (MSFD)) into Irish law. The MSFD is similar to the Water Framework Directive (WFD) in that it required all EU member states, including Ireland, to reach good environmental status in the marine environment by 2020. The Directive is implemented in six-year cycles and is currently in its second cycle; at the time of writing the Marine Strategy Part 2: Monitoring Programme is being updated (Department of Housing, Local Government and Heritage, 2021). The purpose of the MSFD Regulations is to help develop Ireland's ocean economy whilst protecting and preserving the marine environment. The MSFD Regulations consider the following: Physical and chemical features, such as: • Topography and bathymetry of the seabed features; • Annual and seasonal temperature regime, turbidity, current velocity, upwelling, wave exposure, mixing characteristics, residence time; and • Spatial and temporal distribution of salinity. Pressures and Impacts – Contamination of hazardous substances: • Introduction of synthetic compounds, for example: priority hazardous substances under Directive 2000/60/EC which are relevant for the marine environment such as pesticides, antifoulants pharmaceuticals resulting from losses from diffuse sources, pollution by ships, atmospheric deposition, and biologically active substances; and

Publisher	Name of document incl. reference	Key provisions
		• Introduction of non-synthetic substances and compounds, for example: heavy metals and hydrocarbons resulting from pollution by ships and oil, gas and mineral exploration and exploitation, atmospheric deposition, and riverine inputs. Nutrient and organic matter enrichment: • Inputs of fertilisers – and other nitrogen and phosphorus rich substances – including inputs from point and diffuse sources, for example: agriculture, aquaculture and atmospheric deposition.
European Commission, 2000	European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003)	Gives further effect to EU Directive 2000/60/EC WFD into Irish law. The WFD was established to provide a single framework for the protection of surface waterbodies (including rivers, lakes, coasts and estuaries) and groundwater. Coastal waters between the coast and one nautical mile offshore are designated for ecological status under the WFD. Each waterbody has an assigned ecological status. The ecological status is assigned by considering the biological, hydromorphological, chemical and specific contaminants. The different ecological statuses are: • High; • Good; • Moderate; • Poor; or • Bad. The WFD requires that management plans are prepared on a river basin basis of which the second River Basin Management Plan (RBMP) (DHPLG, 2018) was published in 2018, to cover the period of 2018 to 2021. The draft Third Round River Basin Management Plan for Ireland 2022-2027 was issued for public consultation in 2022, but at the time of writing has not been issued in final form. The RBMPs outline the approach to protect waters in Ireland, identifies the water

Publisher	Name of document incl. reference	Key provisions
		bodies which are 'at risk' of not achieving their status objective and sets out actions required to achieve 'good' ecological status. The Environmental Quality Standards (EQSs) define the standards for contaminants within surface waters to reduce the polluting substances entering the environment. These standards are established in the Schedule 5 of the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (SI No. 272 of 2009), as amended.
European Commission	European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009) Subsequently amended: European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012 (S.I. No. 327 of 2012) Subsequently amended: European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2015 (S.I. No. 386 of 2015) Subsequently amended: European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77 of 2019)	These Regulations give statutory effect to the Environmental Quality Standards Directive to Directive 2008/105/EC on EQS in the field of water policy. The Regulations also give further effect to the WFD establishing a framework for Community action in the field of water policy and Directive 2006/11/EC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community. The Regulations apply to all surface waters and provide, inter alia, for— guide: • The establishment of legally binding quality objectives for all surface waters and environmental quality standards for pollutants; • The examination and where appropriate, review of existing discharge authorisations by Public Authorities to ensure that the emission limits laid down in authorisations support compliance with the new water quality objectives/standards; • The classification of surface water bodies by the Environmental Protection Agency (EPA) for the purpose of the WFD; • The establishment of inventories of priority substances by the EPA; and • The drawing up of pollution reduction plans by coordinating local authorities (in consultation with EPA) to reduce pollution by priority substances and to cease and/or phase out discharges, emissions or losses of priority hazardous substances. The Environmental Quality Standards Directive (EQSD) includes measures establishing EQS for priority substances and certain other

Publisher	Name of document incl. reference	Key provisions
		pollutants as provided for in Article 16 of the Water Framework Directive that are to apply in calculating the chemical status of bodies of surface water. These prescribed measurements include: • The Annual Average – Environmental Quality Standards (AA-EQS) which is an arithmetic mean; and • The Maximum Allowable Concentration – Environmental Quality Standards (MAC-EQS) which is an upper threshold which should not be breached.
European Commission, 2008 European Commission,	European Communities (Environmental Liability) Regulations 2008 (S.I. No. 547 of 2008) came into force in Ireland in April 2009	Transposes the EU Directive 2004/35/EC (Environmental Liability Directive) into Irish Law. The Environmental Liability Directive is a European Union law Directive on enforcement of claims against occupational activities which damage the environment. Its objective is to create "a more uniform regime for the prevention and remediation of environmental damage" across the EU. The purpose of these Regulations is to establish a framework of environmental liability based on the 'polluter-pays' principle, to prevent and remedy environmental damage.
European Commission, 2008	European Communities (Bathing Water Quality) Regulations 2008 (S.I. No. 79 of 2008) Subsequently amended: Bathing Water Quality (Regulations Amendment) Regulations 2011 (S.I. No. 351 of 2011)	Transposes EU Directive 2006/7/EC (revised Bathing Water Directive: (rBWD)) into Irish law. The rBWD has four different classifications of performance, these are: • Excellent – the highest, cleanest classification; • Good – generally good water quality; • Sufficient – the water meets minimum standards; and • Poor – the water has not met the minimum required standards. The rBWD was transposed into Irish law by means of the Bathing Water Quality Regulations 2008 (S.I. No. 79 of 2008) and subsequently, the Bathing Water Quality (Amendment) Regulations 2011 (S.I. No. 351 of 2011) (hereafter referred to as the Bathing Water Regulations). Under the Bathing Water Regulations, local authorities measure, and monitor the number of certain types of bacteria which may indicate the presence of pollution, mainly from sewage or animal faeces, these are *Escherchia coli* (*E. coli*) and intestinal enterococci (IE). An increase in the concentrations of these

Publisher	Name of document incl. reference	Key provisions
		bacteria indicates a decrease in water quality. The Environmental Protection Agency (EPA) is responsible for compiling this BWs information and its submission to the European Commission.
European Commission, 2006	European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. No. 268 of 2006) (Hereafter referred to as the Shellfish Water Regulations): Subsequently amended: European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009 (S.I. No. 55 of 2009) Subsequently amended: European Communities (Quality of Shellfish Waters) (Amendment) (No.2) Regulations 2009 (S.I. No. 464 of 2009)	Transposes EU Directive 2006/113/EC (Shellfish Water Directive) into Irish law. These Regulations prescribe quality standards for Shellfish Waters (SFWs) and designate the waters to which they apply, together with sampling and analysis procedures to be used to determine compliance with the standards. The Shellfish Water Regulations applied to 12 designated shellfish waters. The Shellfish Water Regulations were amended in 2009 to include the addition of a further 49 SFWs by the European Communities (Quality of Shellfish Waters) (Amendment) Regulation 2009 (S.I. No. 55 of 2009). A further SFW (in Cork Harbour at Rostellan) was protected under European Communities (Quality of Shellfish Waters) (Amendment) (No.2) Regulation 2009 (S.I. No. 464 of 2009). *E. coli*
European Commission, 1991	European Communities (Urban Waste-Water Treatment) Regulations 2001 (S.I. No. 254 of 2001)	Transposes EU Directive 91/271/EC (Urban Waste -Water Treatment Directive (UWWTD)) into Irish law and updated the Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations, 1994 (as amended in 1999) to list nutrient sensitive waters. EU member states are required under the UWWTD (91/271/EEC) to identify nutrient-sensitive areas. These have been defined as “natural freshwater lakes, other freshwater bodies, estuaries and coastal waters which are found to be eutrophic or which in the near future may become eutrophic if protective action is not taken”.
	The Nitrates Directive (91/676/EEC)	The Nitrates Directive (91/676/EEC) was adopted by the EU member states with the aim of reducing water pollution from agricultural

Publisher	Name of document incl. reference	Key provisions
		sources and to promote the use of good farming practice. Under the Nitrates Directive surface waters are identified where the concentration of dissolved nitrogen has altered the plant growth, impacting the organisms reliant on the water body. In areas where nitrate concentration in the water body exceeds the levels set in the Nitrates Directive, they are designated as Nitrate Vulnerable Zones (NVZs). In designated NVZs there are mandatory rules enforced to reduce the nitrate pollution from agricultural land, protecting vulnerable resources against water pollution.
Government of Ireland, 2000	Planning and Development Act 2000 (Number 30 of 2000) Subsequently amended: Planning and Development (Amendment) Act 2018 (Number 16 of 2018) and The Planning and Development Regulations 2001 (as amended) (S.I. No. 600/2001)	The Planning and Development Regulations, 2001, implement provisions of the Planning and Development Act, 2000, in relation to, among others, development control, exempted development, Environmental Impact Assessments (EIA), coastal zone development control and plans and developmental guidelines. The Planning and Development (Amendment) Act 2018 worked to amend and extend the Planning and Development Acts 2000 to 2018 and for the purpose to establish an office, to be known as the Office of the Planning Regulator, to evaluate and carry out assessments relating to planning matters and provide observations and recommendations in relation to those matters, to conduct reviews and examinations and to conduct education and training programmes and research in relation to planning matters; to provide for the organisation and staffing of that Office; to provide for a National Planning Framework; to provide for certain planning and development requirements to be taken into account by Irish Water; to make miscellaneous and consequential amendments to the Planning and Development Act 2000 and to various other Acts in so far as they relate to planning and development; to amend the Derelict Sites Act 1990; to give effect to Directive 2014/89/EU of the European Parliament and of the Council of

Publisher	Name of document incl. reference	Key provisions
		23 July 2014 establishing a framework for marine spatial planning; and to provide for matters connected therewith.
	Chemicals Act 2008 (No. 13 of 2008) Subsequently amended: Chemicals (Amendment) Act 2010 (No. 32 of 2010) Subsequently amended: Chemicals Act 2008 (Rotterdam Regulation) Regulations 2019 (S.I. No. 213 of 2019)	The Chemicals Acts 2008 and 2010 outlined the enforcement of certain EU Regulations and Directives (including the Rotterdam Regulations). The Act was used to regulate and control the manufacture, use, placing on the market, export, import, transport, testing, storage, classification, labelling and packaging of chemicals; to make provision in relation to major accident hazards, and the prevention of accidents, involving chemicals. The 2008 Regulation was repealed with effect from 1 March 2014, as provided for by Regulation (EU) No. 649 of 2012 of the 4 July 2012 concerning the export and import of hazardous chemicals. The 2012 Rotterdam Regulations is a recast Regulation and repeals the 2008 Regulation in its entirety. So, the Chemicals Act 2008 (Rotterdam Regulation) Regulations 2019 bring the 2012 EU Rotterdam Regulation under the Chemicals Act enforcement framework by amending the reference to EU Rotterdam Regulation in the definition of “chemical” in the 2008 and 2010 Act.
Planning Policy and Development Control		
Department of Communications, Climate Action and Environment (DCCAE), 2018	Offshore Renewable Energy Development Plan (OREDP) Interim Review (DCCAE, 2018): https://www.gov.ie/pdf/?file=https://assets.gov.ie/77207/ae15d6ae-7230-4b2a-9178-9d8d326656cb.pdf#page=null	The OREDP identifies the opportunity for the following: • The sustainable development of Ireland's abundant offshore renewable energy resources; • To increase indigenous production of renewable electricity; • To contribute to reductions in our greenhouse gas emissions; and • To improve the security of our energy supply creating jobs in the green economy.

Publisher	Name of document incl. reference	Key provisions
		The OREDP sets out key principles, policy actions and enablers for delivery of Ireland's significant potential in this area. In this way, the OREDP provides a framework for the sustainable development of Ireland's offshore renewable energy resources. It includes Action 9: Environmental Monitoring
Department of Communications, Climate Action and Environment (DECC), 2022	Strategic Environmental Assessment (SEA) of the Offshore Renewable Energy Development Plan (OREDPII) in Ireland: Environmental Report: https://www.gov.ie/en/publication/71e36-offshore-renewable-energy-development-plan-ii-oredp-ii/#environmental-assessments	The OREDP II involves a number of environmental assessments, including a SEA and an Appropriate Assessment (AA), to evaluate potential impacts and inform the direction of the plan. These will be the subject of statutory public consultations. This resource has some important information on existing baseline conditions in the maritime area.
Department of Housing, Local Government and Heritage (2021)	Project Ireland 2040 National Marine Planning Framework: https://www.gov.ie/en/publication/a4a9a-national-marine-planning-framework/	This NMPF contains the objectives, policies and supporting actions the Government considers necessary to support the effective management of marine activities and more sustainable use of our marine resources. The policies that relate to the guidance of Marine Water and Sediment Quality (MW&SQ) are listed below. <u>Water Quality Policy 1</u> Proposals that may have significant adverse impacts upon water quality, including upon habitats and species beneficial to water quality, must demonstrate that they will, in order of reference and in accordance with legal requirements: a) Avoid, b) Minimise, or c) Mitigate Significant adverse impacts <u>Biodiversity Policy 1</u>

Publisher	Name of document incl. reference	Key provisions
		Proposals incorporating features that enhance or facilitate species adaptation or migration, or natural native habitat connectivity will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this NMPF. Proposals that may have significant adverse impacts on species adaptation or migration, or on natural native habitat connectivity must demonstrate that they will, in order of preference and in accordance with legal requirements: a) Avoid, b) Minimise, or c) Mitigate significant adverse impacts on species adaptation or migration, or on natural native habitat connectivity. <u>Biodiversity Policy 2</u> Proposals that protect, maintain, restore and enhance the distribution and net extent of important habitats and distribution of important species will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this NMPF. Proposals must avoid significant reduction in the distribution and net extent of important habitats and other habitats that important species depend on, including avoidance of activity that may result in disturbance or displacement of habitats. <u>Biodiversity Policy 4</u> Proposals must demonstrate that they will, in order of preference and in accordance with legal requirements: a) Avoid,

Publisher	Name of document incl. reference	Key provisions
		b) Minimise, or c) Mitigate significant disturbance to, or displacement of, highly mobile species. <u>Marine Litter Policy 1</u> Proposals that facilitate waste re-use or recycling, or that reduce marine and coastal litter will be supported, where they contribute to the policies and objectives of the NMPF. Proposals that could potentially increase the amount of litter that is discharged into the maritime area, either intentionally or accidentally, must include measures (such as development of a waste management plan) to, in order of preference and in accordance with legal requirements: a) Avoid, b) Minimise, or c) Mitigate the litter. Demonstration of these measures must provide satisfactory evidence that the proposal is able to manage all waste without the creation of litter. <u>Sea Floor and Water Column Integrity Policy 1</u> Proposals that incorporate measures to support the resilience of marine habitats will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority and where they contribute to the policies and objectives of this NMPF. Proposals which may have significant adverse impacts on marine, particularly deep sea, habitats must demonstrate that they will, in order of preference and in accordance with legal requirements: a) Avoid, b) Minimise, or

Publisher	Name of document incl. reference	Key provisions
		c) Mitigate significant adverse impacts on marine habitats, or d) If it is not possible to mitigate significant adverse impacts on marine habitats must set out the reasons for proceeding. <u>Sea Floor and Water Column Integrity Policy 2</u> Proposals, including those that increase access to the maritime area, must demonstrate that they will, in order of preference and in accordance with legal requirements: a) Avoid, b) Minimise, or c) Mitigate adverse impacts on important habitats and species. <u>Sea Floor and Water Column Integrity Policy 3</u> Proposals that protect, maintain, restore and enhance coastal habitats for ecosystem functioning and provision of ecosystem services will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this NMPF. Proposals must take account of the space required for coastal habitats, for ecosystem functioning and provision of ecosystem services, and demonstrate that they will, in order of preference and in accordance with legal requirements: a) Avoid; b) Minimise; or c) Mitigate for net loss of coastal habitats.

Publisher	Name of document incl. reference	Key provisions
		Aquaculture Policy 2 Non-aquaculture proposals in aquaculture production areas must demonstrate consideration of, and compatibility with, aquaculture production. Where compatibility is not possible, proposals must demonstrate that they will, in order of preference: a) Avoid; b) Minimise; or c) Mitigate significant adverse impacts on aquaculture; or d) If it is not possible to mitigate significant adverse impacts upon aquaculture, proposals should set out the reasons for proceeding
Guidelines and technical standards		
Department of Housing, Planning and Local Government, 2018	Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018) (hereafter referred to as the EIA Guidelines): https://www.gov.ie/pdf/?file=https://assets.gov.ie/44535/34aa9919f24243b79454994bc06476e1.pdf#page=null	These guidelines are issued to planning authorities and An Bord Pleanála (the Board) under section 28 of the Planning and Development Act 2000 (as amended). They replace Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment issued by the Department of the Environment, Community and Local Government in March 2013. The guidelines aim to ensure compliance with the highest international and up to date standards in relation to taking environmental factors into account when determining development proposals and ensuring that environmental considerations are fully addressed as part of the planning process, as well as properly managed thereafter.

Publisher	Name of document incl. reference	Key provisions
Non-Statutory		
Planning Policy and Development Control		
Wicklow County Council, 2022	Wicklow County Development Plan 2022 – 2028: https://www.wicklow.ie/Living/Services/Planning/Development-Plans-Strategies/National-Regional-County-Plans/Wicklow-County-Development-Plan-2022-2028/Stage-7	The plan provides for, and controls, the physical, economic and social development of the County, in the interests of the overall common good and in compliance with environmental controls. It includes a set of development objectives and standards, which set out where land is to be developed, and for what purposes. For example, to ensure that there is no removal of sand dunes, beach sands or gravels and to ensure the County's natural coastal defences (beaches, sand dunes, salt marshes and estuary lands) are protected and ensure they are not put at risk by inappropriate works or development.
Guidelines and technical standards		
DCCAE, 2018	Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects: https://www.gov.ie/en/publication/3d6efb-guidance-documents-for-offshore-renewable-energy-developers/	This non-statutory guidance document supports the Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects, DCCAE 2016 and is supported by Data and Information Sources for Offshore Renewable Energy Developments, DCCAE, 2016.
EPA, 2022	Guidelines on the Information to be Contained in Environmental Impact Assessment Reports:	These Guidelines apply to the preparation of all Environmental Impact Assessment Reports undertaken in the State (Ireland). Guidance is provided on the expected scope of the Baseline Scenario.

Publisher	Name of document incl. reference	Key provisions
	https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf	
Marine Institute, 2006 & 2019	Guidelines for the assessment of dredge material for disposal in Irish waters: https://oar.marine.ie/handle/10793/251 Updated in 2019: https://www.epa.ie/publications/licensing—permitting/freshwater—marine/Addendum-to-2006-Guidelines-(Marine-Insitute-2019).pdf	These guidelines have been adopted for this assessment since consent will be required to deposit sediment removed during seabed preparation works within the Array Area boundary (see section 7.2.2) The proposed strategy for the assessment of sediments involves a 3-phased approach (e.g. Class 1, 2 and 3). Two sets of guidance values (upper and lower) aid the assessment. Class 1: • Contaminant concentrations less than level 1. • Uncontaminated: no biological effects likely. Class 2: • Contaminant concentrations between Level 1 and Level 2; • Marginally contaminated; and • Further sampling & analysis necessary to delineate problem area, if possible. Class 3: • Heavily contaminated; • Very likely to cause biological effects / toxicity to marine organisms; and • Alternative management options to be considered.
Irish Wind Energy Association (IWEA), 2012	Best Practice Guidelines for the Irish Wind Energy Industry: https://windenergyireland.com/images/files/9660bdfb5a4f1d276f41ae9ab54e991bb600b7.pdf	Guidance to development of renewable energy in Ireland and includes examples of typical ecology impacts that might be considered within an EIA.

Publisher	Name of document incl. reference	Key provisions
OSPAR, 2008	Guidance on Environmental Considerations for Offshore Wind Farm Development: https://www.ospar.org/work-areas/eiha/offshore-renewables	The purpose of this guidance is to assist OSPAR contracting parties, developers, consultants, regulators or any other interested parties or individuals in the identification and consideration of some of the issues associated with determining the environmental effects of offshore wind farm developments.
Chartered Institute of Ecology and Environmental Management (CIEEM), 2018	Guidance on Environmental Considerations for Offshore Wind Farm Development: https://cieem.net/wp-content/uploads/2019/02/Combined-EclA-guidelines-2018-compressed.pdf	Guidelines to the preparation of all Environmental Impact Assessment Reports undertaken in the United Kingdom (UK) and Ireland.

7.2.2 Irish Action Levels

7.2.2.1 For the purposes of determining the contamination levels within seabed sediments, the thresholds outlined in 'Guidelines for The Assessment of Dredge Material for Disposal In Irish Waters' (Marine Institute, 2006 & 2019) (hereafter referred to as the Irish action levels) have been adopted in this assessment. Table 7.2 provides those Irish action levels which have been used to contextualise the level of contamination within the study area and the Proposed Development.

7.2.2.2 Whilst the Proposed Development is not a dredging scheme, consent will be required to deposit sediment removed during seabed preparation works within the Array Area, Cable Corridor and Working Area boundary. Therefore, contaminants identified from research or environmental surveys will be compared with the Irish action levels within this EIAR chapter to provide an indicative risk to the environment. These Irish action levels have been used as part of a consideration of the suitability of material for disposal at sea and the degree of contamination within seabed sediments which may be disturbed.

Table 7.2: Irish Action Levels (Source: Marine Institute 2006 & 2019)

Parameters	Units (dry weight[a])	Lower Level	Upper Level[b]
Arsenic	mg/kg	20[c]	70
Cadmium	mg/kg	0.7	4.2
Chromium	mg/kg	120	370
Copper	mg/kg	40	110[d]
Lead	mg/kg	60	218
Mercury	mg/kg	0.2	0.7
Nickel	mg/kg	40[e]	60
Zinc	mg/kg	160	410
Σ TBT & DBT	mg/kg	0.1	0.5
γ – HCH (Lindane)	µg/kg	0.3	1
Hexachlorobenzene (HCB)	µg/kg	0.3	1
PCB (individual congeners of ICES 7)	µg/kg	1	180
PCB (Σ ICES 7)	µg/kg	7	1260
PAH (Σ 16)	µg/kg	4000	n/a
Total Extractable Hydrocarbons	g/kg	1	n/a
[a] Total sediment results based on <2mm fraction			
[b] Effects Range Median (ERM) (rounded up)			
[c] This value was amended in the 2019 addendum			

[d] Probable Effects Level (PEL). PEL as ERM considered high

[e] This value was amended in the 2019 addendum

7.3 Consultation

7.3.1.1 As part of the Scoping of the EIAR for the Proposed Development, consultation has been undertaken with various statutory and non-statutory authorities and stakeholders for the EIAR process as well as for the NIS. A summary of the consultation undertaken for MW&SQ to date for the Proposed Development is provided in Table 7.3.

7.3.1.2 In accordance with recommendations outlined in the DCCAE (DECC) guidelines, the Developer sought to consult during the scoping stage with the EPA, the Minister of Communications, Climate Action and Environment, Irish Water, the Local Authority on matters relating to MW&SQ.

Table 7.3: Summary of consultation relating to MW&SQ

Date	Consultation type and stakeholder	Consultation and key issue raised	Section where provision is addressed
13 November 2020	ABWP2 Scoping Consultation – Wicklow Bay Sea Angling Club	Serious concerns about the effect that waterborne particles and sediment will have on the fishing. Firstly, when all these particles and sediment settle what effect will it have on the areas of settlement? What will it do to the established vegetation growth, seeds, shellfish, fish and spawn in these areas.	Section 7.9.1 of this report provides a full impact assessment on the effects of suspended sediment concentrations on water quality. The transport and fate of sediment is covered in detail in Volume II, Chapter 6: Coastal Process and Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling . Sediment deposition and its concurrent effect on benthic life is covered in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology. Impacts of suspended sediment and associated deposition on fish and shellfish are covered in Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology.

Date	Consultation type and stakeholder	Consultation and key issue raised	Section where provision is addressed
13 November 2020	ABWP2 Scoping Consultation – Wicklow Bay Sea Angling Club	Serious concerns about the effect that waterborne particles and sediment will have on the fishing. Secondly what effect will these waterborne particles and sediment have on predatory fish? Predatory fish will not stay around in areas of regular cloudy, sedimented waters. We have seen this negative affect first hand over the years when similar scenarios arose, and fish disappeared.	The potential impacts of temporary and permanent habitat loss and increased suspended sediments and associated deposition during the construction, O&M and/or decommissioning phases has been assessed in Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology.
13 November 2020	ABWP2 Scoping Consultation – Wicklow Bay Sea Angling Club	We have seen the negative effects disruption of the seabed and waterborne particles / sediment have on angling in the area and we are not happy to see more of the same. It is our opinion that there will be detrimental effects to angling caused by this development.	Section 7.9.1 of this report provides a full impact assessment on the effects of suspended sediment concentrations on water quality across construction, O&M and decommissioning phases.
16 November 2020	ABWP2 Scoping Consultation – Wicklow Boat Charters	I have serious concerns about the effect that un-natural waterborne particles and sediment will have on the fishing in two regards. Firstly, when all these particles and sediment settle what effect will it have on the areas of settlement? What will it do to the established growth, seeds, shellfish, fish, and spawn in these areas.	The transport and fate of disturbed sediment is covered in detail in Volume II, Chapter 6: Coastal Process and Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling. Section 7.9.1 of this report provides a full impact assessment on the effects of suspended sediment concentrations on water quality. Moreover, section 7.9.2 covers the potential release of sediment bound contaminants from disturbed sediments and the resulting impact to MW&SQ. The potential impacts of temporary and permanent habitat loss and increased

Date	Consultation type and stakeholder	Consultation and key issue raised	Section where provision is addressed
			suspended sediments and associated deposition during the construction, O&M and/or decommissioning phases has been assessed in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology.
16 November 2020	ABWP2 Scoping Consultation – Wicklow Boat Charters	I have serious concerns about the effect that un-natural water bourn particles and sediment will have on the fishing in two regards. Secondly what effect will these waterborne particles and sediment have on certain fish? Predatory fish in particular will not stay around in areas of regular cloudy, sedimented waters. I have seen this affect first hand over the years when similar scenarios arose, and fish disappeared.	Section 7.9.1 of this report provides a full impact assessment on the effects of suspended sediment concentrations on water quality. Moreover, section 7.9.2 covers the potential release of sediment bound contaminants from disturbed sediments and the resulting impact to MW&SQ. The potential impacts of temporary and permanent habitat loss and increased suspended sediments and associated deposition during the construction, O&M and/or decommissioning phases has been assessed in Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology.
29 October 2020	ABWP2 Scoping Consultation – Marine Institute	Note the absence of impacts of chemical use, discharge, and spillage in the Offshore Infrastructure construction. I recommend that the chemicals to be used offshore are identified and quantified, and that potential impacts of discharge and spillage be considered in the EIAR	A full description of the development, including materials and number of vessel trips required, is outlined in Volume II, Chapter 4: Description of Development. Types of chemicals and pollutants which may be released as a result of

Date	Consultation type and stakeholder	Consultation and key issue raised	Section where provision is addressed
			spillage are considered in Table 7.14 and Table 7.15 under the 'Accidental releases or spills of materials or chemicals' section. Section 7.9.3 provides a full assessment of the potential impacts from any accidental releases or spills of materials or chemicals.
19 October 2020	ABWP2 Scoping Consultation – Department of Agriculture, Environment and Rural Affairs (Marine Institute)	The chemicals to be used should be identified and quantified, and potential impacts of discharge and spillage should be considered in the EIAR.	A full description of the development, including materials and number of vessel trips required, is outline in Volume II, Chapter 4: Description of Development. Types of chemicals and pollutants which may be released as a result of spillage are considered in Table 7.14 and Table 7.15 under the 'Accidental releases or spills of materials or chemicals' section. Section 7.9.3 and provides a full assessment of the potential impacts from any accidental releases or spills of materials or chemicals.
19 October 2020	ABWP2 Scoping Consultation – Department of Agriculture, Environment and Rural Affairs (Marine Institute)	Polypropylene is likely to be involved with mattresses and fronds so there is potential for the introduction of plastic into marine environment. The impact of polypropylene ropes degrading in the marine environment of the Arklow Bank is likely to be assessed as imperceptible or slight. However best practice would still be to avoid its introduction to the marine environment.	Specific materials to be used for the Proposed Development are detailed in Volume II, Chapter 4: Description of Development.

Date	Consultation type and stakeholder	Consultation and key issue raised	Section where provision is addressed
8 August 2023	ABWP2 Scoping Consultation – Environmental Health Service	Water quality and soil contaminants should be assessed in the EIAR that may affect drinking water and bathing water quality. Installation of infrastructure and construction activities may affect water and bathing quality, such as trenching of the offshore export cable and activities at the landfall must be assessed in terms of the Water Framework Directive.	All sites designated under the WFD that fall under the MW&SQ Study Area are identified in Table 7.6, where coastal/ transitional waters are listed in detail in Table 7.9 and BWs in Table 7.10. The installation of infrastructure and construction activities as an impact on each MW&SQ receptor is assessed in Section 7.9.1 (Project Design 1) and 7.10.1 (Project Design 2). A WFD assessment has been conducted to characterise the coastal and transitional marine environment. In the absence of Irish specific guidance on WFD assessments, UK guidance has been applied (Environment Agency, 2023). This guidance identifies the requirement to characterise the baseline within 2 km from the Proposed Development; further detail is provided in Volume III, Appendix 7.1: Water Framework Directive. In regard to drinking, surface and ground water quality, in May 2022, Sure Partners Ltd. (the Developer) received planning approval for the Onshore Grid Infrastructure (OGI) (Case Reference: 310090). In June 2022, the Developer received

Date	Consultation type and stakeholder	Consultation and key issue raised	Section where provision is addressed
			planning permission for the Operations and Maintenance Facility (OMF) (Planning Register Reference: 21/1316). Therefore, potential Impacts to Onshore surface and ground water quality were covered in ABWP2 Onshore Grid Infrastructure EIAR, Volume II, Chapter 10: Water.
8 August 2023	ABWP2 Scoping Consultation. – Environmental Health Service	All existing or proposed wind farm developments in the vicinity should be clearly identified in the EIAR. The impact on sensitive receptors of the proposed development combined with any other wind farm/ renewable energy developments in the vicinity should be considered. The EIAR should include a detailed assessment of any likely significant cumulative impacts of the proposed renewable energy development.	All existing/ proposed wind farm developments within the vicinity of the Proposed Development and relevant to the Cumulative Impacts Assessment (CIA) are presented in Section 7.12 of this EIAR Chapter are based upon the results of a screening exercise (Volume III, Appendix 3.2: Cumulative Impact Assessment Screening).

7.4 Study Area

7.4.1.1 The MW&SQ Study Area, as presented in Figure 7.1, contains all elements of the Proposed Development that are located seaward of the HWM and include the:

- Array Area (including Wind Turbine Generators (WTGs), Offshore Substation Platforms (OSPs) inter-array cables and interconnectors cables);
- Cable Corridor and Working Area (including export cables and working area for construction activities), which includes the transition from offshore to nearshore marine process environmental conditions;
- Landfall; and
- The seabed and water column surrounding these areas that may be influenced by changes to MW&SQ due to the potential impacts of the Proposed Development.

7.4.1.2 The MW&SQ Study Area is presented in Figure 7.1 and includes buffer zones to represent a potential "Zone of Influence (ZoI)" for impacts that might be created within the main areas of activity. Using a precautionary approach, the buffer zones are scaled to conservatively represent the equivalent distance of two tidal excursions on a mean spring tide and comprise a distance of, approximately 20 km in a north-south direction, from the Proposed Development's boundary, corresponding with the direction of the tidal flow (Volume II, Chapter 6: Coastal Processes). This Study Area around the Array Area and Cable Corridor and Working Area is considered to be

appropriately precautionary and will encapsulate all reasonably foreseeable effects on the physical marine environment.

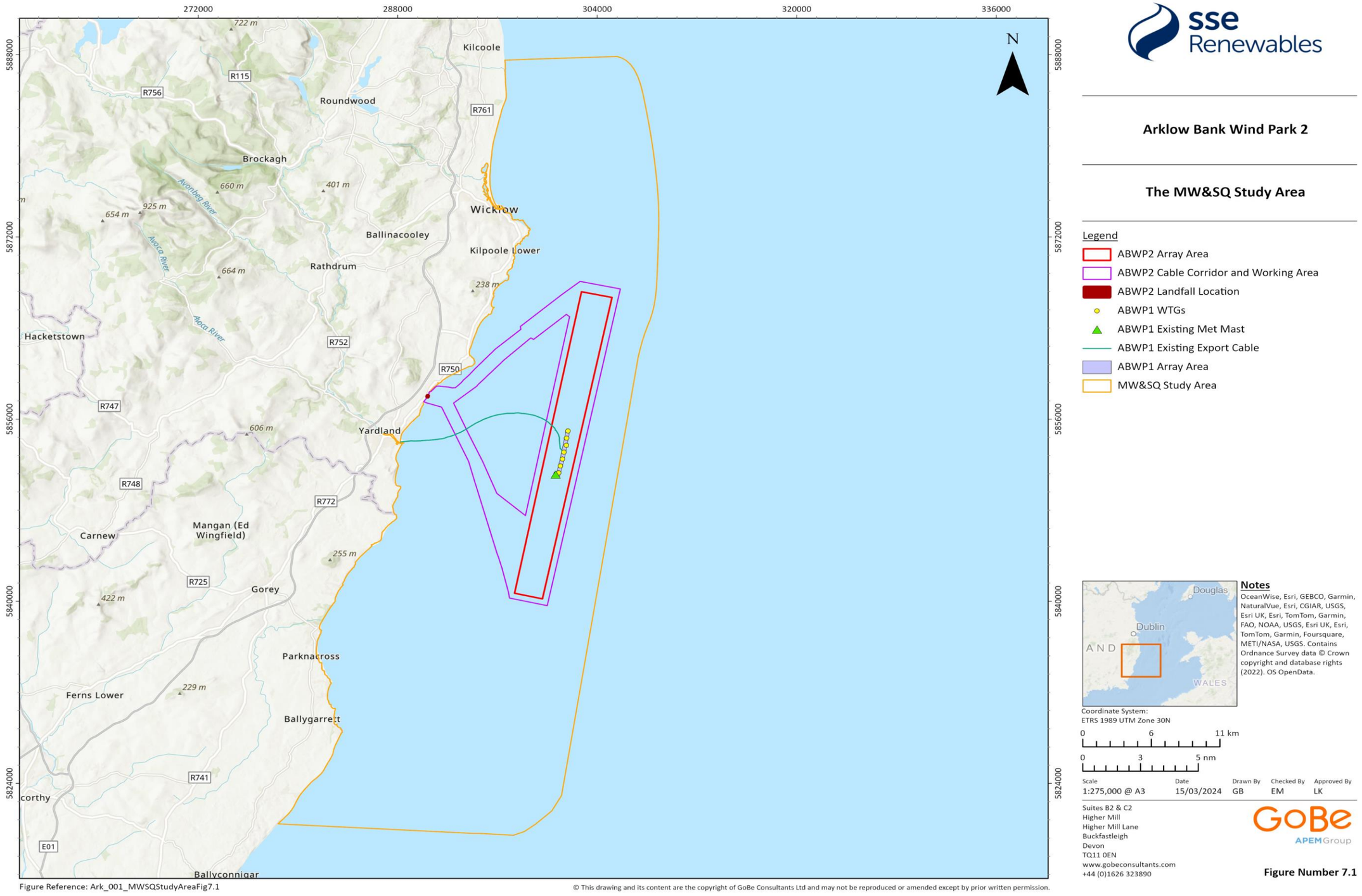

Figure Reference: Ark_001_MWSQStudyAreaFig7.1

Arklow Bank Wind Park 2

The MW&SQ Study Area

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- ABWP2 Landfall Location
- ABWP1 WTGs
- ABWP1 Existing Met Mast
- ABWP1 Existing Export Cable
- ABWP1 Array Area
- MW&SQ Study Area

Notes

OceanWise, Esri, GEBCO, Garmin, NaturalVue, Esri, CGIAR, USGS, Esri UK, Esri, TomTom, Garmin, FAO, NOAA, USGS, Esri UK, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS. Contains Ordnance Survey data © Crown copyright and database rights (2022). OS OpenData.

Coordinate System:
ETRS 1989 UTM Zone 30N

0 6 11 km

0 3 5 nm

Scale	Date	Drawn By	Checked By	Approved By
1:275,000 @ A3	15/03/2024	GB	EM	LK

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Higher Mill
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Figure Number 7.1

Figure 7.1 The MW&SQ Study Area

7.5 Methodology

7.5.1 Methodology to inform the baseline

Desktop studies

7.5.1.1 Information on the baseline environment within the MW&SQ Study Area was collected through a detailed desktop review of existing studies and datasets. These reports are summarised in Table 7.4 and represent the most up to date sources of information at the time of writing.

Table 7.4: Summary of key desktop reports and data resources

Title	Source	Year	Author
Seabed Mapping Programme	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) [Accessed: February 2024]	Multiple	INFOMAR
Seabed mapping in the southern Irish Sea: predicting benthic biological communities based on sediment characteristics	Hydrobiologia (Volume 606, pages 93 – 103) DOI: 10.1007/s10750-008-9341-0 [Accessed: February 2024]	2008	McBreen *et al.*
Benthic surveys of sandbanks in the Irish Sea	Irish Wildlife Manuals (No. 29) National Parks and Wildlife Services (NPWS), Department of Environment, Heritage and Local Government ISSN 1393 – 6670 [Accessed: February 2024]	2007	Roche *et al.*
Seabed Habitats of the Southern Irish Sea: In SEAFLOOR Geomorphology as Benthic Habitat	Habitat Mapping for Conservation and Management of the Southern Irish Sea (HABMAP), Benthic Biodiversity in the Southern Irish Sea Project (BIOMOR) and Southwest Irish Sea Survey (SWISS) projects [Accessed: February 2024]	2012	Robinson *et al.*
European Marine Observation and Data Network (EMODnet)	EMODnet broad-scale seabed habitat map for Europe https://emodnet.ec.europa.eu/geoviewer/ [Accessed: February 2024]	2021	European Commission

Title	Source	Year	Author
Effect of Wind Farm Structures on the Arklow Bank Seabed	Sure Engineering Europe [Accessed: February 2024]	2001	Murphy J. and Dollard B.
Blackwater Bank Special Protection Area (SPA)	NPWS Website https://www.npws.ie/protected-sites/sac/002953 [Accessed: February 2024]	2013	NWPS
Wicklow Reef Special Area of Conservation (SAC)	NPWS Website https://www.npws.ie/protected-sites/sac/002274 [Accessed: February 2024]	2013	NWPS
A new seabed mobility index for the Irish Sea: Modelling seabed shear stress and classifying sediment mobilisation to help predict erosion, deposition, and sediment distribution	Continental Shelf Research (Volume 229) DOI: https://doi.org/10.1016/j.csr.2021.104574 [Accessed: February 2024]	2021	Coughlan *et al.*
SWISS of benthic biodiversity	Marine biodiversity in Ireland and adjacent waters (pp.166-170) https://www.researchgate.net/publication/230667312_The_South-west_Irish_Sea_Survey_SWISS_of_benthic_biodiversity [Accessed: February 2024]	2002	Mackie *et al.*
Distribution and abundance of microplastics in coastal sediments depends on grain size and distance from sources	Marine Pollution Bulletin (Volume 172) DOI: https://doi.org/10.1016/j.marpolbul.2021.112802. [Accessed: February 2024]	2021	Mendes *et al.*
Marine Institute Monthly Modelled Means	https://data.gov.ie/dataset/marine-institute-monthly-model-means [Accessed: February 2024]	2023	
Marine Institute (2014), 'Biological Effects and Chemical Measurements in Irish Marine Waters'	https://oar.marine.ie/bitstream/handle/10793/974/Biological%20Effects%20and%20Chemical%20Measurements%20in%20Irish%20Marine%20Waters%20Final%20Report.pdf?sequence=1&isAllowed=y	2014	Giltrap *et al.*

Title	Source	Year	Author
	[Accessed: February 2024]		
EPA Maps (Water)	https://gis.epa.ie/EPAMaps/WATER [Accessed: February 2024]	Various	EPA
EPA Maps (Sea)	https://gis.epa.ie/EPAMaps/SEA [Accessed: February 2024]	Various	EPA
Arklow Port Dredge Spoil Disposal: Application to Dump Dredge Spoil at Sea	https://epawebapp.epa.ie/licences/lic_eDMS/090151b28037c82f.pdf [Accessed: February 2024]	2009	Arup Consulting Engineers
Arklow Bank Dumping at Sea Permit Application Supporting Information	https://epawebapp.epa.ie/licences/lic_eDMS/090151b28037c82f.pdf [Accessed: February 2024]	2016	Ramboll Environ Ltd.
Dublin Port Eight Year Maintenance Dredging Programme (2022 -2029) Application for Foreshore Licence	9606f75b-da65-4c21-a221-1ea7fac7506a.pdf (www.gov.ie) [Accessed: February 2024]	2021	RPS
Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report	Anchor dredge sampling and particle size analysis (PSA) [Accessed: February 2024]	October 2004	Centre for Marine and Coastal Studies (CMACS) Ltd. (requested by North East Diving Services, on behalf of Hydrographic and Marine Services for Arklow Energy Ltd)
Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report	Anchor dredge sampling and particle size analysis (PSA) [Accessed: February 2024]	November 2005; June 2006; May 2007; and May 2008	Aquatic Services Unit (requested Hydroserv Projects Ltd., on behalf of Arklow Energy Ltd.)
Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report	Anchor dredge sampling and particle size analysis (PSA) [Accessed: February 2024]	June 2009	Aquatic Services Unit (contracted by Island Shipping Ltd., on

Title	Source	Year	Author
			behalf of Arklow Energy Ltd.)
Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report	Anchor dredge sampling and particle size analysis (PSA) [Accessed: February 2024]	June 2010	Aquatic Services Unit (contracted by Island Shipping Ltd., on behalf of Arklow Energy Ltd.)
Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report	Anchor dredge sampling and particle size analysis (PSA) [Accessed: February 2024]	June 2011	Aquatic Services Unit (contracted by Island Shipping Ltd., on behalf of Arklow Energy Ltd.)
Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report	Anchor dredge sampling and particle size analysis (PSA) [Accessed: February 2024]	Septembe r 2021	Aquatic Services Unit (requested by Alpha Marine, on behalf of Arklow Energy Ltd.)
Arklow Wastewater Treatment Plant (FS006862) Application for Foreshore Licence	https://www.gov.ie/en/foreshore-notice/19a60-irish-water-arklow-waste-water-treatment-plant/ In particular, https://www.water.ie/docs/arklow-wwtp/Appendix-G-EIA-Reports/EIAR-Volume2-EIAR/Arklow-WWTP-EIAR-Volume-2_Book-3-of-3.pdf [Accessed: February 2024]	Septembe r 2018	Arup

Site specific surveys

7.5.1.2 In order to inform the EIAR, site-specific surveys were undertaken. A summary of the surveys used to inform the MW&SQ impact assessment is outlined in Table 7.5 below.

Table 7.5: Site specific surveys

Data source	Date(s) of survey	Overview of survey	Survey contractor
Arklow Offshore Wind Farm Metocean Study, Final Data Report	2021	Half hourly data, for temperature, conductivity, salinity, density, turbidity, waves, water level, currents, at five	Fugro GB Marine (Commissioned by Sure Partners Ltd)

		locations on Arklow Bank.	
Site-specific geophysical and hydrographic surveys of the ABWP2 Array Area and Cable Corridor and Working Area.	August to November 2022	Sub-bottom profiler, Ultra High-Resolution Survey (UHRS), side scan sonar and magnetometer, multi-beam bathymetry and backscatter.	Green Rebel

Identification of designated sites

7.5.1.3 All designated sites within the MW&SQ Study Area and qualifying interests that could be affected by the construction, O&M, and decommissioning phases of the Proposed Development were identified using the three-step process described below:

- *Step 1: All designated sites of international, national and local importance within the MW&SQ Study Area were identified through a desk-based search of all relevant sources. These included the Environmental Protection Agency (EPA) and National Parks and Wildlife Service (NPWS) websites.*
- *Step 2: Information was compiled on the relevant qualifying interest for each of these sites which may make them a sensitive receptor in terms of MW&SQ. For example, changes in suspended sediment concentration may affect water clarity.*
- *Step 3: Using the above information and expert judgement, sites were included for further consideration if:*
  - *A designated site directly overlaps with the Proposed Development; or*
  - *Sites and associated qualifying interests were located within the potential ZoI for impacts associated with the Proposed Development.*

7.5.1.4 The location of the relevant designated sites in relation to the Proposed Development are shown in Figure 7.4 and listed in Table 7.6.

Table 7.6: Designated sites and relevant qualifying interests for the MW&SQ chapter

Designated Site	Closest Distance to the Array Area (km)	Closest Distance to the Cable Corridor and Working Area (km)	Relevant Qualifying Interest
Wicklow Reef SAC	4.5	3.6	• Reefs (formation on areas subject to scour) • Wicklow Reef is of high conservation value as it is the only documented example in Ireland of a biogenic reef. • Supports a number of uncommon species sensitive to changes in MW&SQ parameters.

Blackwater Bank SAC	19.7	19.1	• Annex I habitat 'Sandbanks which are slightly covered by seawater all the time'. • Sandbanks are usually home to burrowing animals such as molluscs and worms, as well as animals living on the surface such as shrimps, crabs, fish, anemones and sea-peans. • These sediments support a variety of worms, cockles, urchins and sea cucumbers sensitive to changes in MW&SQ parameters.
Silver Strand Bathing Water	6.54	5.60	• WFD Protected Area • 'Good' BW Quality Status (2023)
Clogga Beach	11.3	6.1	• WFD Protected Area • 'Good' BW Quality Status (2023)
Brittas Bay North Beach	7.5	2.0	• WFD Protected Area • 'Excellent' BW Quality Status (2023)
Brittas Bay South Beach	7.7	1.9	• WFD Protected Area • 'Excellent' BW Quality Status (2023)
Ballymoney, North Beach	13.8	12.6	• WFD Protected Area • 'Good' BW Quality Status (2023)
Courtown, North Beach	15.8	15.3	• WFD Protected Area • 'Excellent' BW Quality Status (2023)
Morriscastle	24.52	23.94	• WFD Protected Area • 'Excellent' BW Quality Status (2023)
Brittas Bay (HA10)	4.7	0	• WFD Protected Area • 'High' coastal water classification (2016 – 2021)
Killiney Bay (HA10)	4.05	1.33	• WFD Protected Area • 'High' coastal water classification (2016 – 2021)
Southwest Irish Sea (Has 11;12)	9.54	6.9	• WFD Protected Area • 'Good' coastal water classification (2016 – 2021)

Owenavorragh Estuary	15.22	14.68	• WFD Protected Area • 'Moderate' transitional water classification (2016 – 2021)
Broad Lough	6.97	8.88	• WFD Protected Area • 'Moderate' transitional water classification (2016 – 2021)
Avoca Estuary	11.3	3.8	• WFD Protected Area • 'Moderate' transitional water classification (2016 – 2021)
Kilcoole Marsh	19.47	18.47	• WFD Protected Area • 'Moderate' transitional water classification (2016 – 2021)

7.5.2 Baseline environment

7.5.2.1 The characterisation of the baseline environment presented in this chapter provides a regional overview of the area 'receiving' the Proposed Development. The baseline environment has been assessed in terms of MW&SQ characteristics. Where applicable, the Array Area and Cable Corridor and Working Area receiving environment have been evaluated individually.

Water Quality

TEMPERATURE AND SALINITY

7.5.2.2 Two of the most important characteristics of seawater are temperature and salinity – together they determine the density of the water column and provide a backbone to allow marine life to survive. These parameters are well reported for in the Irish Sea in the form of modelled Ocean Forecasts (Marine Institute, 2023) and observations (Climate Status Report for Ireland, 2020). Where possible, these data sources have been paired with project-specific data to determine the most realistic baseline environment.

ARRAY AREA

7.5.2.3 The Marine Institute Monthly Model predicts that annual mean sea surface salinity in the Array Area is around 34 psu with minimal fluctuations throughout the year (ranging from 34.08 to 34.47 psu) and no visible variation in water depth (Figure 7.2). Temperature values in the Array Area showed a strong seasonal signal with highs of 16.53 °C in September and lows of 7.94 °C in February. A very slight temperature variation was observed in depth of the water column with fluctuations of 0.1 °C to 0.2 °C, but not enough to suggest temperature stratification (Table 7.7).

7.5.2.4 A project-specific survey conducted by Fugro (2021) was in agreement with the modelled means from the Marine Institute. Temperature data were gathered from a range of instruments and collected at the sea surface and seabed, describing mean seabed temperatures between a range of 10.15 °C and 15.31 °C and mean sea surface temperatures of 10.1°C and 10.3 °C in the Array Area. These data displayed large tidal fluctuations, with largest variations observed during spring tide.

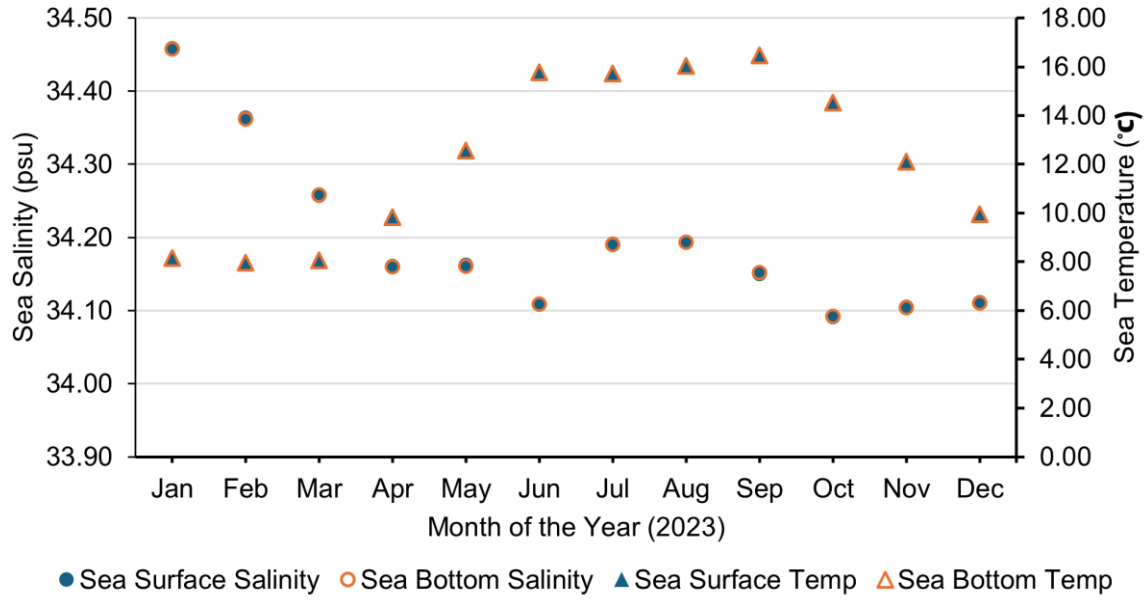


Figure 7.2: Monthly predictions for mean sea surface temperature and salinity within the Array Area (source: Marine Institute)

Table 7.7: Modelled monthly mean sea surface temperature and salinity and sea bottom temperature and salinity values across the Array Area over 2023 from the Marine Institute SWAN and ROMS models (Marine Institute, 2023).

Month	Sea Surface Temperature (°C)	Sea Surface Salinity (psu)	Sea Bottom Temperature (°C)	Sea Bottom Salinity (psu)
January	8.17 (8.09, 8.25)	34.46 (34.45, 34.47)	8.15 (8.07, 8.23)	34.46 (34.45, 34.47)
February	7.98 (7.94, 8.02)	34.36 (34.45, 34.38)	7.97 (7.93, 8.00)	34.36 (34.34, 34.38)
March	8.07 (8.05, 8.09)	34.26 (34.35, 34.28)	8.06 (8.04, 8.08)	34.26 (34.24, 34.28)
April	9.85 (9.81, 9.85)	34.16 (34.24, 34.18)	9.84 (9.79, 9.89)	34.16 (34.14, 34.18)
May	12.57 (12.45, 12.70)	34.16 (34.15, 34.18)	12.56 (12.43, 12.69)	34.16 (34.14, 34.18)
June	15.79 (15.60, 15.98)	34.11 (34.10, 34.12)	15.77 (15.58, 15.96)	34.11 (34.10, 34.12)
July	15.74 (15.67, 15.81)	34.19 (34.17, 34.21)	15.73 (15.66, 15.80)	34.19 (34.17, 34.21)
August	16.06 (15.99, 16.14)	34.19 (34.18, 34.20)	16.05 (15.97, 16.13)	34.19 (34.19, 34.20)
September	16.47 (16.42, 16.53)	34.15 (34.14, 34.16)	16.46 (16.41, 16.52)	34.15 (34.14, 34.16)
October	14.53 (14.51, 14.55)	34.09 (34.08, 34.10)	14.52 (14.50, 14.54)	34.09 (34.08, 34.10)
November	12.13 (12.04, 12.21)	34.10 (34.09, 34.12)	12.11 (12.02, 12.20)	34.10 (34.09, 34.12)
December	9.95 (9.82, 10.08)	34.11 (34.09, 34.14)	9.94 (9.81, 10.07)	34.11 (34.08, 34.14)
Annual	12.28	34.19	12.26	34.19

Mean (minimum, maximum) are shown for each monthly parameter

CABLE CORRIDOR AND WORKING AREA

7.5.2.5 Modelled temperature and salinity values across the Cable Corridor and Working Area are similar to those found in the Array Area. Coordinates from each corner of the Cable Corridor and Working Area were inserted into the Environmental Research Division's Data Access Program (ERDDAP) to gather the monthly modelled means within the Cable Corridor and Working Area. Sea surface salinity across the Cable Corridor and Working Area was modelled around 34 psu with minimal fluctuations throughout the year (ranging from 33.99 to 34.66 psu) and no visible variation in water depth (Figure 7.3). Temperature values in the Cable Corridor and Working Area showed a strong seasonal signal with highs of 16.68 °C in September and lows of 7.93 °C in February. A very

slight temperature variation was observed in depth of the water column with fluctuations of 0.1 °C to 0.3 °C, not enough to suggest temperature stratification (Table 7.8). These numbers are characteristic of an offshore marine environment throughout an annual cycle.

7.5.2.6 A project-specific survey conducted by Fugro (2021) was in agreement with the modelled temperature means from the Marine Institute. Temperature data were gathered from a range of instruments and collected at the sea surface and seabed, describing mean seabed temperatures of 8.97 °C and 8.6 °C and mean sea surface temperatures of 8.9 °C in the Cable Corridor and Working Area. These data suggest a slightly cooler environment in the Cable Corridor in comparison to the Array Area (see 7.5.2.3) which is consistent with freshwater input nearer the coastline. These data were in agreement with the data extracted from the Marine Institute, further indicating a well-mixed environment.

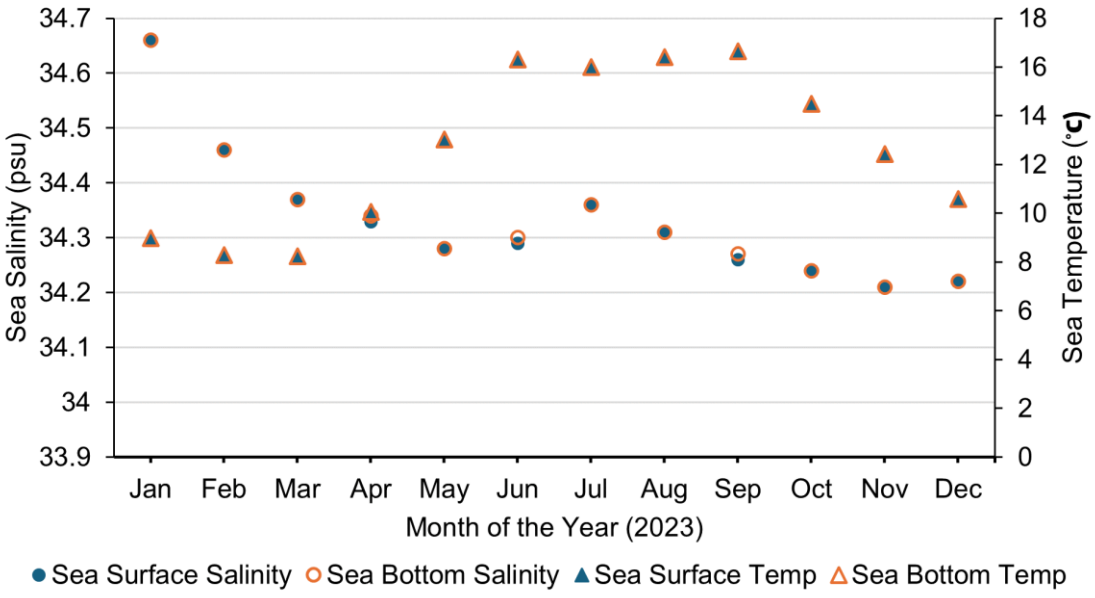


Figure 7.3: Monthly predictions for mean sea surface temperature and salinity within the Cable Corridor and Working Area (source: Marine Institute)

Table 7.8: Modelled monthly mean sea surface temperature and salinity and sea bottom temperature and salinity values across the Cable Corridor and Working Area over 2023 from the Marine Institute SWAN and ROMS models (Marine Institute, 2023).

Month	Sea Surface Temperature (°C)	Sea Surface Salinity (psu)	Sea Bottom Temperature (°C)	Sea Bottom Salinity (psu)
January	8.45 (7.97, 8.99)	34.51 (34.35, 34.66)	8.44 (7.96, 8.99)	34.51 (34.35, 34.66)
February	8.11 (7.93, 8.30)	34.38 (34.29, 34.46)	8.10 (7.91, 8.29)	34.38 (34.29, 34.46)
March	8.17 (8.05, 8.27)	34.30 (34.22, 34.37)	8.16 (8.03, 8.25)	34.3 (34.22, 34.37)
April	9.85 (9.56, 10.08)	34.24 (34.13, 34.33)	9.83 (9.52, 10.06)	34.24 (34.13, 34.34)
May	12.50 (11.82, 13.05)	34.20 (34.14, 34.28)	12.46 (11.75, 13.02)	34.2 (34.13, 34.28)
June	15.6 (14.49, 16.34)	34.18 (34.09, 34.29)	15.55 (14.39, 16.32)	34.18 (34.09, 34.30)
July	15.6 (14.99, 16.01)	34.25 (34.14, 34.36)	15.58 (14.96, 15.99)	34.26 (34.14, 34.36)
August	15.98 (15.37, 16.44)	34.24 (34.18, 34.31)	15.96 (15.33, 16.42)	34.25 (34.18, 34.31)
September	16.41 (15.97, 16.68)	34.20 (34.14, 34.26)	16.38 (15.92, 16.66)	34.2 (34.14, 34.27)
October	14.48 (14.44, 14.51)	34.15 (34.05, 34.34)	14.47 (14.43, 14.50)	34.16 (34.06, 34.24)
November	12.06 (11.67, 12.44)	34.11 (33.99, 34.21)	12.05 (11.65, 12.43)	34.11 (33.99, 34.21)
December	9.96 (9.38, 10.59)	34.14 (34.02, 34.22)	9.95 (9.36, 10.59)	34.14 (34.03, 34.22)
Annual	12.27	34.24	12.24	34.24

Mean (minimum, maximum) are shown for each monthly parameter.

NUTRIENT INPUTS

7.5.2.7 Information pertaining to the monitoring of nutrient inputs in the Irish Sea was provided by the EPA and documented in the Water Quality in Ireland Report (2016 to 2021). Estuarine and coastal waters are sensitive to inputs of nutrients from agricultural runoff, particularly nitrogen and phosphate. Elevated concentrations of these nutrients may lead to harmful algal blooms and eutrophication. Nitrogen is considered the primary limiting nutrient in coastal ecosystems. Out of the 103 estuarine and coastal water bodies assessed by the EPA, around 21% were in unsatisfactory condition for dissolved inorganic nitrogen. Conversely, nearly all estuaries and coastal waters assessed (97%) were in satisfactory condition for phosphate (EPA Water Quality

In 2022 – An Indicators Report, 2023). Regarding excessive nutrients in the Study Area, the most recent information provided by the EPA shows that the water quality in this region is considered unpolluted (EPA, 2021).

WATER COLUMN CONTAMINATION

7.5.2.8 Coastal water bodies can be vulnerable to pollution from certain chemical substances that are known to be harmful to the environment. Due to the hydrophobic nature of many organic compounds, and the partitioning of metals to suspended particles, the concentrations of dissolved contaminants in seawater samples are often low or below detection limits (Cefas, 2005). Within the Irish Sea, over 80% of the measured concentrations of metals originated from riverine inputs, the exception being mercury for which riverine sources contribute circa 50% (OSPAR, 2004). Typically, metal concentrations reduce significantly in water samples taken further offshore; with the highest concentrations typically found in estuarine and coastal waters subject to industrial and wastewater inputs (Cefas, 2005).

7.5.2.9 Chemical status (i.e. volume of metals, pesticides, and various industrial chemicals) of coastal and transitional regions in Ireland was assessed against compliance with the Environmental Quality Standards (EQS). Where concentrations in excess of the EQS were found for one or more substance the water body was deemed to have failed to achieve good chemical status. The EPA reported that many of the chemical status failures (i.e. 173 of the 349 surface waters) were due to the presence of substances that are either the legacy of historical pollution (e.g. Polychlorinated biphenyls (PCBs) from waste electrical equipment) or indirect pollution (e.g. mercury and Polycyclic Aromatic Hydrocarbons (PAHs) from combustion of fossil fuels). As such, concentrations of these substances are expected to fall as the sources are reduced (EPA 2016 – 2021).

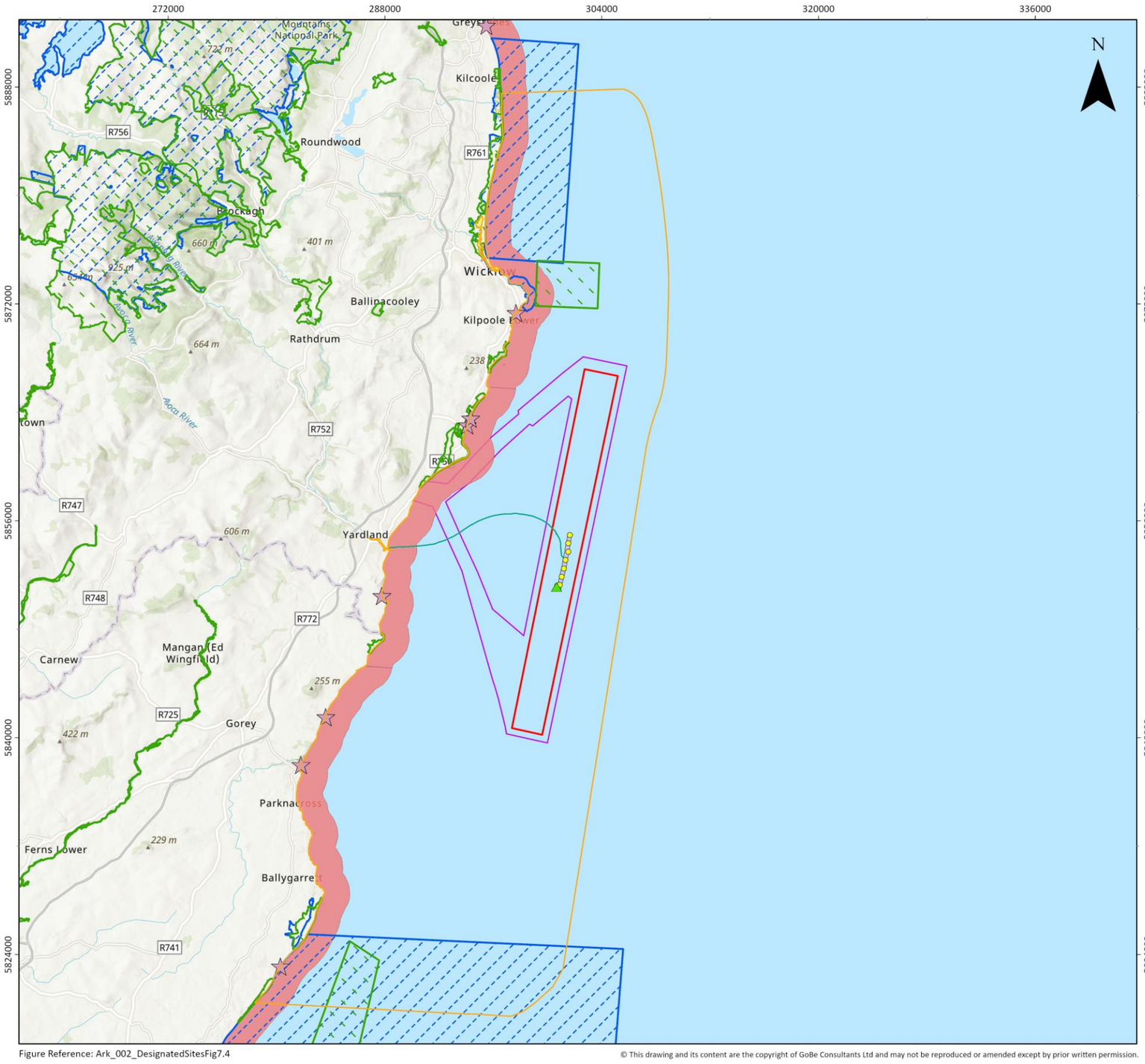
7.5.2.10 Worth noting, is the output from the Avoca River which flows into the Irish Sea at Arklow where it widens into a large estuary. A six-year study by the EPA (2019) put the Avoca River on the list of nine of the most polluted rivers in Ireland due to the decades of raw sewage from Arklow entering the river. The pollution is also thought to have originated from the 200-year history of mining in the area that contributed to high volumes of lead, copper and zinc (ERBD, 2009). In 2019, the Court of Justice of the European Union made a judgment against Ireland for failing to meet the UWWTD. This led to the construction of a new wastewater treatment plant due to be completed by September 2025 and subsequently pollution from this region is expected to further improve significantly. The potential cumulative impacts of construction and O&M phases of Arklow Waste Water Treatment Plant and the Proposed Development is considered within the Cumulative Impact Assessment (CIA; see section 7.12).

Water Framework Directive Water Bodies

7.5.2.11 As specified by the WFD and MSFD regulations (Table 7.1), there is a requirement to fully characterise the marine environment to one nautical mile (nm) offshore. This MW&SQ chapter further characterises a Study Area based on the expected maximum distance that water from within the Array Area and Cable Corridor and Working Area might be transported on a single mean spring tide, in either the flood and/ or ebb direction. However, using a precautionary approach, the buffer zones are scaled to conservatively represent the equivalent distance of two tidal excursions on a mean spring tide and comprise a distance of, approximately, 20 km in a north-south direction from the Proposed Developments boundary, corresponding with the direction of the tidal flow (Volume II, Chapter 6: Coastal Processes). All sites designated under these directives that fall within the 20 km Study Area (Figure 7.4) are assessed as receptors within this EIAR and include:

- Three Coastal and four Transitional WFD waterbodies
- Six Bathing Waters;

- No SFWs; and
- No nutrient sensitive areas designated under the UWWTD.



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Arklow Bank Wind Park 2

Designated Sites in Relation to the MW&SQ Study Area

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- ABWP1 WTGs
- ABWP1 Existing Met Mast
- ABWP1 Existing Export Cable
- ABWP1 Array Area
- MW&SQ Study Area
- Transitional Water Bodies
- Coastal Water Bodies
- Special Protection Area (SPA)
- Special Areas of Conservation (SAC)
- Bathing Waters

Notes

Esri, CGIAR, USGS, Esri UK, Esri, TomTom, Garmin, FAO, NOAA, USGS, Esri UK, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Esri, GEBCO, Garmin, NaturalVue. Contains Ordnance Survey data © Crown copyright and database rights (2022). OS OpenData.

Coordinate System:
ETRS 1989 UTM Zone 30N

0 6 11 km

0 3 5 nm

Scale	Date	Drawn By	Checked By	Approved By
1:275,000 @ A3	22/05/2024	GB	EM	LK

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Figure Number 7.4

Figure Reference: Ark_002_DesignatedSitesFig7.4

Figure 7.4: Designated Sites in Relation to the MW&SQ Study Area

COASTAL AND TRANSITIONAL WATERS

7.5.2.12 There are currently 84 transitional water bodies and 47 coastal water bodies that are monitored and managed under the WFD. Of these, seven sites were identified to be within the MW&SQ Study Area for the Proposed Development (Table 7.9). Transitional waters were all reported as 'Moderate' indicating a potential source of pollution. While the aim of the WFD is to ensure all transitional and coastal water bodies achieve good qualitative health, it is typical for transitional waters to report higher pollution levels due to in-flow from rivers that carry agricultural and urban run-off. Moreover, all coastal sites were reported as either 'High' or 'Good' which indicates good physiochemical status in coastal areas in and around the Study Area. Any coastal and transitional waters within 20 km of the Proposed Development are shown in Figure 7.4 and listed in Table 7.9.

7.5.2.13 In 2020, the risk of not meeting WFD objectives was determined by assessment of monitoring data, data on the pressures and data on the measures that have been implemented. Waterbodies that are 'At risk' are prioritised for implementation of measures. This assessment was completed by the EPA Catchments Unit in conjunction with other public bodies and was primarily based on monitoring data up to the end of 2018. All coastal waterbodies are presented as 'Not at risk', where the transitional water bodies were either under review or presenting as 'At risk' of failing to meet WFD objectives. Transitional waters are directly exposed to contaminant inputs from ground run-off from various anthropogenic pressures which could explain the lower classification and resulting risk of failing to achieve 'Good' status.

Table 7.9: Coastal and transitional waters considered within the MW&SQ assessment (EPA, 2021; Department of Housing, Local Government and Heritage, 2018)

Site	Location	Distance from Array Area (km)	Distance from Cable Corridor and Working Area (km)	Classification 2016 - 2021	WFD risk status
Coastal	Brittas Bay (HA10)	4.7	0	High	Not at risk
Coastal	Killiney Bay (HA10)	4.05	1.33	High	Not at risk
Coastal	Southwest Irish Sea (HAs 11;12)	9.54	6.9	Good	Not at risk
Transitional	Owenavorragh Estuary	15.22	14.68	Moderate	Review*
Transitional	Broad Lough	6.97	8.88	Moderate	At risk
Transitional	Avoca Estuary	11.3	3.8	Moderate	At risk
Transitional	Kilcoole Marsh	19.47	18.47	Moderate	Review*

*Additional information is needed to determine their status before resources and more targeted measures are initiated or the measures have been undertaken, but the outcome hasn't yet been measured/monitored.

BATHING WATERS

7.5.2.14 There are currently 148 identified BWs that are monitored and managed under the Bathing Water Regulations in Ireland (EPA, 2022). Of these, six sites were identified to be within the MW&SQ Study Area for the Proposed Development (Table 7.10). All these sites were reported as either

'Excellent' or 'Good' which indicates low bacterial pollution in coastal areas in and around the Study Area.

Table 7.10: Water quality status of Bathing Waters screened into this assessment (EPA, 2023)

Site location	Distance from Array Area (km)	Distance from Cable Corridor and Working Area (km)	2020	2021	2022	2023
Silver Strand Beach	6.54	5.60	Good	Excellent	Excellent	Good
Brittas Bay North Beach	7.5	2.0	Excellent	Excellent	Excellent	Excellent
Brittas Bay South Beach	7.7	1.9	Excellent	Excellent	Excellent	Excellent
Clogga Beach	11.3	6.1	Excellent	Excellent	Good	Good
Ballymoney, North Beach	13.8	12.6	Good	Excellent	Excellent	Good
Courtown, North Beach	15.8	15.3	Excellent	Excellent	Excellent	Excellent

SHELLFISH WATERS

7.5.2.15 A total of 64 sites have been designated by the EPA as SFWs in Ireland. However, there are no SFWs in the Study Area of the Proposed Development. The nearest SFW site was identified as Wexford Harbour Outer with a distance of 43.93 km from the Cable Corridor and Working Area. Wexford Harbour Outer is protected for blue mussels (Mytilus edulis) and carries a classification of 'B', where 'A' is the least contaminated and 'C' is the most. No designated SFWs are anticipated to be affected by the Proposed Development.

NUTRIENT SENSITIVE AREAS

7.5.2.16 A total of 48 sites have been identified by the EPA where wastewater discharges are the main significant pressure on water bodies at risk of pollution. 'At risk of pollution' is defined as being at risk of not achieving the specific environmental target set for that water body, such as good ecological status under the WFD. There are no nutrient sensitive areas in or around the Study Area of the Proposed Development. The nearest reported nutrient sensitive areas are Liffey Estuary and Tolka Estuary in Dublin County. Therefore, no designated nutrient sensitive areas are anticipated to be affected by the Proposed Development.

DUMPING AT SEA SITES

7.5.2.17 The reporting of any relevant Dumping at Sea sites are of relevance to the Study Area since increased suspended particulate matter concentrations are correlated with Dumping at Sea activities. Arklow Energy Limited secured a permit for Seabed levelling undertaken via plough dredging in an area to the east of ABWP1 that is approximately 700m in length and 100m in width (Permit Number: S0027-01). The application relates to the dumping of up to 99,999 tonnes of material over an 8-year period from 1 July 2017 to 31 May 2025. As per the Licence and Enforcement Access Portal on the EPA website, "Arklow Energy Ltd" have not undertaken any activity under the permit Reg. S0027-01 over the reporting calendar year 2022 and reported no plans to undertake any activity during 2023. As the permit has been granted until 2025, cessation of activities will occur before construction of ABWP2 is anticipated to begin. Any ongoing or planned Dumping at Sea sites will be accounted for in the CIA (Section 7.12).

Sediment Quality

7.5.2.18 Sediment characteristics (grain type and size) influence a lot of important biotic and abiotic aspects in the marine environment and is therefore considered an important impact pathway. For example, diversity and composition of macro and meio benthic communities, organic carbon storage and contaminant storage/ distribution are strongly conditioned by sediment grain size. Sediments with a finer particle size, such as clays and muds, can act as adsorption surfaces for contaminants that may be released into the water column if the sediment is disturbed (Cefas, 2001). This is due to their larger surface area to volume ratios and higher organic carbon content. Sediments consisting of coarser sand and gravel are accepted to carry a much lower contamination risk. Information regarding particle sizes is an important step in assessing the contamination risk to the marine environment.

7.5.2.19 Seabed sediment data are available from several public projects, including INFOMAR (EMODnet), HabMap (Robinson *et al.*, 2008), and the Southwest Irish Sea Survey (SWISS) (Wilson *et al.*, 2001). The surficial sediments of the Irish Sea have also been mapped by the British Geological Survey (BGS), and a seabed mobility index developed by Coughlan *et al.*, (2021). These data are used alongside site-specific data to map out a realistic baseline of sediment size, type, and potential contamination.

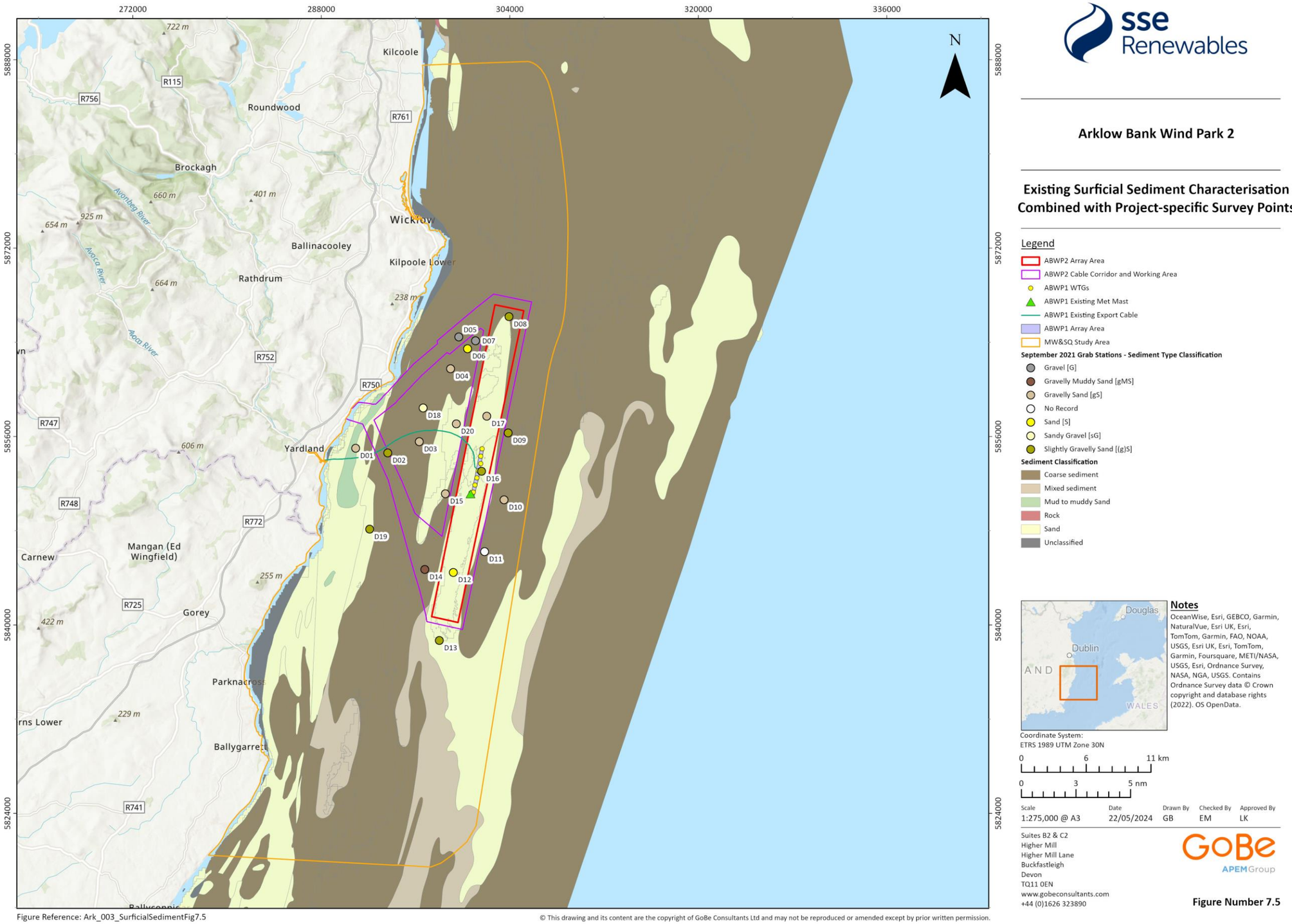
PARTICLE SIZE ANALYSIS

7.5.2.20 The INFOMAR database shows surficial seabed sediments within the regional area are characterised by sand and gravel material, as illustrated in Figure 7.5 (INFOMAR). Project specific surveys indicate that sediments are heterogenous and composed of mobile: sands, slightly gravelly sands, and gravelly sands on Arklow Bank seabed (Aquatic Services Unit, 2004; 2011, 2021). Results from the most recent benthic survey (Aquatic Services Unit, 2021) are in line with findings from previous surveys (Aquatic Services Unit, 2004; 2011), with minor variations considered to be related to the heterogenous nature of the sediment across the survey site (Table 7.11).

7.5.2.21 Further project-specific surveys agree the classification of sediment in the MW&SQ Study Area is dominated by sand or slightly gravelly sand. For example, recent sampling campaigns (Arklow Energy Ltd., 2016) in the area confirm that the bank is comprised of sandy sediments with around 90% of the sediment composition between 2 mm and 63 µm. Overall, across the Proposed Development, the substratum ranges from sandy shell to gravel (to the west, north and south of the bank) and coarse shell and gravel and some rock (to the east of the bank). The bank itself consists of mainly sand, cobbles with shells and pebbles at the northern end of the bank and fine sand at the southern end.

7.5.2.22 As shown in Figure 7.5, there is good agreement between the regional sediment data (INFOMAR), the site specific and project specific grab samples collected. This MW&SQ chapter

defines sediment type and size due to the influence this has on storage and frequency of contaminants. Further detail regarding the surficial sediment composition and seabed morphology within the Proposed Development is provided in Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling.



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Arklow Bank Wind Park 2

Existing Surficial Sediment Characterisation Combined with Project-specific Survey Points

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- ABWP1 WTGs
- ABWP1 Existing Met Mast
- ABWP1 Existing Export Cable
- ABWP1 Array Area
- MW&SQ Study Area

September 2021 Grab Stations - Sediment Type Classification

- Gravel [G]
- Gravelly Muddy Sand [gMS]
- Gravelly Sand [gS]
- No Record
- Sand [S]
- Sandy Gravel [sG]
- Slightly Gravelly Sand [(g)S]

Sediment Classification

- Coarse sediment
- Mixed sediment
- Mud to muddy Sand
- Rock
- Sand
- Unclassified

Notes

OceanWise, Esri, GEBCO, Garmin, NaturalVue, Esri UK, Esri, TomTom, Garmin, FAO, NOAA, USGS, Esri UK, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Esri, Ordnance Survey, NASA, NGA, USGS. Contains Ordnance Survey data © Crown copyright and database rights (2022). OS OpenData.

Coordinate System:
ETRS 1989 UTM Zone 30N

0 6 11 km

0 3 5 nm

Scale	Date	Drawn By	Checked By	Approved By
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Figure Number 7.5

Figure Reference: Ark_003_SurficialSedimentFig7.5

Figure 7.5: Existing Surficial Sediment Characterisation Combined with Project-specific Survey Points

Table 7.11: Classification of sediment types at September 2021 grab stations according to methods after Buchanan and Kain (1984) and Folk & Ward (1954), in addition to Folk & Ward classification from previous surveys for comparison (Hydroserv Projects Ltd., 2006 – 2011, 2021)

Site Code	Classification after Buchanan (2021)	Folk Classification						
		September 2021	June 2011	June 2010	June 2009	May 2008	May 2007	June 2006
1	Very Fine Gravelly Fine Sand	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]
2	Slightly Very Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Gravelly Muddy Sand [gMS]	Slightly Gravelly Sand [(g)S]	Muddy Sandy Gravel [msG]	Gravelly Sand [gS]	Gravelly Sand [gS]
3	Fine Gravelly Fine Sand	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]
4	Fine Gravelly Medium Sand	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Gravel [G]	Gravel [G]	Gravel [G]
5	Gravel	Gravel [G]	Gravel [G]	Gravel [G]	Gravel [G]	Gravel [G]	Sandy Gravel [sG]	Sandy Gravel [sG]
6	Moderately Well Sorted Fine Sand	Sand [S]	Gravelly Sand [gS]	Gravelly Sand [gS]	Sandy Gravel [sG]	Gravel [G]	Slightly Gravelly Sand [(g)S]	Sand [S]
7	Gravel	Gravel [G]	Sandy Gravel [sG]	Gravel [G]	Sandy Gravel [sG]	Gravel [G]	Gravel [G]	Sandy Gravel [sG]

Site Code	Classification after Buchanan (2021)	Folk Classification						
		September 2021	June 2011	June 2010	June 2009	May 2008	May 2007	June 2006
8	Slightly Very Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]
9	Slightly Very Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Sandy Gravel [sG]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]
10	Very Fine Gravelly Fine Sand	Gravelly Sand [gS]	Sandy Gravel [sG]	Gravelly Sand [gS]	Sandy Gravel [sG]	Slightly Gravelly Muddy Sand [(g)mS]	Gravel [G]	Sandy Gravel [sG]
11	No Record	No Record	Muddy Sandy Gravel [msG]	Gravelly Sand [gS]	Sandy Gravel [sG]	Gravel [G]	Muddy Sandy Gravel [msG]	Sandy Gravel [sG]
12	Well sorted Fine Sand	Sand [S]	Sand [S]	Sand [S]	Sand [S]	Sand [S]	Sand [S]	Slightly Gravelly Sand [(g)S]
13	Slightly Very Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Sand [S]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]
14	Fine Gravelly Very Course Silty Fine Sand	Gravelly Muddy Sand [gMS]	Gravelly Sand [gS]	Gravelly Muddy Sand [gMS]	Sandy Gravel [sG]	Muddy Sandy Gravel [msG]	Gravelly Sand [gS]	Sandy Gravel [sG]

Site Code	Classification after Buchanan (2021)	Folk Classification						
		September 2021	June 2011	June 2010	June 2009	May 2008	May 2007	June 2006
15	Fine Gravelly Medium Sand	Gravelly Sand [gS]	Gravelly Sand [gS]	Sandy Gravel [sG]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]
16	Slightly Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Sand [S]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]
17	Very Fine Gravelly Medium Sand	Gravelly Sand [gS]	Sandy Gravel [sG]	Gravelly Sand [gS]	Sandy Gravel [sG]	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]
18	Sandy Fine Gravel	Sandy Gravel [sG]	Gravelly Sand [gS]	Sandy Gravel [sG]	Gravel [G]	Gravel [G]	Gravel [G]	Sandy Gravel [sG]
19	Slightly Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Gravelly Muddy Sand [gMS]	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]
20	Fine Gravelly Medium Sand	Gravelly Sand [gS]	Sandy Gravel [sG]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand [gS]

MICROPLASTICS

7.5.2.23 Sediment particle size is an important factor to consider in areas where contaminants are less understood, such as microplastics. A recent research study of the Irish Sea examined microplastics in subtidal areas and found more microplastics were captured in finer-grained sediment such as mudflats (Mendes *et al.* 2021). As a more stable environment, the subtidal zone is considered a "sink" for microplastic particles. However, the larger, coarser sediments characteristic of the Proposed Development suggests less volume and frequency of storage for microplastic particles. The most common polymers present from Irish Sea samples were polypropylene, polyethylene terephthalate and polyethylene. Analysis undertaken by Mendes *et al* (2021) suggested that the large volume of clear fibres indicates they entered the marine environment via grey-water sources such as from sinks, showers, baths and mostly washing machines. Of note, the literature on microplastic contamination is still in its infancy, however, it is important that it be considered as a potential contaminant that is now ubiquitous in the marine environment.

SEDIMENT CONTAMINATION

7.5.2.24 From publicly available data sources, within the Irish Sea, the concentration of contaminants within sediments are typically greater than those found in seawater (Cefas, 2005). Concentrations of PAH and PCBs have been shown to be significantly higher in inshore areas where there was either riverine input and/or direct industry discharge. This is demonstrated between the volume of contaminants observed in the Avoca Estuary (Table 7.13) versus offshore samples near the ABWP1 Array Area (Table 7.12). An offshore negative correlation has been found in the Western Irish Sea between PAH concentration and sediment grain size, whilst a positive correlation was found between metal distribution and the percentage of silt and clay sized sediments (Cefas, 2005). As stated in Paragraph 7.5.2.20 and shown in Figure 7.5, there is a predominance of sands, slightly gravelly sands, and gravelly sands within the Study Area. In general terms, this suggests less potential for metal contamination in the environment.

ARRAY AREA

7.5.2.25 In May 2016, Ramboll Environ UK Ltd was commissioned to undertake sediment sampling and chemical analysis of sediments from three locations on Arklow Bank in order to support a permit application to undertake seabed levelling works along Arklow Bank (i.e. to facilitate access of maintenance vessels to existing ABWP1 WTGs). Levels of contaminants which included a suite of metals, organochlorines, Tributyltin (TBT), Dibutyltin (DBT), PCBs and PAHs were all below the respective lower Irish action levels (Cronin *et al.*, 2006). The exception was arsenic which was marginally elevated. At the time of sampling, the lower Irish action levels for arsenic was 9 mg/kg and therefore 'Sample 3' exceeded this by 0.47 mg/kg at a single station. Consultation with the Marine Institute confirmed that this was acceptable for the material to be disposed of at sea (Ramboll Environ, 2016). However, after the Irish action levels were updated in 2019, the lower Irish action level for arsenic now sits at 20 mg/kg and therefore 'Sample 3' falls well below this limit (Table 7.12).

Table 7.12: Sediment contaminant analysis from Arklow Energy Limited sampled around the Array Area of ABWP1 (Ramboll Environ UK Ltd, 2016)

Contaminant	Unit	Sample 1	Sample 2	Sample 3
Copper	mg/kg	0.797	1.06	1.1
Zinc	mg/kg	9.42	9.86	11.5

Cadmium	mg/kg	0.031	0.025	0.025
Mercury	mg/kg	0.0011	0.0012	0.0011
Lead	mg/kg	2.31	2.47	2.95
Arsenic	mg/kg	7.38	6.29	9.47
Chromium	mg/kg	4.62	4.74	5.75
Manganese	mg/kg	<Null>	<Null>	<Null>
Nickel	mg/kg	3.73	3.75	4.92
Lithium	mg/kg	3.06	2.56	4.3
Aluminium	mg/kg	1910	1750	2280
Σ TBT & DBT	mg/kg	-	<0.008	-
PCB (individual congeners of ICES 7)	µg/kg	-	<0.1	-
PCB (Σ ICES 7)	µg/kg	-	<0.1	-
PAH (Σ 16)	µg/kg	-	<0.7	-
Total Extractable Hydrocarbons	g/kg	-	0.00204	-

Exceedance of Irish Action Level (AL) 1 (*), Exceedance of Irish AL 2 (**)

CABLE CORRIDOR AND WORKING AREA

7.5.2.26 To provide further context for potential levels of contamination in the study area, additional sources of sediment contamination data have been considered to characterise the baseline environment. It should be noted that these samples are from outside the Cable Corridor and Working Area and therefore no direct interaction is proposed with these sediments.

7.5.2.27 In 2009, Arup Consulting Engineers (Arup) were commissioned by Arklow Harbour Commissioners to prepare an application for the Arklow Port Dredge Disposal Licence Application. Legislative requirements for the disposal of dredge spoil include the undertaking of a full contamination assessment of the sediment. The location of samples can be viewed on the EPA Maps website under 'Chemical Monitoring' and the output of these samples are listed in Table 7.13. Sediment contamination is higher in the inshore area when compared with sampling results from the offshore area (Table 7.12; Table 7.13). Of note, the upper ALs were exceeded for copper, zinc, lead and DBT. These elevated concentrations are likely sourced from the 200-year history of mining in the area linked to high volumes of lead, copper, and zinc (ERBD, 2009). The lower ALs were exceeded for cadmium, arsenic, PCBs, and TEH. These contaminants are typical of industrial port/ harbour sediment and are legacy of historical pollution and it is anticipated that these substances will fall as the sources are reduced (EPA 2016 – 2019). Therefore, as the samples were collected in 2009 and contaminants are characteristic of historical pollution, it is anticipated that volumes have since also reduced.

7.5.2.28 In a more recent EIA Report conducted to support the application of Arklow Wastewater Treatment Plant, the results of borehole investigations with 15 sediment samples taken in January

and February 2018 near the long sea outfall (in Arklow Harbour) were shown in comparison to Irish ALs. For context, the Arklow Waste Water Treatment Plant is now located 10.79 km from the Array Area and 3.38 km from the Cable Corridor and Working Area. In accordance with the older (2006) Irish ALs, the survey found that 7 of the samples were classified as 'uncontaminated' where 8 of the samples were classified as 'marginally polluted'. However, if the same results are compared with the updated (2019) Irish ALs, only 3 samples are classified as marginally polluted (Irish Hydrodata Limited, 2018). The updated Irish ALs take into consideration naturally elevated levels of arsenic that can occur. The three remaining samples, classified as 'marginally contaminated', did not surpass the AL2 threshold. However, they did exceed the AL1 limit for one or more of the following metals:

- Arsenic: 20.6mg/kg, AL1 Limit 20 mg/kg;
- Copper: 88.9mg/kg, AL1 limit 40mg/kg;
- Cadmium: 0.92 mg/kg, AL1 limit 0.7 mg/kg;
- Nickel: 30.5 and 38.8 mg/kg, AL1 limit 21 mg/kg.

7.5.2.29 Copper and cadmium were both present at only one location and represented as isolated occurrences. The EIAR for Arklow Waste Water Treatment Plant concluded that the marine sediments were very slightly contaminated at relatively low levels for some specific parameters. Overall, when these results are compared with the earlier survey of Arklow Harbour (Table 7.13), the concentration of metal contaminants are substantially lower in volume.

7.5.2.30 A more recent survey of Dublin Port was conducted in 2020 to support the application of a permit to carry out a Maintenance Dredging Programme at the site (RPS, 2021). The sediment chemistry results displayed low level contamination of arsenic, cadmium, copper, lead, nickel and zinc at select locations within Dublin Harbour (approximately 50 km away from the Array Area and Cable Corridor and Working Area). The results also showed some localised, slightly elevated levels of PCBs, PAHs, and TEH over the lower AL at select locations. However, none of the 31 samples they collected exceeded the upper AL and therefore are not classed as heavily contaminated. Whilst Dublin Harbour is a significant distance away from Arklow Harbour, they are both characterised by similar pollution sources and are located adjacently to the Irish sea. Therefore, it is of relevance to compare these more recent results with the survey of Arklow Harbour from 2009. Further, the same report carried out sediment chemistry trend analysis of Dublin Ports navigation channel between 2006 and 2020 and found that metal concentrations have generally reduced, PCBs showed a modest decrease, and PAHs showed a substantial decrease over this timeframe (RPS, 2021).

Table 7.13: Sediment contaminant analysis from the Avoca Estuary which is located 3.8 km from the Cable Corridor and Working Area (Arklow Port, 2009)

Contaminant Type	Sample ID							
	BC7C	BC5A	BC2B	BC8B	BC4A	BC1B	BC7A	BC1C
Metals (mg/kg)								
Copper	659**	117**	209**	299**	116**	66*	131**	83.6*
Zinc	1500**	419**	467**	990**	236**	195**	417**	182**
Cadmium	3.57*	0.983*	1.33*	2.62*	0.686*	0.283*	1.43*	0.213*
Mercury	0.21	0.053	0.0602	0.107	0.0528	0.0089	0.07	0.0041

Lead	362**	145**	134**	268**	103**	67.4**	135**	89.4**
Arsenic	51.7*	24.4*	30.4*	35.9*	17	15.9	24*	17.3
Chromium	81.2	58.9	67.3	79.2	53.8	51.5	62.6	46
Manganese	579	699	1160	601	1300	795	432	1860
Nickel	28.4	27.3	29.8	31.9	22.3	22.3	28.2	25.3
Lithium	68	63.1	99.5	72.6	70.1	89.4	62.9	93.6
Aluminium	49800	43900	46400	53800	41000	47400	42300	45800
Organotins (µg/kg)								
Dibutyltin (DBT)	50**	30*	<6.00	40*	20	<3.00	400**	<3.00
Tributyltin (TBT)	<7.00	<7.00	<6.00	<7.00	<6.00	<3.00	<8.00	<3.00
PCBs (µg/kg)								
PCB28	<2.00*	<0.290	<0.100	<1.30*	<0.100	<0.100	<1.32*	<0.100
PCB52	<6.54*	<0.100	<0.100	<6.14*	<0.100	<0.100	<5.57*	<0.100
PCB101	3.83*	0.19	<0.100	9.36*	<0.100	<0.100	<0.100	<0.100
PCB138	3.21*	0.28	<0.100	8.37*	<0.100	<0.100	<0.100	<0.100
PCB153	4.14*	0.27	<0.100	11.2*	<0.100	<0.100	<0.100	<0.100
PCB180	1.52*	<0.100	<0.100	5.53*	0.41	<0.100	<0.100	<0.100
PCB118	2.35*	<0.100	<0.100	6.48*	<0.100	<0.100	<0.100	<0.100
PAHs and THC (µg/kg)								
Anaphthene	23	7.07	22.2	0	18.4	11	25.6	19.6
aphthylene	5.5	<4.20	<16.2	null	<10.0	<4.00	<32.8	<6.10
Anthracene	13	4.08	19.5	null	18.1	<2.00	57.3	2.82
Bantracene	49	19.2	83.8	0	87.2	0	189	27.4

Benzpyrene	35	17.3	94.8	null	100	<2.00	<203	<2.00
bfluorant	78	0	0	0	0	0	0	0
perylene	17	<10.0	63.6	null	78.1	<10.0	167	31.8
kfluorant	46	<10.0	53.2	null	58.1	<10.0	<122	18.9
Chrysene	34	18.6	90.6	0	107	3.3	239	40.5
Dibenz	3.6	<5.00	14.7	null	18.7	<5.00	40.2	12.4
Flourene	8.7	<10.0	36.1	null	30.3	17	62.7	21.9
Fluoranthe	83	39	160	0	169	7.11	365	64
Indeno123	35	11.9	75.7	null	93.5	<10.0	196	53
Naphthalen	33	81.8	112	0	59.4	69.9	64.5	19.1
Phenanthre	45	<10.0	71.1	null	91.9	<10.0	152	25.8
Pyrene	35	17.3	94.8	null	100	<2.00	<203	<2.00
TEHs (g/kg)								
THE	0.521	0.166	0.0879	0.852	0.122	0.0357	1.6*	0.0115

Exceedance of Irish AL 1 (*), Exceedance of Irish AL 2 (**)

SUSPENDED SEDIMENTS

7.5.2.31 The Irish Sea is characterised by a high degree of spatial and temporal (both annual and inter-annual) variability in Suspended Sediment Concentration (SSC). In general, there exists an inshore to offshore gradient in SSC, with the highest concentrations observed close to bay inlets. When resuspended, particulate-bound contaminants may be remobilised into the water column and become bioavailable to an additional assemblage of species. Such resuspension occurs through a range of natural and anthropogenic processes each of which may be thought of as pulsed disturbances resulting in pulsed exposures to contaminants. Thus, it is important to understand not only the toxicological responses of organisms to resuspended contaminated sediments, but also the frequency, magnitude, and duration of sediment disturbance events.

7.5.2.32 Turbidity is caused by a range of small particles in the water column, including organic material. These are typically summarised under the term Suspended Particulate Matter (SPM). The Centre for Environment, Fisheries and Aquaculture Sciences (Cefas) Climatology Report 2016 (Cefas, 2016) shows the spatial distribution of average non-algal SPM for the majority of the United Kingdom (UK) continental shelf. It is estimated that the average SPM associated with the Arklow Bank over this period is approximately less than 2.5 mg/l. Higher levels are experienced more commonly in the winter months. See the Coastal Processes Technical Report (Volume III: Chapter 6.1) for an in-depth analysis of turbidity and other topics related to sedimentological regime.

7.5.3 'Do nothing' scenario

7.5.3.1 Annex IV of the EIA Directive sets out the information required to be included in an EIAR. This includes "a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge". In the event that the Proposed Development does not proceed, an assessment of the future baseline conditions has been carried out and is described within this section.

7.5.3.2 There are a few anticipated changes to the future receiving environment that are unrelated to any project development in the area. Changes to seawater chemistry, including reductions in pH and salinity, have been observed and attributed to anthropogenic climate change. These changes may result indirectly in changes in coastal dynamics, water column stability and water quality. A recent report from the Marine Institute on the Irish ocean climate reported a general trend of warmer oceans, more acidic, decreased oxygen levels and rising sea levels (Marine Institute, 2023). In addition, marine biological systems have been shown to be very sensitive to changes in water chemistry (EPA, 2016; Marine Institute, 2023). In Ireland, significant work has been done on the impacts of changes in chemistry on natural systems and growth. There is evidence of freshening in coastal waters on the Irish continental shelf as a result of increased winter precipitation, however it should be noted that there is inter-annual variability and lower confidence in salinity projections (Nolan *et al.*, 2010).

7.5.3.3 In the absence of the Proposed Development being constructed, the characterisation of the receiving and future environment, as presented above, is anticipated to remain valid, i.e. no alterations to the evolving baseline environment out with any natural responses to climate change, in respect of MW&SQ, are anticipated to occur. Regarding the wider marine environment, a deterioration in water quality and in particular biological characteristics and nutrient loads may occur as a result from climate change, and in particular in response to an increased frequency of extreme weather events, increased water flows and temperature fluctuations (EPA, 2021; Walker Institute for Climate Change, 2014). However, locally speaking, the installation of the Arklow Wastewater Treatment Plant is expected to improve water and sediment quality in the area via reduction of pollution input from waste disposal.

7.5.4 Data limitations

7.5.4.1 Whilst many of the baseline characteristics are well understood, as described above, some data sources or assumptions are less well studied and/or quantified for the Study Area. This section seeks to identify areas of uncertainty and potential data gaps.

7.5.4.2 Grab sampling, while providing detailed information on the sediment types (and fauna) present at collection sites, cannot cover wide swaths of the seabed and individually represent point samples that can then be interpreted in combination together and with the other appropriate datasets, such as the INFOMAR predictive substrate model (Figure 7.5). That being said, data confidence is considered high since several surveys undertaking grab samples have been conducted in the area over a substantial and consistent time frame (i.e. 2004 to 2021), which additionally show good validation against the INFOMAR predictive substrate model. The seabed morphology and sediment types are well-studied and are considered sufficient to characterise the study (and wider) area. As such, the available evidence base is sufficiently robust to underpin the assessment presented here and an overall high confidence is placed in the characterisation of the baseline.

7.5.4.3 The assessment of sediment contamination encompassed a thorough evaluation of various contaminant types (i.e. PAHs, THC, PCBs, organotins and metals), where site-specific samples of the Array Area revealed no indications of reportable contamination and did not exceed lower Irish Action levels (Ramboll Environ UK Ltd, 2016). The transitional water (Avoca Estuary) samples, from 2009, were more notable. However, it is anticipated that much of the pollution (i.e. heavy metals and DBT) identified from Avoca Estuary samples were largely due to historical and legacy pollutants and therefore are likely to continue to reduce as the source inputs reduce (EPA, 2016 – 2019). Moreover, recent samples for the Arklow Waste Water Treatment Plant application indicate substantially reduced contamination levels in Arklow Harbour, with no samples exceeding the upper Irish ALs. This point is further backed up by the more recent report by RPS (2021), using sediment chemistry trend analysis, showed that metals, PCBs and PAHs presented decreasing trends at sample locations in Dublin Port from 2006 to 2020 (RPS, 2021). While a decrease in contamination sources based on the general trend of reducing historic pollution sources, there is still a present risk of pollution (e.g. wastewater and agricultural run-off). Of note, the low proportion of fines and majority sand and gravel sediments found in the Study Area are accepted to carry a much lower contamination risk. Furthermore, cross-referencing site-specific data (Ramboll Environ UK Ltd, 2016) with existing surveys within the wider study area (RPS, 2021; Arklow Port 2009) conducted in nearby areas enhances the validation of the findings. Therefore, it is not anticipated that sediment contamination is present in the MW&SQ Study Area in concentrations that are likely to cause ecotoxicological effects or exceed the Irish Action Levels.

7.5.4.4 There is some uncertainty associated with the sediment plume assessment and accompanying bed level changes due to activities of the Proposed Development and/ or activities of potential other projects. This arises due to the uncertainty regarding how the seabed geology will respond to drilling and jetting. There are several factors which determine the exact volume of material that is entrained into the water column; including the exact type of drilling/cable installation equipment used, the variability of the forcing conditions at the installation time (i.e. the waves and tidal conditions) and the mechanical properties of the geological units. To minimise this limitation, a series of potential release scenarios have been considered in Volume II, Chapter 6: Coastal Processes. Together, these scenarios capture the potential impacts in terms of the highest concentration and persistent suspended sediment plumes and the greatest spatial extent of changes in bed level elevation.

7.6 Impact assessment methodology

7.6.1 Key parameters for assessment

7.6.1.1 The assessment of significance of effects has been carried out on both of the two discrete project design options detailed in Volume II, Chapter 4, Description of Development. This approach has allowed for a robust and full assessment of the Proposed Development.

7.6.1.2 The two project design options and parameters relevant to each potential impact are detailed in Table 7.14 and Table 7.15.

Table 7.14: Project design parameters and impacts assessed – Project Design Option 1

Potential impact	Phase			Project design option 1
	C	O	D	
Impact 1: Deterioration in water quality due to suspension of sediments Temporary increases may occur (i.e. seabed levelling, cable protection remediation and removal of Proposed Development infrastructure), resulting in reduction of water clarity and resuspension of nutrients, altering water quality and primary production levels.	✓	✓	✓	***Construction phase*** <u>Confirmatory surveys:</u> A suite of site investigations are to be undertaken to confirm the seabed and geological conditions prior to the installation of infrastructure for which specific details can be found in Volume II, Chapter 4: Description of Development. An example of sampling techniques that may be relevant to Impact 1 include: • Geotechnical surveys using: – Boreholes (approximately 131); – Cone penetrating testing (approximately 431); – Vibrocore/ gravity core (approximately 300); and – Grab samples (approximately 240). • Metocean surveys using floating Light Detection and Tanging (LiDAR), Acoustic Doppler Current Profiler (ADCP) and wave buoy; and • Sediment dynamic surveys using benthic flume and benthic lander. <u>Site preparation:</u> Site preparation activities prior to inter-array, interconnector and offshore export cable installation to include sand wave clearance. For the foundations, seabed preparation may be required within an area of 100 m in diameter, with 5 m depth of material being relocated. This may occur for approximately 20% of the WTG locations. The anticipated total volume of seabed clearance for WTGs (56) and OSP (2) foundation installation is estimated at 139,200 m^3. The total volume of seabed clearance for scour protection is estimated at 1,000,000 m^3. For the offshore export, inter-array and interconnector cabling, sand waves may be cleared along a corridor of 70 m in width (for each cable) with 10 m depth of material being relocated. This may
Impact 2: Release of sediment bound contaminants from disturbed sediments. (Whilst in suspension, there is the potential for sediment-bound contaminants, such as metals, hydrocarbons, and organic pollutants, to be released into the water column and lead to an adverse effect on water quality receptors).	✓	✓	✓	

Potential impact	Phase			Project design option 1
	C	O	D	

				occur across 30% of the cable length. The anticipated total volume of seabed clearance for each cable:
				• Interconnector cables: 500,000 m^3;
				• Inter-array cables: 1,000,000 m^3; and
				• Export Cables: 500,000 m^3.
				<u>Foundation installation:</u>
				WTGs and OSPs installed on monopile foundations:
				Drilled installation of:
				• WTG Foundations:
				  • Number of piles requiring drilling: 25;
				  • Diameter: 11 m (range 7 m to 11 m);
				  • Drill depth: 20 - 37 m;
				  • Drilling duration (per pile): 88 hours;
				  • Number of concurrent drilling events: 1;
				  • Volume of drill arisings per pile: approximately 5,280 m^3; and
				  • Total volume of drill arisings: approximately 132,000 m^3.
				• OSP Foundations:
				  • Number of piles requiring drilling: 2;
				  • Diameter: 14 m (range 7 m to 14 m);
				  • Drill depth: 45 m;
				  • Drilling duration (per pile): 88 hours;
				  • Number of concurrent drilling events: 1; and
				  • Volume of approximately 13, 860 m^3 per pile.
				<u>Cable installation:</u>

Potential impact	Phase			Project design option 1
	C	O	D	

				Cable installation techniques include:
				• Jetting;
				• Ploughing;
				• Mechanical cutting;
				• Simultaneous lay and burial; and
				• Controlled Flow Excavator (CFE).
				
				Installation parameters for each cable-type:
				• Interconnector cables:
				  • Length between 25 - 28 km;
				  • Burial depth between 0 - 2.5 m;
				  • Seabed disturbance width anticipated to be 15 m; and
				  • Total disturbance area of 420,000 m^2 for the full Offshore Wind Farm (OWF)
				• Inter-array cables:
				  • Length between 110 - 122 km;
				  • Burial depth between 0 - 1.5 m;
				  • Seabed disturbance width anticipated to be 15 m; and
				  • Total disturbance area of 1,830,000 m^2 for the full OWF
				• Export cables:
				  • Length between 35 - 40 km;
				  • Burial depth between 0 - 2.5 m;
				  • Seabed disturbance width anticipated to be 15 m; and
				  • Total seabed disturbance area of 600,000 m^2 for the entire OWF.
				
				Modelling base on release of fine sediments.

Potential impact	Phase			Project design option 1
	C	O	D	

				Operational and maintenance phase
				
				O&M Cable Parameters:
				
				• Interconnector cables:
				  • Length between 25 - 28 km
				  • Proportion of total length requiring protection (50%);
				  • Burial depth (0 - 2.5 m); and
				  • Seabed disturbance width (anticipated: 15 m).
				• Inter-array cables:
				  • Length between 110 - 122 km;
				  • Burial depth (0 - 1.5 m); and
				  • Seabed disturbance width (anticipated: 15 m)
				• Export cables:
				  • Length between 35 - 40 km;
				  • Burial depth (0 - 2.5 m); and
				  • Seabed disturbance width (anticipated: 15 m).
				
				Cable repair/ reburial activities:
				Interconnector and Inter-array cable maintenance to be carried out approximately once every 3 years for the potential repair/ replacement of assets. Additionally, dredging may be required for asset reburial/ stabilisation of exposed cable section or removal of excess sediment once every 5 years with conservative dredge volume estimates of:
				• 300,000 m^3 for inter-array cables; and
				• 100,000 m^3 for interconnector and export cables combined.
				
				Geophysical surveys of the seabed and assets (i.e., WTG foundations, OSP foundations, inter-array cables and interconnector cables) will be conducted routinely with survey vessel(s) or unmanned surface vehicles every six months for the first two years and annually thereafter.

Potential impact	Phase			Project design option 1
	C	O	D	
				Decommissioning phase All structures above the seabed would be removed, scour protection, cables and cable protection would be left *in situ*; and Decommissioning would be undertaken in the reverse of construction. No piling will take place as part of the decommissioning works.
Impact 3: Accidental releases or spills of materials or chemicals. The Proposed Development has the potential to result in accidental spills during all phases which has the potential to lower the quality of water physically, chemically, or biologically.	✓	✓	✓	***Construction phase*** The installation of infrastructure has the potential to increase the occurrence of accidental releases or spills of materials or chemicals. The frequency, and volumes of materials required for each structure, are described below. <u>WTGs:</u> Project design 1 proposes the installation of 56 WTGs within the Array Area. Each WTG will contain quantities of oils and fluids (such as lubricating oils, hydraulic oils, coolants) to support regular operations and maintenance activities. The types of oils and fluids (and approximate volumes per WTG) include: • Grease (500 l); • Synthetic Oil (10000 l); • Hydraulic Oil (850 l); • Gear Oil (2400 l); • Lubricants (included in Grease); • Nitrogen (63000 l); • Water/Glycol (22500 l); • Transformer Silicon/ Ester Oil (included in synthetic oil); • Sulphur hexafluoride or Sulphur hexafluoride (SF6) (8 kg); and • Glycol/Coolants (included in water/glycol)

Potential impact	Phase			Project design option 1
	C	O	D	
				While there will be no permanent diesel inventory, there may be temporary generators present during temporary works, with an associated bunded fuel cube storage capacity of approximately 1000 l of diesel per WTG. OSPs: Each OSP will contain quantities of oils and fluids (such as lubricating oils, hydraulic oils, coolants). The types of oils and fluids (and approximate volume) required for the OSPs include: • Diesel fuel (for standby/backup generator) (up to 57,000 l/ 48 mT); • Transformer coolant oil (up to 137,000 l); • Uninterruptible Power Supply (UPS) Batteries (Up to 36 mT of batteries in total. 18 mT/ 13,500 l of electrolyte); • Harmonic Filters (Capacitators) (contain up to 270 l of biodegradable electrolyte); • Fire Suppression Systems (up to 15 mT of extinguishant); • Heating Ventilation and Air Conditioning (HVAC) Coolant (up to 1,000 kg); and • SF6 (up to 1000 kg). Additional petroleum fuels may be used to fuel temporary generators providing power to equipment and marine lighting during the construction phase. Cables: Cable location and length will impact the area in which potential spillages may occur. The length required for each cable installation are listed below. • Inter-array cables between 110 km and 122 km in length • OSP interconnector cables between 25 km and 28 km in length • Offshore export cables between 35 km and 40 km in length Vessel Traffic:

Potential impact	Phase			Project design option 1
	C	O	D	

Accidental pollution can and may occur during the approximate 4,150 vessel round-trips to port by construction vessels (the Project phase with the most substantial vessel traffic). There will be a maximum of 1,797 vessel return trips per year during the construction phase, comprised of jack-up vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, scour/cable protection installation vessels, pre-installation boulder clearance vessels, sandwave clearance vessels, Unexploded Ordnance (UXO) clearance vessels and other support vessels.

In addition, a maximum of 294 helicopter return trips (118 per year) will be carried out during the construction phase, with a maximum capacity of three helicopters at any one time.

To be noted, no chemicals (with the exception of drilling mud – see impact 1) are proposed to be discharged into the environment as part of construction activities.

Operational and maintenance phase

Oils and fluids (see above) will be replaced as required during the O&M phase for various structures that may introduce the risk of spillage:

- WTGs – replacement of consumables (e.g. oil replaced annually and Gearbox oil minimum 5 yearly);
- OSPs – replacement of consumables (e.g. oils and lubricants will require replacement upon checking via monthly inspection); and
- WTG Foundations and OSP Foundations will require an application of paint or other coatings to protect the foundations from corrosion (internal/external), including surface preparation (carried out when necessary, during other works).

Additional petroleum fuels may be used to fuel temporary generators providing power to equipment and marine lighting during O&M phases.

<u>Vessel Traffic:</u>

Accidental pollution can and may occur during the approximate 1,359 vessel roundtrips to port by O&M vessels (up to 30 vessels on site at any one time).

Potential impact	Phase			Project design option 1
	C	O	D	
				To be noted, no chemicals (with the exception of drilling mud – see impact 1) are proposed to be discharged into the environment as part of O&M activities. ***Decommissioning phase*** Each WTG and OSP will contain components that require oils and fluids (see above), even at the end of the Project lifespan. Therefore, it is important to consider the spillage of these materials during the decommissioning phase. Additional petroleum fuels may be used to fuel temporary generators providing power to equipment and marine lighting during the decommissioning phase.

Table 7.15: Project design parameters and impacts assessed - Project Design Option 2

Potential impact	Phase			Project design option 2
	C	O	D	
Impact 1: Deterioration in water quality due to suspension of sediments Temporary increases may occur (i.e. seabed levelling, cable protection remediation and removal of Proposed Development infrastructure), resulting in reduction of water	✓	✓	✓	**Construction phase** <u>Confirmatory surveys:</u> A suite of site investigations are to be undertaken to confirm the seabed and geological conditions prior to the installation of infrastructure for which specific details can be found in Volume II, Chapter 4: Description of Development. An example of sampling techniques that may be relevant to impact 1 include: • Geotechnical surveys using: – Boreholes (approximately 131);

Potential impact	Phase			Project design option 2
	C	O	D	
clarity and resuspension o nutrients and contaminants.				– cone penetrating testing (approximately 431); – vibrocore/ gravity core (approximately 300); and – grab samples (approximately 240). • Metocean surveys using floating LiDAR, ADCP, wave buoy; and • Sediment dynamic surveys using benthic flume and benthic lander.
Impact 2: Release of sediment bound contaminants from disturbed sediments. (Whilst in suspension, there is the potential for sediment-bound contaminants, such as metals, hydrocarbons, and organic pollutants, to be released into the water column and lead to an adverse effect on water quality receptors).	✓	✓	✓	<u>Site preparation:</u> Site preparation activities prior to inter-array, interconnector and offshore export cable installation to include sand wave clearance. For the foundations, seabed preparation may be required within an area of 100 m in diameter, with 5 m depth of material being relocated. This may occur for approximately 20% of the WTG locations. The anticipated total volume of seabed clearance for WTGs (47) and OSP (2) foundation installation is estimated at 117,600 m^3. The total volume of seabed clearance for scour protection is estimated at 1,000,000 m^3. For the offshore export, inter-array and interconnector cabling, sand waves may be cleared along a corridor of 70 m in width (for each cable) with 10 m depth of material being relocated. This may occur across 30% of the cable length. The anticipated total volume of seabed clearance for each cable: • Interconnector cables: 500,000 m^3; • Inter-array cables: 1,000,000 m^3; and • Export Cables: 500,000 m^3. <u>Foundation installation:</u> WTGs and OSPs installed on monopile foundations: Drilled installation of: • WTG Foundations: • Number of piles requiring drilling: 25;

Potential impact	Phase C	Phase O	Phase D	Project design option 2

- Diameter: 11 m (range 7 m to 11 m);
- Drill depth: 20 - 37 m;
- Drilling duration (per pile): 88 hours;
- Number of concurrent drilling events: 1;
- Volume of drill arisings per pile: approximately 7,040 m^3; and
- Total volume of drill arisings: approximately 176,000 m^3.

- OSP Foundations:
  - Number of structures: 2;
  - Diameter: 14 m (range 7 m to 14 m);
  - Drill depth: 45 m;
  - Drilling duration (per pile): 88 hours;
  - Number of concurrent drilling events: 1;
  - Volume of drill arisings per pile: approximately 13,860 m^3; and
  - Total volume of drill arisings: approximately 27,720 m^3.

<u>Cable installation:</u>

Cable installation techniques include:

- Jetting;
- Ploughing;
- Mechanical cutting;
- Simultaneous lay and burial; and
- CFE

Installation parameters for each cable-type:

- Interconnector cables:
  - Length between 25 - 28 km;
  - Burial depth between 0 - 2.5 m;

Potential impact	Phase			Project design option 2
	C	O	D	

- Seabed disturbance width anticipated to be 15 m.

- Inter-array cables:
  - Length between 110 - 122 km;
  - Burial depth between 0 - 1.5 m;
  - Seabed disturbance width anticipated to be 15 m.

- Export cables:
  - Length between 35 - 40 km;
  - Burial depth between 0 - 2.5 km;
  - Seabed disturbance width anticipated to be 15 m.

Modelling based on release of fine sediments.

Operational and maintenance phase

O&M cable parameters:

- Interconnector cables:
  - Length between 25 – 28 km
  - Proportion of total length requiring protection (50%);
  - Burial depth (0 - 2.5 m);
  - Seabed disturbance width (anticipated: 15 m).

- Inter-array cables:
  - Length between 110 - 122 km;
  - Burial depth (0 - 1.5 m);
  - Seabed disturbance width (anticipated: 15 m)

- Export cables:

Potential impact	Phase			Project design option 2
	C	O	D	
				• Length between 35 - 40 km; • Burial depth (0 - 2.5 m); • Seabed disturbance width (anticipated: 15 m). <u>Cable repair/ reburial activities:</u> Interconnector and Inter-array cable maintenance to be carried out approximately once every 3 years for the potential repair/ replacement of assets. Additionally, dredging may be required for asset reburial/ stabilisation of exposed cable section or removal of excess sediment once every 5 years with conservative dredge volume estimates of: • 300,000 m^3 for inter-array cables; and • 100,000 m^3 for interconnector and export cables combined. Geophysical surveys of the seabed and assets (i.e., WTG foundations, OSP foundations, inter-array cables and interconnector cables) will be conducted routinely with survey vessel(s) or unmanned surface vehicles every six months for the first two years and annually thereafter. **Decommissioning phase** All structures above the seabed would be removed, scour protection, cables and cable protection would be left in situ; and Decommissioning would be undertaken in the reverse of construction.
Impact 3: Accidental releases or spills of materials or chemicals. The Proposed Development has the potential to result in accidental spills during all phases which has the potential to lower the quality of water	✓	✓	✓	**Construction phase** The installation of infrastructure has the potential to increase the occurrence of accidental releases or spills of materials or chemicals. The frequency, and volumes of materials required for each structure, are described below. <u>WTGs:</u>

Potential impact	Phase			Project design option 2
	C	O	D	
physically, chemically, or biologically.				Each WTG will contain quantities of oils and fluids (such as lubricating oils, hydraulic oils, coolants) to support regular operations and maintenance activities. The types of oils and fluids (and approximate volumes per WTG) include: • Grease (500 l); • Synthetic Oil (10000 l); • Hydraulic Oil (850 l); • Gear Oil (2400 l); • Lubricants (included in Grease); • Nitrogen (63000 l); • Water/Glycol (22500 l); • Transformer Silicon/ Ester Oil (included in synthetic oil); • Sulphur hexafluoride or SF6 (8 kg); and • Glycol/Coolants (included in water/glycol) While there will be no permanent diesel inventory, there may be temporary generators present during temporary works, with an associated bunded fuel cube storage capacity of approximately 1000 l of diesel per WTG. <u>OSPs:</u> Each OSP will contain quantities of oils and fluids (such as lubricating oils, hydraulic oils, coolants). The types of oils and fluids (and approximate volumes) required for the OSPs include: • Diesel fuel (for standby/backup generator) (up to 57,000 l/ 48 mT); • Transformer coolant oil (up to 137,000 l); • UPS Batteries (Up to 36 mT of batteries in total. 18 Mt/ 13,500 l of electrolyte); • Harmonic Filters (Capacitators) (contain up to 270 l of biodegradable electrolyte); • Fire Suppression Systems (up to 15 mT of extinguishant); • HVAC Coolant (up to 1,000 kg); and • SF6 (up to 1000 kg)..

Potential impact	Phase			Project design option 2
	C	O	D	
				Additional petroleum fuels may be used to fuel temporary generators providing power to equipment and marine lighting during the construction phase. Cables: Cable location and length will impact the area in which potential spillages may occur. The length required for each cable installation are listed below. • Inter-array cables between 110 km and 122 km in length • OSP interconnector cables between 25 km and 28 km in length • Offshore export cables between 35 km and 40 km in length Vessel Traffic: Accidental pollution can and may occur during the approximate 4,150 vessel round-trips to port by construction vessels (the Project phase with the most substantial vessel traffic). There will be a maximum of 1,797 vessel return trips per year during the construction phase, comprised of jack-up vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, scour/cable protection installation vessels, pre-installation boulder clearance vessels, sandwave clearance vessels, UXO clearance vessels and other support vessels. In addition, a maximum of 294 helicopter return trips (118 per year) will be carried out during the construction phase, with a maximum capacity of three helicopters at any one time. To be noted, no chemicals (with the exception of drilling mud – see Impact 1) are proposed to be discharged into the environment as part of construction activities. **Operational and maintenance phase** Oils and fluids (see above) will be replaced as required during the O&M phase for various structures that may introduce the risk of spillage: • WTGs – replacement of consumables (e.g. oil replaced annually and Gearbox oil minimum 5 yearly);

Potential impact	Phase			Project design option 2
	C	O	D	
				• OSPs – replacement of consumables (e.g. oils and lubricants will require replacement upon checking via monthly inspection); and • WTG Foundations and OSP Foundations will require an application of paint or other coatings to protect the foundations from corrosion (internal/external), including surface preparation (carried out when necessary, during other works). Additional petroleum fuels may be used to fuel temporary generators providing power to equipment and marine lighting during O&M phases. <u>Vessel Traffic:</u> Accidental pollution can and may occur during the approximate 1,359 vessel roundtrips to port by O&M vessels (up to 30 vessels on site at any one time). To be noted, no chemicals (with the exception of drilling mud – see impact 1) are proposed to be discharged into the environment as part of O&M activities. **Decommissioning phase** Each WTG and OSP will contain components that require oils and fluids (see above), even at the end of the Project lifespan. Therefore, it is important to consider the spillage of these materials during the decommissioning phase. Additional petroleum fuels may be used to fuel temporary generators providing power to equipment and marine lighting during the decommissioning phase

7.6.2 Impacts scoped out of the assessment

7.6.2.1 On the basis of the baseline environment and the description of development outlined in Volume II, Chapter 4: Description of Development, a number of impacts are proposed to be scoped out of the assessment for MW&SQ. These impacts are outlined, together with a justification for scoping them out, in Table 7.16.

Table 7.16: Impacts scoped out of the assessment for MW&SQ

Potential impact	Justification
Scour of seabed sediments.	The potential for scour of seabed sediments around the wind turbine and OSP foundations has been scoped out of the assessment on the basis of the description of development which includes for scour protection (see Volume II, Chapter 4: Description of Development).
Changes in water and sediment quality associated with the protection and cleaning of infrastructure.	Some routine maintenance activities on infrastructure (such as removal/cleaning of biofouling) have the potential to result in reduced water and sediment quality in the immediate vicinity of the activity. Operational cleaning activities may release some substances, such as anti-fouling paint into the marine environment. By nature, anti-fouling paint works by releasing a range of bioactive ingredients to prevent organisms (e.g. biofilms and barnacles) from attaching to marine infrastructure. Anti-fouling paints have been shown to leach into surrounding water, releasing harmful chemicals that may then be ingested by organisms resulting in various negative effects to marine ecosystems. However, the use of harmful biocides in anti-fouling paints are well regulated. For instance, in 2008, organotin compounds acting as biocide (e.g. TBT compounds) were banned entirely in anti-fouling paint, included in the Rotterdam Convention and have been banned by the International Convention on the Control of Harmful Anti-fouling Systems on Ships of the International Maritime Organization. The presence of guano in marine environments has been shown to produce or accelerate a so-called 'ornitheutrophication' process (Otero *et al*., 2017), thereby increasing the biomass of primary producers, changing the structure and communities of phytoplankton present in coastal areas near colonies. However, the volume of guano removed, and the volume of anti-fouling paint released from infrastructure foundations, transition pieces and access ladders are anticipated to be highly localised, small scale, temporary, and short-lived. Any small-scale risks are well managed through the factored in measures presented in Table 1.12. Cathodic protection will be installed on each foundation (Volume II, Chapter 4: Description of Development). This may consist of subsea zinc or aluminium anodes, as is typical for offshore wind farms and other subsea structures. These are also known as 'sacrificial' anodes, as the anodes gradually dissipate and are diluted into the sea water, protecting the foundation. Alternatively, an Impressed Current Cathodic Protection (ICCP) system may be used or in combination with sacrificial anodes. These systems are essential to protect the steel construction against corrosion in the harsh marine environment during their service lifetime and are an important factor for the long-term stability of the offshore structure (Kirchgeorg *et al,*.2018). Cathodic protection consists in controlling the corrosion of a metallic surface by means of an anode made of a metallic alloy of which electrochemical potential is lower than that of the metal to be protected (Guibert, 2009). The galvanic anode undergoes oxidation in the marine environment and releases various metals in the forms

Potential impact	Justification
	of ions or oxy-hydroxides into the environment. The principal metals composing the anodes are aluminium, zinc or magnesium because of their negative corrosion potential. The annually necessary material and thus related emissions from galvanic anodes are in the range of several kilos (for e.g. monopile foundations) (Kirchgeorg *et al,*.2018). The emissions suggest currently a low environmental risk of the different systems, also in comparison to other sources of chemicals into the marine environment (e.g. oil and gas industry, riverine input, ship traffic, atmospheric deposition).
Deterioration of MW&SQ in SFWs and nutrient sensitive areas from Proposed Development activities	Impacts upon SFWs and nutrient sensitive areas have been scoped out from this assessment as potential receptors upon which significant effects might occur. This is based on the site-specific modelling undertaken which demonstrates that these designated waters are too remote (greater than 20 km) from the Proposed Development for effects on water quality at the site to occur. The Coastal Processes Chapter (Volume II, Chapter 6) provides further details of the project specific modelling undertaken.
Deterioration in water quality due to potential suspension of sediments from confirmatory geophysical surveys	Sediment disturbance resulting from site investigation activities will be of shorter duration, lesser magnitude and highly localised when compared to those resulting from site preparation, foundation and cable installation works. Therefore, it is not anticipated to have an impact on MW&SQ receptors. Where there is potential for deterioration in water quality due to the suspension of sediments from construction, O&M and decommissioning activities, this has been assessed in Section 7.9.1.

7.7 Methodology for Assessing the Significance of Effects

7.7.1 Overview

7.7.1.1 The MW&SQ impact assessment has followed the methodology set out in Volume II, Chapter 5: EIA Methodology. Specific to the MW&SQ impact assessment, the following guidance documents have also been complied with:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022);
- Guidance for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018).

7.7.2 Impact assessment criteria

SENSITIVITY

7.7.2.1 This section describes the criteria applied in this chapter to assign values to the sensitivity of the receptors. The terms used to define sensitivity are based on those which are described in further detail in Volume II, Chapter 5: EIA Methodology of the EIAR.

7.7.2.2 A receptor's sensitivity is a function of its capacity to accommodate change and indicates its ability to recover if it is affected. The identification of sensitivity is via a consideration of adaptability, tolerance, recoverability, and value.

7.7.2.3 The criteria used in defining the sensitivity of the MW&SQ receptor is provided in Table 7.17. Where a receptor could reasonably be assigned more than one level of sensitivity, professional

judgement has been used to determine which level is applicable. The inclusion of internationally or nationally important features within the high sensitivity definition provides the opportunity to increase the sensitivity of the receptor if required, even if capacity for dilution exists.

Table 7.17: Definitions of sensitivity of the receptor

Receptor sensitivity	Definition
High	Adaptability: The receptor cannot avoid or adapt to an impact. Tolerance: The environment has no capacity to accommodate the proposed form of change. Recoverability: The effect on the receptor is anticipated to be permanent (i.e. over 60 years) or long-lasting (15 – 60 years). Value: The water quality of the receptor supports or contributes towards the designation of an internationally or nationally important feature.
Medium	Adaptability: The receptor has a limited capacity to avoid or adapt to an impact. Tolerance: The environment has a moderate to low capacity to accommodate the proposed form of change. Recoverability: The receptor is anticipated to recover fully within the medium term (i.e. seven to 15 years). Value: The water quality of the receptor supports or contributes towards the designation of an internationally or nationally important feature.
Low	Adaptability: The receptor has a reasonable capacity to avoid or adapt to an impact. Tolerance: The environment has a high capacity to accommodate the proposed form of change. Recoverability: The receptor is anticipated to recover fully within the short-term (i.e. one to seven years). Value: The water quality of the receptor supports or contributes towards the designation of a nationally important feature.
Negligible	Adaptability: The receptor has a high capacity to avoid or adapt to an impact. Tolerance: The environment has a high capacity to accommodate the proposed form of change. Specific water quality conditions of the receptor are likely to be able to tolerate change with very little or no impact upon the baseline conditions detectable. Recoverability: The receptor is anticipated to recover fully and will be temporary (i.e. lasting less than one year). Value: The receptor is not designated but may be of local importance and/ or local socio-economic value.

MAGNITUDE

7.7.2.4 This section described the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume II, Chapter 5: EIA Methodology of the EIAR.

7.7.2.5 The definition of magnitude specific to MW&SQ is provided in Table 7.18. Where a range of magnitude criteria are met, the final assessment for each impact is based upon expert judgement.

Table 7.18: Definition of terms relating to the magnitude of an impact

Magnitude	Definition
High	Extent: Impact across the near-field and far-field areas beyond the Study Area. Duration: The impact is anticipated to be permanent (i.e. over 60 years). Frequency: The impact will occur constantly throughout the relevant project phase. Probability: The impact can reasonably be expected to occur. Consequences: Permanent changes across the near- and far-field environment to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Medium	Extent: The maximum extent of the impact is restricted to the far-field (i.e. the defined Study Area). Duration: The impact is anticipated to medium-term (i.e. seven to 15 years) to long-term (i.e. 15 to 60 years). Frequency: The impact will occur constantly throughout a relevant project phase. Probability: The impact can reasonably be expected to occur. Consequences: Noticeable change to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Low	Extent: The maximum extent is restricted to the near-field and adjacent far-field areas. Duration: The impact is anticipated to be temporary (i.e. lasting less than one year) to short term (i.e. one to seven years). Frequency: The impact will occur frequently throughout a relevant project phase. Probability: The impact can reasonably be expected to occur. Consequences: Barely discernible/ noticeable change to key characteristics or features of the particular environmental aspect's character or distinctiveness
Negligible	Extent: The maximum extent of the impact is restricted to the near -field and immediately adjacent far-field areas. Duration: The impact is anticipated to be momentary (i.e. minutes) to brief (i.e. days). Frequency: The impact will occur once or infrequently throughout a relevant project phase Probability: The impact can reasonably be expected to occur. Consequences: No discernible/ barely discernible change to key characteristics or features of the particular environmental aspects or distinctiveness.

SIGNIFICANCE OF EFFECT

7.7.2.6 The significance of the effect upon MW&SQ is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in

7.7.2.7 Table 7.19. Where a range of significance of effect is presented in

7.7.2.8 Table 7.19, the final assessment for each effect is based upon expert judgement.

Table 7.19: Significance of effect matrix

			Baseline Environment - Sensitivity			
			High	Medium	Low	**Negligible**
Description of Impact - Magnitude	**Adverse Impact**	High	Profound or Very Significant (significant)	Significant	Moderate*	Imperceptible
		Medium	Significant	Moderate*	Slight	Imperceptible
		Low	Moderate*	Slight	Slight	Imperceptible
	Neutral Impact	Negligible	Not Significant	Not Significant	Not Significant	Imperceptible
	Positive Impact	Low	Moderate*	Slight	Slight	Imperceptible
		Medium	Significant	Moderate*	Slight	Imperceptible
		High	Profound or Very Significant (significant)	Significant	Moderate*	Imperceptible

*Moderate levels of effect have the potential, subject to the assessor's professional judgement to be significant or not significant. Moderate will be considered as significant or not significant in EIA terms, depending on the sensitivity and magnitude of change factors evaluated. These evaluations are explained as part of the assessment, where they occur.

7.7.3 Factored in measures

7.7.3.1 The Project Design Options set out in Volume II, Chapter 4: Description of Development includes a number of designed-in measures and management measures (or controls) which have been factored into the Proposed Development and are committed to be delivered by the Developer as part of the Proposed Development.

7.7.3.2 These factored-in measures are standard measures applied to offshore wind development, including lighting and marking of the Proposed Development, use of 'soft-starts' for piling operations etc, to reduce the potential for impacts. Factored-in measures relevant to the assessment on MW&SQ are presented in

7.7.3.3 Table 7.20. These measures are integrated into the description of development and have therefore been considered in the impact assessment (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development. 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 proposed proposal' (EPA, 2022).

Table 7.20: Factored in measures

Factored in measures	Justification
Implementation of an Environmental Management Plan (EMP) (Volume III, Appendix 25.1).	An Environmental Management Plan (EMP) will be implemented, this includes mitigation/monitoring measures and commitments made within the EIAR, including but not limited to chemical usage, invasive and non-native species, pollution prevention and waste management.
Scour protection	In the absence of scour protection, there is potential for scour pits to develop around foundations. This may result in the release of sediment, and concurrent sediment-bound contaminants, into the water column. However, scour protection will be installed prior to the foundations in order to reduce the development of scour around the structures. Further detail is provided in Volume II, Chapter 4: Description of Development.
Volume II, Chapter 4: Description of Development sets out the O&M activities and indicative programme.	This includes a schedule of O&M activities and a procedure for setting out the refined parameters of any cable repair or reburial activities. This commitment is standard practice and required to ensure that all necessary measures associated with MW&SQ are in place. O&M activities (i.e. cable repair or reburial) could have impacts on disturbance of contaminated sediments and reduction in water quality. The O&M activities are set out in Volume II, Chapter 4: Description of Development.
An Invasive Non-Indigenous Species Management Plan is included in the EMP (Volume III, Appendix 25.1).	The plan outlines measures to ensure vessels comply with the International Maritime Organisation (IMO) ballast water management guidelines, it will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as measures to be adopted in the event that a high alert species is recorded. This commitment is standard practice and minimises the risk of potential introduction or spread of invasive and non-native species that could have impacts on MW&SQ receptors, for example SFWs.
A Marine Pollution Contingency Plan (MPCP) is included in the EMP to ensure plans are in place to manage any marine pollution spills and including key emergency contact details (Volume III, Appendix 25.1 Annex 2).	The MPCP will ensure that any potential risk of spillage or pollution is minimised. This commitment is standard practice and ensures the use of appropriate preventative measures and serves as an embedded mitigation against this type of pollution incidence. If an accidental spill occurs, all relevant parties would be informed as required in the MPCP.
Adherence to a Vessel Management Plan (VMP) (Volume III, Appendix 25.7).	The VMP will confirm the types and numbers of vessels that will be engaged on the proposed development and consider vessel coordination including indicative transit route planning (Marine Coordination). This commitment is standard practice and relates to consideration of impacts associated with non-native species, accidental pollution, habitat loss/disturbance and collision risk.
Adherence to a Rehabilitation Schedule Volume II, Chapter 4: Description of Development) and	This commitment is standard practice. The Rehabilitation Schedule describes measures for the decommissioning of the Proposed Development. There will be several impacts to

Factored in measures	Justification
Rehabilitation Schedule (Volume III, Appendix 4.1).	receptors associated with decommissioning (e.g. removal of infrastructure).
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339).	The Developer was granted a Foreshore Licence (FS007339) for Site Investigations (associated with the Proposed Development) from the Minister for Housing, Local Government and Heritage in May 2022. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339) being carried out. As such there is no temporal overlap between the activities consented in this Foreshore Licence and the Proposed Development and there will be no potential for cumulative effects.
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 (should a licence be granted) are being carried out.	The Developer submitted a Foreshore Licence Application for Site Surveys to the Minister for Housing, Local Government and Heritage in April 2023 (FS007555) and this application is pending determination. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 (should a licence be granted) are being carried out. As such there is no temporal overlap between the activities proposed in the Foreshore Licence Application and the Proposed Development.

7.8 Assessment of the significance of effects

7.8.1.1 The impacts of the construction, O&M and decommissioning phases of both Project Design Options, as presented in Volume II, Chapter 4: Description of Development, forming the Proposed Development have been assessed on MW&SQ. The potential impacts arising from the construction, O&M and decommissioning phases of the Proposed Development are listed in Table 7.14 and Table 7.15, along with the project parameters against which each impact has been assessed.

7.8.1.2 A description of the potential effect on MW&SQ caused by each identified impact is provided in Section 7.9 and Section 7.10.

7.9 Assessment of Project Design Option 1

7.9.1 Impact 1 – Deterioration in water quality due to suspension of sediments

7.9.1.1 Proposed Development activities will result in the disturbance of sediments and consequential release into the water column. In turn, this will give rise to suspended sediment plumes and localised changes in seabed levels as the material settles out of suspension. Increases in SSC, and consequently turbidity, may result in a decrease in the depth to which natural light can penetrate into the water column. Increased turbidity/ artificial reduction of natural light may result in a reduction of primary productivity (i.e. the production of organic compounds through the biological process of photosynthesis by phytoplankton) and/ or an increase in bacterial growth. Moreover, the disturbance of seabed sediments may result in the release of additional nutrients (e.g. nitrogen and phosphorus) that were sediment bound. This anthropogenic cause of increased SSC can lead to an unnatural surge of nutrient availability in the water column for aquatic plants (e.g. seaweeds). The temporary influx of nutrients (known as nutrient loading) can cause phytoplankton and/ or seaweed to bloom and then die, in a process referred to as eutrophication. Subsequently, bacteria and other decomposer organisms then take up oxygen as they decompose materials (e.g. dead seaweeds).

7.9.1.2 There are a range of factors which will influence both the magnitude and extent of change in SSC. These include, but are not limited to, the actual total volumes and rates of sediment disturbance, the local water depth and current speed at the time of the activity, the local sediment type and grain size distribution in addition to the local seabed topography and slopes. Due to the wide range of possible combinations of these factors it is not possible to predict specific dimensions with complete certainty. To provide a robust assessment, a range of realistic combinations have been considered within Volume II, Chapter 6 (Coastal Processes) based on conservatively representative location (environmental) and project specific information, including a range of water depths, sediment ejection/initial resuspension heights, and sediment types.

7.9.1.3 In addition to the output from the numerical modelling undertaken for the marine coastal processes assessment (Volume II, Chapter 6: Coastal Processes and Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling), the understanding of the potential increase in suspended sediments due to Proposed Development installation activities can be informed by the evidence base regarding marine dredging impacts, specifically sediment plumes (e.g., Cooper and Brew, 2013). Highly concentrated sediment plumes formed of coarser material (sands) will only occur for short-time periods and in the immediate vicinity of the seabed disturbance. The output of this modelling has been used to comprehend a realistic magnitude of impact to MW&SQ.

7.9.1.4 It should be noted that the effect of increased SSC on MW&SQ can act as an impact pathway for other EIAR receptors that are sensitive to changes in water quality, in particular:

- Volume II, Chapter 9: Benthic and Subtidal and Intertidal Ecology; and
- Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology.

SENSITIVITY OF THE RECEPTOR

7.9.1.5 The MW&SQ receptors have been split into three categories; the wider marine environment (i.e. non-designated sites of local importance), designated coastal waters (of international importance), and designated BW's (of international importance), to accurately identify their sensitivity. Within these categories, the specific receptor sites have been listed individually as their sensitivity may vary (e.g. the sensitivity of a BW classified as 'Poor' will be higher than one classified as 'Excellent' when assessing the impact of increased SSC since there would be a decreased tolerance and recoverability).

7.9.1.6 The Proposed Development activities are not expected to cause a measurable reduction in dissolved oxygen availability in the water column. Moreover, dissolved oxygen concentrations of the baseline environment were characteristic of a normal coastal marine environment. Therefore, no source receptor pathways are identified for a deterioration of dissolved oxygen or eutrophication. On this basis, no likely substantial effects are predicted in either the wider environment, designated coastal waters or BW's.

7.9.1.7 A reduction in water clarity and quality associated with Proposed Development activities, namely the export cable installation and associated preparation, will occur in temporary and discrete events. Owing to the temporary nature of the impact, these events will not significantly directly alter the water quality status of the receiving environment. However, the mortality of bacteria, including those commonly tested for in the health of BW's (*E. coli* and IE), is strongly influenced by the amount of ultraviolet light penetrating the water column. Under higher ultraviolet conditions the mortality is higher and faster. The reduced water clarity could therefore result in temporary increases in bacterial counts within the water column due to increased mortality. Moreover, there is the potential for release of sediment bound bacteria from disturbing the seabed sediments. Together, these elevated bacterial counts could theoretically cause a deterioration in the water quality of local BWs. However, given the predicted levels of dilution and dispersion of the suspended sediments (and so bacteria) from the modelling, coupled with the temporary nature of the activities; it is expected that any increases in bacterial counts in the water column would be in the order of days. The resultant increase in bacterial counts from the Proposed Development activities would be analogous to storm events and therefore is not anticipated to result in a reduction of water quality at the identified BWs beyond background conditions and natural variation.

7.9.1.8 The MW&SQ Study Area, and wider regional marine environment, has been characterised in Section 7.5.2. All reports indicated a healthy baseline environment, characteristic of coastal areas connecting to the Irish Sea. All designated coastal waters were classified as 'High' except for Southwest Irish Sea (Has 11;12) which is classified as 'Good'. These characterisations and classifications indicate stable, healthy, and resilient conditions with a capacity to adapt to the change where baseline conditions are already strong, and effects are considered temporary. The designated transitional waterbodies were all classified as 'Moderate' and two were at risk of not meeting 'Good' quality status by 2027 under the requirements of the WFD. However, the result of 'failing to achieve good' originated from failing to meet specific pollutant conditions for cadmium, copper, lead, and zinc as opposed to biological (e.g. high bacteria count) or physical parameters (e.g. low dissolved oxygen). Therefore, it is anticipated the wider marine environment and designated coastal and transitional waters indicate a high capacity to accommodate any proposed forms of change from increased SSC caused by Proposed Development activities. The most recent reports showed that three of the identified BWs were classified as 'Excellent' and three as 'Good', also indicating stable, healthy, and resilient conditions. However, due to the possibility of effect to BW's quality status, the designated BWs indicate a moderate capacity to accommodate the potential increased bacterial counts caused by increased SSC from Proposed Development activities.

Table 7.21 Sensitivity of MW&SQ receptors to potential changes in water quality from increased SSC

MW&SQ Receptor	Specific site	Overall Sensitivity
Non-designated sites	Wider marine environment	Rated as **Low**
Designated coastal and transitional waterbodies	Brittas Bay (HA10)	Rated as **Low**
	Killiney Bay (HA10)	Rated as **Low**

MW&SQ Receptor	Specific site	Overall Sensitivity
	Southwest Irish Sea (Has 11;12)	Rated as **Low**
	Owenavorragh Estuary	Rated as **Low**
	Broad Lough	Rated as **Low**
	Avoca Estuary	Rated as **Low**
	Kilcoole Marsh	Rated as **Low**
Designated BWs	Silver Strand Beach	Rated as **Medium**
	Brittas Bay North Beach	Rated as **Medium**
	Brittas Bay South Beach	Rated as **Medium**
	Clogga Beach	Rated as **Medium**
	Ballymoney, North Beach	Rated as **Medium**
	Courtown, North Beach	Rated as **Medium**

Construction phase

7.9.1.9 Construction activities will result in the greatest seabed sediment disturbance, due to the associated temporal scale, spatial scale, and sediment volumes as presented in Table 7.14. These activities are:

- Seabed preparation (including sand wave clearance for WTG and OSP foundations and along the Cable Corridor and Working Area) including spoil disposal via a Trailing Suction Hopper Dredger (TSHD);
- Foundation installation using drilling techniques;
- Pre-lay cable trenching using jetting tools at the seabed; and
- Drilling fluid release during HDD, or other trenchless technique, operations.

7.9.1.10 The following section provides a summary of construction activities and how they may influence SSC and therefore impact MW&SQ receptors.

SEABED PREPERATION (INCLUDING SANDWAVE CLEARANCE FOR WTG FOUNDATIONS AND ALONG THE CABLE CORRIDOR AND WORKING AREA)

SANDWAVE CLEARANCE OF THE ARRAY AREA

7.9.1.11 Seabed preparation may be required prior to the installation of infrastructure required for the Proposed Development. This is likely to include seabed levelling to allow the foundations to be placed onto a flat seabed (parameters for which are described in Table 7.14 and well defined in Volume II, Chapter 4: Description of Development). The sediment volume likely to be removed for seabed levelling within the Array Area (excluding export cables) is up to 2,639,200 m^3 and is to be excavated using a TSHD with an assumed hopper volume of 20,000 m^3 over the entire construction period. Whilst the hopper is being filled, overspill is likely to develop a near-surface sediment plume (consisting largely of fine sediments). Once each hopper is filled, dredged material (spoil) will be returned to the seabed at a specified disposal site, currently defined to the

south of, and within the boundary of, the Array Area, as a relatively sudden release from under the vessel.

7.9.1.12 Modelling of SSC resulting from a plume caused by sand wave clearance activities in the Array Area, exhibits SSC at a maximum of 2,000 mg/l within the first hour. As this plume is advected by the tidal currents along the tidal axis, it is also dispersed such that the SSC levels reduce. After five hours, the plume is reduced to typical background concentrations (less than 2.5 mg/l). In accordance with the UK Technical Advisory Group (UKTAG) water turbidity ranking (see Tyler-Walters *et al.*, 2018), this is classified as clear. Moreover, elevated SSC above background concentrations is not predicted after 10 hours following the initial sandwave clearance. Under all tidal flow simulations (speed and direction), elevated SSC (above background concentration) are not shown to disperse beyond 8 km from the Cable Corridor and Working Area. Therefore, construction activities in the Array Area are not predicted to significantly impact any identified WFD waterbodies.

SANDWAVE CLEARANCE OF THE CABLE CORRIDOR AND WORKING AREA

7.9.1.13 Seabed preparation for cable installation activities is also likely to include sandwave clearance (the removal of mobile bedforms) to ensure effective cable burial below the level of the stable bed. The parameters for these activities are presented in Table 7.14 and are well defined in Volume II, Chapter 4: Description of Development. The largest sediment volume likely to be removed for seabed levelling within the Cable Corridor and Working Area is around 500,000 m^3, to be excavated using a TSHD with an assumed hopper volume of 20,000 m^3.

7.9.1.14 Modelling of SSC resulting from a plume caused by sand wave clearance activities in the Cable Corridor and Working Area initially results in maximum SSC in the order of 2,000 mg/l. Rapid dispersion is such that the discrete plume (circa 2 km by 0.5 km) is less than 250 mg/l after three hours, and by five hours the plume has further reduced such that it will only slightly be discernible from background concentrations (less than 5.0 mg/l). Moreover, elevated SSC above background concentrations is not predicted after 10 hours following the initial sandwave clearance. Under all tidal flow simulations (speed and direction), elevated SSC (above background concentration) are not shown to disperse beyond 8 km from the Cable Corridor and Working Area. Therefore, construction activities in the Cable Corridor and Working Area are not predicted to significantly impact any identified WFD waterbodies.

FOUNDATION INSTALLATION USING DRILLING TECHNIQUES

7.9.1.15 Monopile foundations are to be installed using standard piling techniques. In some cases, the seabed material may be drilled within the pile footprint to assist in the pilling process. The impact of drilling operations mainly relates to the release of drilling spoil at or above the water surface which will put sediment into suspension and the subsequent redeposition of that material to the seabed. A maximum of 45% of locations within the Array Area have been estimated to require drilling.

7.9.1.16 Numerical modelling simulated drilling at two foundation locations along the tidal axis in the Array Area; at a WTG location on the western side of Arklow Bank and the southern OSP. A summary of the results demonstrates elevations in SSC progressively increase in both concentration and spatial extent as the drilling operations continue. The maximum SSC concentrations occur close to the OSP foundation and is a direct consequence of greater volume of drill arisings, where WTG foundations of Project Design Option 1 release 5,230 m3 (compared to Project Design Option 2 with 7,040 m3) and installation of OSP foundations release 13,860 m3.

7.9.1.17 Finally, within 12 hours following the completion of OSP drilling, elevated SSC of up to 2.5 mg/l are predicted 7 km to the south of the Array Area, displaying maximum elevation of 10 mg/l within only a few hundred of meters from the location of the works. After two days following completion,

elevated SSC will be undiscernible from background concentrations (i.e. 2.5 mg/l). This increased SSC will remain within the ZoI and moreover, is unlikely to impact designated WFD coastal waterbodies or BW's.

DRILLING FLUID RELEASE DURING HDD, OR OTHER TRENCHLESS TECHNIQUE, OPERATIONS

7.9.1.18 The subsea export cable ducts will be installed underneath the beach using trenchless installation techniques, with trenchless techniques outlined in Table 7.14 and well-defined in Volume II, Chapter 4: Description of Development. The drilling activity utilises a viscous drilling fluid which consists of a mixture of water and bentonite. Bentonite is a non-toxic, inert, natural clay mineral (<63µm particle diameter) included in the List of Notified Chemicals approved for use and discharge into the marine environment. Classified as a Group E substance under the Offshore Chemical Notification Scheme for which it is least likely to cause environmental harm being "readily biodegradable and non-bioaccumulative". This is further supported by bentonite being included on the OSPAR List of Substances Used and Discharged Offshore which are considered to Pose Little or No Risk to the Environment (PLONOR). The release of drilling fluid and drill cuttings from HDD operations will result in a plume of elevated SSC. The drilling fluid has an overall density and viscosity similar to seawater and so is expected to behave in a similar manner.

7.9.1.19 This precautionary assessment has been based on the maximum bentonite volume which could be released into the environment. The principal issue, for MW&SQ receptors, relating to bentonite release to the water column comprises the potential for an increase in SSC (and so turbidity) within the water column and thus a potential reduction in bacterial mortality. With the exception of the potential for increased turbidity from a bentonite release, no other potential deterioration in water quality, such as the introduction of nutrients, is anticipated following the release of drilling mud.

7.9.1.20 Numerical modelling has been used to simulate the release of bentonite over a 4-5 day period during trenchless landfall operations. Further detail is provided in Volume II, Chapter 6: Coastal Processes. In summary, the modelling output showed that elevated SSC will be of localised extent and temporary duration, with maximum concentrations of 50 mg/l occurring only within the location of the punch out trenchless technique exit pit and during the installation of works. SSC is advected along the coast along the tidal axis to distances of up to 4 km, although concentrations at this distance are limited to below 25 mg/l. Away from the landfall works and out with the Proposed Development, SSC levels are comparable/ less than background levels, shown to be no greater than 2.5 mg/l.

7.9.1.21 Bentonite clearance may cause increased SSC across the coastline, reaching WFD water bodies, including Brittas Bay (North) and Brittas Bay (South) BWs. However, any measurable increases in SSC and deposition are small-scale, highly localised and is expected to be rapidly redistributed by wave action – leading to a reduced magnitude of impact.

PRE-LAY CABLE TRENCHING AT THE SEABED

7.9.1.22 Of the different pre-lay cable trenching techniques considered by the project, for which more information is presented in Volume II, Chapter 4: Description of Development, the use of jetting tools has been utilised for numerical assessment as it provides the potential for the greatest amount of seabed sediment to be disturbed and the greatest extent into the water column. Other installation methods are considered to mobilise the seabed sediments to a lesser extent (BERR (2008), Table 7.14).

7.9.1.23 Cable burial operations have been reported to result in a localised and temporary re-suspension and subsequent settling of sediments (BERR, 2008). The exact nature of this disturbance will be determined by the soil conditions, the length of installed cable, the burial depth, burial method,

and environmental conditions at the time of installation works. Full details of the modelling scenarios are provided in Volume II, Chapter 6: Coastal Processes.

7.9.1.24 Modelling of SSC resulting from jetting tools demonstrates a maximum increase of SSC immediately adjacent to the active works (with levels circa 500 mg/l), whilst levels above background (2.5 mg/l) are observed up to 8 km from the point of disturbance. After completion of the active seabed disturbance, the elevated SSC rapidly reduces such that levels are comparative to background concentrations. This increased SSC will remain within the ZoI and moreover, is unlikely to impact identified WFD waterbodies.

MAGNITUDE OF THE IMPACT

7.9.1.25 The scale of construction activities, and resulting SSC, has been presented in this MW&SQ EIAR and fully detailed in Chapter 6: Coastal Processes. For the purpose of this EIAR, a 'maximum distance' (i.e. the spatial extent that any resultant plumes might be reasonably experienced) has been conservatively estimated using spring tidal excursion distances (this distance is illustrated in Figure 7.1). Any location beyond the tidal excursion distance is unlikely to experience any measurable change in SSC from a sediment plume. Given the temporary nature of sediment disturbance, and the temporary nature of the activities that are likely to generate it, any impacts are also anticipated to be short-lived. Therefore, the increased SSC is predicted to be of localised spatial extent, short term duration (individual construction operations would occur over the period of days to weeks) intermittent and high reversibility.

7.9.1.26 Output from all considered construction activities is not anticipated to affect phytoplankton or dissolved oxygen as no nutrients are anticipated to be released from the seabed in significant concentrations beyond those observed in typical storm conditions. Furthermore, the effects are anticipated to be temporary in nature (e.g. less than a day). In addition to no significant nutrient releases, there will not be any outfalls or discharges associated with the Proposed Development and as such the proposed activities are not expected to cause a reduction in the dissolved oxygen in the water column. Consequently, no source-receptor-pathways are identified for a deterioration of dissolved oxygen, phytoplankton blooms or eutrophication, as a result of the proposed construction activities.

7.9.1.27 Bacterial mortality, including *E. coli* and intestinal enterococci, within the water column is strongly influenced by the amount of ultra-violet (UV) light which penetrates the water column; under higher UV scenarios, bacterial mortality is higher. Therefore, any Project activities in the coastal zone which reduce water clarity could result in temporary increases in bacterial counts due to the decreased bacterial mortality and UV light within the water column. Further, it could result in the potential release of sediment bound bacteria. In theory, elevated bacterial counts could cause a deterioration in the water quality and if present at the identified BWs during the designated bathing season, could theoretically cause a deterioration in their performance classifications (see Table 7.10). However, the SSC elevation and associated decrease in bacterial mortality, would be localised, temporary and within the range of natural variability. The magnitude of the increases to SSC, and associated decrease in bacterial mortality, from construction activities has been assessed in Table 7.22.

Table 7.22: Determination of magnitude of Impact 1 during the construction phase

Magnitude	Definition
Extent	The temporary impact of increased SSC from Proposed Development activities will be localised to within the ZoI (i.e. within the near-field and the adjacent areas of the far-field).
Duration	The impact will be restricted to the construction phase of the Proposed Development (for which the offshore phase has a conservative assumption of 5 years) and will

Magnitude	Definition
	therefore be short-term (1 - 7 years), although works in any given discrete location and activity within the project boundary will be classified as temporary (considerably less than 1 year).
Frequency	The impact will occur frequently in discrete areas throughout the construction phase of the development.
Probability	The impact upon the water quality receptors can reasonably be expected to occur.
Consequence	Sediment plumes are expected to quickly dissipate after cessation of the activities, due to settling and wider dispersion with the concentrations reducing quickly over time to background levels. Therefore, the consequence will be noticeable but brief changes in SCC concentrations occurring during the construction phase within the near-field and the adjacent areas of the far-field.
Overall Magnitude	The potential magnitude of the predicted changes is rated as **Low adverse.**

SIGNIFICANCE OF THE EFFECT

The significance of effects of increased SSC from construction activities on the identified receptors have been carefully assessed in accordance with the matrix provided in

7.9.1.28 Table 7.19.

7.9.1.29 The sensitivity of the wider marine environment has been assessed as **Low**. The magnitude of Impact 1 from construction activities has been assessed as **Low adverse**. Consequently, the significance of Impact 1 upon the wider marine environment as a result of construction activities is concluded to be **Slight adverse.**

7.9.1.30 The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low.** The magnitude of Impact 1 from construction activities has been assessed as **Low adverse.** Consequently, the significance of Impact 1 upon designated coastal and transitional waterbodies as a result of construction activities is concluded to be **Slight adverse.**

7.9.1.31 The sensitivity of designated BWs has been assessed as **Medium**. The magnitude of Impact 1 from construction activities has been assessed as **Low adverse**. Consequently, the significance of Impact 1 upon designated BWs as a result of construction activities is concluded to be **Slight adverse.**

PROPOSED MITIGATION

The significance of effect from Impact 1 during the construction phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

Table 7.20 is considered necessary.

RESIDUAL EFFECT ASSESSMENT

7.9.1.32 The significance of effect from Impact 1 during the construction phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.1.33 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

Operational and maintenance phase

7.9.1.34 The effects of O&M activities resulting in increased SSC have been assessed on MW&SQ receptors caused by each identified impact. An explanation of the significance of effect upon MW&SQ receptors caused by O&M activities is also provided below.

7.9.1.35 As presented in Table 7.14, if a section of the cable became exposed or damaged it would require reburial and/ or replacement. Reburial (and/ or replacement) would be undertaken using similar techniques to that set out in the assessment of SSC associated with cable installation activities (see Volume II, Chapter 6: Coastal Processes). The lengths of the cable to be replaced or reburied would be shorter, and the potential impacts consequently will be more localised and occur over a shorter duration than those considered in the construction phase.

7.9.1.36 Therefore, the magnitude (and so significance) of the effect on water and sediment quality in the marine environment resulting from O&M activities would be no greater than those assessed in the construction phase. The potential magnitude of the predicted changes is explained in paragraph 7.9.1.10 *et seq*.

MAGNITUDE OF IMPACT

7.9.1.37 During the O&M phase of the Proposed Development, geophysical surveys of the seabed and assets (i.e., WTG foundations, OSP foundations, inter-array cables and interconnector cables) will be conducted routinely with survey vessel(s) or unmanned surface vehicles every six months for the first two years and annually thereafter. Any increased SSC from these surveys is expected on a short-term and localised basis, occurring from the placement of an instrument and its' mooring system on the seabed to sediment removal (as boreholes/ grabs). Sediment disturbance resulting from survey activities will typically be of shorter duration (hours to days), lesser magnitude and more localised extend when compared to those resulting from installation or other O&M activities. Whilst activities associated with the Proposed Development during the O&M phase will result in seabed sediment disturbance into the water column, primarily through cable protection and re-burial works, if required, the volumes disturbed are much less than those disturbed during the construction phase. As the magnitude of effect during the construction phase for all activities has been assessed as **Low**, the magnitude of effect arising as a result of increased SSC during the O&M phase are considered to be **Negligible** (Table 7.23).

Table 7.23 Determination of magnitude of Impact 1 during the O&M phase

Magnitude	Definition
Extent	The temporary impact of increased SSC from O&M activities will be localised to within the ZoI (i.e. restricted to the near -field and immediately adjacent far-field areas).
Duration	The impact from increased SSC is anticipated to be brief (i.e. in the order of hours/ up to days).
Frequency	Increased SSC will occur infrequently throughout the O&M phase.
Probability	The impact of increased SSC upon the water quality receptors can reasonably be expected to occur.
Consequence	Sediment plumes are expected to quickly dissipate after cessation of the infrequent activities, due to settling and wider dispersion with the concentrations reducing

Magnitude	Definition
	rapidly to background levels. Therefore, barely discernible changes in SCC concentrations are expected to occur during the O&M phase.
Overall Magnitude	The potential magnitude of the predicted changes is rated as **Negligible**.

SIGNIFICANCE OF EFFECT

The significance of effects of increased SSC from O&M activities on the identified receptors have been carefully assessed in accordance with the matrix provided in

7.9.1.38 Table 7.19

7.9.1.39 The sensitivity of the wider marine environment has been assessed as **Low**. The magnitude of Impact 1 from O&M activities has been assessed as **Negligible**. Consequently, the significance of Impact 1 upon the wider marine environment as a result of O&M activities is concluded to be **Not significant** in EIA terms.

7.9.1.40 The sensitivity of designated coastal and transitional waterbodies have been assessed as **Low.** The magnitude of Impact 1 from O&M activities has been assessed as **Negligible**. Consequently, the significance of Impact 1 upon designated coastal and transitional waterbodies as a result of O&M activities is concluded to be **Not significant** in EIA terms.

7.9.1.41 The sensitivity of designated BWs have been assessed as **Medium**. The magnitude of Impact 1 from O&M activities has been assessed as **Negligible**. Consequently, the significance of Impact 1 upon the designated BWs as a result of O&M activities is concluded to be **Not significant** in EIA terms.

PROPOSED MITIGATION

7.9.1.42 The significance of effect from Impact 1 during the O&M phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.1.43 Table 7.20 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

7.9.1.44 The significance of effect from Impact 1 during the O&M phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.1.45 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

Decommissioning phase

7.9.1.46 As outlined in Table 7.14, the decommissioning activities are generally anticipated to be a reversal of those in construction. Firstly, the structures above the seabed are to be removed in reverse of construction process. As described in Volume III, Appendix 4.1: Rehabilitation Schedule, the assets which will be decommissioned are the WTGs, WTG and OSP transition pieces (TPs), monopiles, all cabling and ducting above the seabed, followed by the remediation of the seabed. Of note are the monopiles which are embedded in the seabed, typically by 28-33m penetration, leaving 20-55m length of steel to be removed. Therefore, the monopiles are cut at the 400t mark, allowing a smaller capacity vessel to undertake the job of transferring. The type of cutting tool utilises an internal high pressure waterjet cutter. The sequence of removal includes dredging inside the monopile to a depth of about 4 m below the mudline to ensure space for the cutting tool. The combined internal cutting and lifting tool is inserted to make the cut which is removed to the vessel deck grillage. These operations will take approximately 60 hours to complete. The vessel will then move onto the next location until its cargo capacity had been reached. The monopiles at two locations could be removed at a time, requiring 29 round trips. With the monopiles removed, there will be void or depression in the seabed to a depth of approximately 2 m below the seabed. Taking into account the scour protection layer in the immediate area, there may be a 4 to 5 m hole of 10 m in diameter to be back-filled with material (400 to 500 m^3). The backfill material will be taken from the perimeter of the scour protection layer and repositioned into the void around the monopile stub. The tools for this operation will be a subsea grab or a scar plough for over trawling the deposited material to ensure it is flat relative to the local surface and a Work-class Remotely Operated Vehicle (WROV) to perform as-left surveys.

7.9.1.47 However, WTG and OSP foundation scour protection and cables (with associated protection) are anticipated to be left *in situ*. Cables (export, inter array and interconnector) are to be cut at seabed level and remain *in-situ*. Cable protection will also remain *in-situ*. Any ducting or cable protection above the seabed will be recovered with the monopile, once removed. Any sections of cable (including cut ends) that are left *in-situ* will be buried, or otherwise protected with rock berms. Where loose rock, rock bags or mattressing is used, this will be left *in-situ* since recovery entails significant impacts upon the benthic ecology in addition to Health and Safety risks.

7.9.1.48 As outlined in Section 7.9.1, the installation of cables was associated with the most notable SSC plumes. Since the cables will be left *in situ*, potential impacts will be more localised and occur over a shorter duration than those considered in the construction phase. Therefore, any effects on MW&SQ from decommissioning activities will be no greater than those assessed in the construction and O&M phases.

MAGNITUDE OF IMPACT

7.9.1.49 Activities associated with the Proposed Development during the decommissioning phase will result in seabed sediment disturbance into the water column, the volumes of which are considered to be equal to, or less than, those disturbed during the construction phase. Given that the magnitude of effect during the construction phase has been assessed as **Low**, the magnitude of effect arising as a result of 'increased suspended sediment concentrations and associated deposition' during the decommissioning phase is also considered to be **Low** (Table 7.24).

Table 7.24 Determination of magnitude of Impact 1 from the decommissioning phase

Magnitude	Definition
Extent	The temporary impact of increased SSC from Proposed Development activities will be localised to within the ZoI (i.e. within the near-field and the adjacent areas of the far-field).
Duration	The impact will be restricted to the decommissioning phase of the Proposed Development (for which the offshore phase has a conservative assumption of 2 years) and will therefore be short-term (1 - 7 years), although works in any given discrete location and activity within the project boundary will be classified as temporary (considerably less than 1 year).
Frequency	The impact will occur frequently in discrete areas throughout the construction phase of the development.
Probability	The impact upon the water quality receptors can reasonably be expected to occur.
Consequence	Sediment plumes are expected to quickly dissipate after cessation of the activities, due to settling and wider dispersion with the concentrations reducing quickly over time to background levels. Therefore, the consequence will be noticeable but brief changes in SCC concentrations occurring during the decommissioning phase within the near-field and the adjacent areas of the far-field.
Overall Magnitude	The potential magnitude of the predicted changes is rated as **Low adverse**.

SIGNIFICANCE OF EFFECT

The significance of effects of increased SSC from decommissioning activities on the identified receptors have been carefully assessed in accordance with the matrix provided in

7.9.1.50 Table 7.19.

7.9.1.51 The sensitivity of the wider marine environment has been assessed as **Low**. The magnitude of Impact 1 from decommissioning activities has been assessed as **Low adverse**. Consequently, the significance of Impact 1 on the wider marine environment as a result of decommissioning activities is concluded to be **Slight adverse.**

7.9.1.52 The sensitivity of designated coastal and transitional waterbodies have been assessed as **Low.** The magnitude of Impact 1 from decommissioning activities has been assessed as **Low adverse.** Consequently, the significance of Impact 1 on designated coastal and transitional waterbodies as a result of decommissioning activities is concluded to be **Slight adverse.**

7.9.1.53 The sensitivity of designated BWs has been assessed as **Medium**. The magnitude of Impact 1 from decommissioning activities has been assessed as **Low Adverse**. Consequently, the significance of Impact 1 on designated BWs as a result of decommissioning activities is concluded to be **Slight adverse.**

PROPOSED MITIGATION

7.9.1.54 The significance of effect from Impact 1 during the decommissioning phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.1.55 Table 7.20 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

7.9.1.56 The significance of effect from Impact 1 during the decommissioning phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.1.57 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

7.9.2 Impact 2 – Release of sediment bound contaminants from disturbed sediments.

7.9.2.1 As described in Section 7.9.1, the construction, O&M and decommissioning of the Proposed Development has the potential to increase SSC in the marine environment through the generation of sediment plumes. Whilst in suspension, there is the potential for sediment-bound contaminants, such as metals, hydrocarbons, and organic pollutants, to be released into the water column and lead to an effect on MW&SQ receptors.

7.9.2.2 Sediment contaminant levels across the Proposed Development were all low and within acceptable limits (i.e. in accordance with Irish Action Levels) (Section 7.5.2.25). This implies a low availability of contaminants to be released with sediment resuspension.

SENSITIVITY OF THE RECEPTOR

7.9.2.3 The total area that is likely to be disturbed by Proposed Development activities, and so the potential volume of material disturbed, resulting in the potential release of sediment bound contaminants is small and localised in extent. In addition, the nature of the subtidal sediments is predominantly coarse with low levels of fines adhering to them. The characterisation of the baseline environment has indicated low levels of contaminants generally in the Array Area (see Section 7.5.2.25) and Cable Corridor and Working Area (see Section 7.5.2.26). The release of contaminants from the fine sediments is likely to be rapidly dispersed with the tide and/ or currents. So, the increased bioavailability of contaminants resulting in adverse ecotoxicological effects is not expected. The levels found are all comparable to the wider regional background and not considered to be of low quality and will not result in a significant effect-receptor pathway if made bioavailable.

7.9.2.4 In addition to normal circumstances, very small contaminants enter to the dissolved phase (and so become bioavailable), with the vast majority adhering to the sediment particles when temporarily entering suspension into the water column. Partition coefficients may be applied to estimate the concentration of the contaminants entering the dissolved phase which will result in a reduction of several orders of magnitude than the concentrations associated with suspended sediments. As such, it is considered highly unlikely that the MAC-EQS will be exceeded for any of the substances as a result of disturbing sediment in the water body from the Proposed Development activities, given the fates of the plumes. Finally, given the short-term nature of the works and the short-term nature of the sediment plumes, any small uplift in water concentrations would be anticipated to return to background levels very quickly.

7.9.2.5 The MW&SQ receptors within the ZoI have been split into three categories; the wider marine environment (i.e. non-designated sites of local importance), designated coastal and transitional waters (of international importance), and designated BW's (of international importance), to accurately identify their sensitivity. Within these categories, the specific receptor sites have been listed individually as their sensitivity may vary (e.g. the sensitivity of a designated coastal waterbody classified as 'Bad' will be higher than one classified as 'High' when assessing the release of sediment bound contaminants since there would be a decreased tolerance and recoverability). The overall sensitivity of each MW&SQ receptor to the release of sediment bound contaminants has been assessed in Table 7.25.

7.9.2.6 The MW&SQ Study Area, and wider regional marine environment, has been characterised in Section 7.5.2. All reports indicated a healthy baseline environment, characteristic of coastal areas connecting to the Irish Sea. The sensitivity of the wider marine environment is judged to be insensitive to short-term and discrete disturbances of the sediments present which may release

sediment-bound contaminants, with a high capacity to adapt to any occurrences. There is no applicable quality status which may be affected by these works. The wider marine environment is anticipated to recover fully, and any effect will be temporary, if at all. Therefore, the sensitivity of the wider marine environment is judged to be **Negligible.**

7.9.2.7 All designated coastal waters were classified as 'High' except for Southwest Irish Sea (Has 11;12) which is classified as 'Good'. These characterisations and classifications indicate stable, healthy, and resilient conditions with a capacity to adapt to the change where baseline conditions are already strong, and effects are considered temporary. The transitional waterbodies were all classified as 'Moderate' and two were at risk of not meeting 'Good' quality status by 2027 under the requirements of the WFD. The designated coastal and transitional waterbodies are conservatively judged to have a moderate capacity to accommodate a temporary increase in re-suspension of contaminated sediments since increased contaminant availability may alter the WFD quality status of the waterbody even if baseline characteristics suggests there are not high levels of contaminants in the sediment. Moreover, the designated coastal and transitional waters are anticipated to recover fully, and any effect will be temporary if at all. The overall sensitivity of coastal and transitional waterbodies is listed in Table 7.25.

7.9.2.8 Of the designated BWs, three were classified as 'Excellent' and three as 'Good' with a history of 'Excellent' status. The designated BWs water quality status is dependent on the monitoring of bacterial counts. There is no source-receptor-pathway which could affect bacterial counts at BWs affected by release of sediment-bound contaminants. The increase of sediment bound contaminants wouldn't alter the quality status of the BWs. The sensitivity of designated BWs are judged to be insensitive to short-term and discrete disturbances of the sediments present which may release sediment-bound contaminants, with a high capacity to adapt to any occurrences. Moreover, the designated BWs are anticipated to recover fully, and any effect will be temporary if at all. The overall sensitivity of BWs is listed in Table 7.25.

Table 7.25: Sensitivity of MW&SQ receptors to potential changes in water quality from release of sediment bound contaminants

MW&SQ Receptor	Specific Site	Overall Sensitivity
Non-designated sites	Wider marine environment	Rated as **Negligible**
Designated coastal and transitional waterbodies	Brittas Bay (HA10)	Rated as **Medium**
	Killiney Bay (HA10)	Rated as **Medium**
	Southwest Irish Sea (Has 11;12)	Rated as **Medium**
	Owenavorragh Estuary	Rated as **Medium**
	Broad Lough	Rated as **Medium**
	Avoca Estuary	Rated as **Medium**
	Kilcoole Marsh	Rated as **Medium**
Designated BWs	Silver Strand Beach	Rated as **Low**
	Brittas Bay North Beach	Rated as **Low**

	Brittas Bay South Beach	Rated as **Low**
	Clogga Beach	Rated as **Low**
	Ballymoney, North Beach	Rated as **Low**
	Courtown, North Beach	Rated as **Low**

Construction phase

MAGNITUDE OF THE IMPACT

7.9.2.9 The tidal regime has been shown to be relatively energetic within both the Array Area and less so the Cable Corridor and Working Area. The energetic tidal currents indicate that the discharge location has no restricted dilution or dispersion. Thus, it is expected that, whilst there may be some contaminant release (noting analysis indicates sediment contamination levels do not exceed Irish upper AL thresholds), this is likely to be rapidly dispersed with tidal currents. As such, an increase in the bioavailability of the contaminants which could result in any adverse ecotoxicological effects is not expected.

7.9.2.10 Typically, whilst very small sediment-bound contaminant concentrations enter the dissolved phase, the vast majority remain adhered to the sediment particles when temporarily entering suspension in the water column. Thus, it is considered highly unlikely that the MAC-EQS threshold will be exceeded for any of the substances as a result of disturbing sediment from the proposed activities, given the fates of the plumes.

7.9.2.11 Moreover, given the short-term nature of the works and presence of the sediment plumes, any small uplift in the water concentrations of ESQ substances would be anticipated to return to background levels very quickly (and thus not materially impact any Annual Average (AA) EQS).

7.9.2.12 It should be noted that any activities disturbing sediment within the Array Area and offshore Cable Corridor and Working Area are not anticipated to heavily impact the designated WFD waterbodies. The Project specific modelling indicates that no works undertaken in the Array Area or offshore Cable Corridor and Working Area have measurable changes in SSC within the WFD water bodies or BWs (Volume II, Chapter 6: Coastal Processes).

7.9.2.13 The magnitude of the increases to SSC, and associated availability of sediment bound contaminants, from construction activities has been assessed in Table 7.26.

Table 7.26: Determination of the magnitude of Impact 2 during the construction phase

Magnitude	Definition
Extent	The temporary impact of sediment resuspension, and potential release of sediment bound contaminants, from construction activities is expected to be restricted to the near field and the adjacent areas of the far-field (within one tidal cycle/ mean spring tidal excursion).
Duration	Sediment resuspension from installation activities will be restricted to the construction phase of the project (for which the offshore phase has a conservative assumption of 5 years) and will therefore be short-term (1 - 7 years), although works in any given

Magnitude	Definition
	discrete location and activity within the project boundary will be classified as temporary (considerably less than 1 year).
Frequency	Sediment resuspension will occur frequently in discrete areas throughout the construction phase of the development.
Probability	The impact of released sediment bound contaminants upon the water quality receptors can reasonably be expected to occur (if contamination is present).
Consequence	Sediment plumes are expected to quickly dissipate after cessation of the activities, noting if there is any contaminated sediment, it will simultaneously be dispersed with the tidal currents. As such, it is not expected that a notable increase in the bioavailability of contaminants will occur with barely discernible changes to the water column.
Overall Magnitude	The potential magnitude of the predicted changes is rated as **Low adverse**.

SIGNIFICANCE OF EFFECT

The significance of effects of the release of sediment bound contaminants from construction activities on the identified receptors have been carefully assessed in accordance with the matrix provided in

7.9.2.14 Table 7.19.

7.9.2.15 The sensitivity of the wider marine environment has been assessed as **Negligible**. The magnitude of Impact 2 from construction activities has been assessed as **Low adverse.** Consequently, the significance of Impact 2 on the wider marine environment as a result of construction activities is concluded to be **Imperceptible.**

7.9.2.16 The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**. The magnitude of Impact 2 from construction activities has been assessed as **Low adverse**. Consequently, the significance of Impact 2 on designated coastal and transitional waterbodies as a result of construction activities is concluded to be **Slight adverse.**

7.9.2.17 The sensitivity of designated BWs has been assessed as **Low**. The magnitude of Impact 2 from construction activities has been assessed as **Low adverse**. Consequently, the significance of Impact 2 on designated BWs as a result of construction activities is concluded to be **Slight adverse.**

PROPOSED MITIGATION

7.9.2.18 The significance of effect from Impact 2 during the construction phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.2.19 Table 7.20 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

7.9.2.20 The significance of effect from Impact 2 during the construction phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.2.21 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

Operational and maintenance phase

MAGNITUDE OF THE IMPACT

7.9.2.22 During the O&M phase of the Proposed Development, geophysical surveys of the seabed and assets (i.e., WTG foundations, OSP foundations, inter-array cables and interconnector cables) will be conducted routinely with survey vessel(s) or unmanned surface vehicles every six months for the first two years and annually thereafter. Any disturbed sediment from these surveys is expected on a short-term and localised basis, occurring from the placement of an instrument and its' mooring system on the seabed to sediment removal (as boreholes/ grabs). Sediment disturbance resulting from survey activities will typically be of shorter duration (hours to days), lesser magnitude and to a more localised extent when compared to those resulting from installation/reburial/repair activities. If a section of the cable became exposed or damaged it would require reburial and/ or replacement undertaken using similar techniques to that set out in the assessment of disturbed sediment associated with cable installation activities. However, the lengths of the cable to be replaced or reburied would be shorter, and the potential impacts consequently will be more localised and occur over a shorter duration than those considered in the construction phase (see Table 7.26).

7.9.2.23 Overall, whilst activities associated with the Proposed Development during the O&M phase will result in seabed sediment disturbance into the water column, primarily through cable protection and re-burial works, if required, the volumes disturbed are much less than those disturbed during the construction phase. As the magnitude of effect during the construction phase for all activities has been assessed as Low, the magnitude of the release of sediment bound contaminants during the O&M phase are considered to be Negligible (Table 7.27).

Table 7.27 Determination of magnitude of Impact 2 during the O&M phase

Magnitude	Definition
Extent	The temporary impact of increased SSC, and so the potential release of sediment bound contaminants, from Proposed Development activities will be localised to within the ZoI (i.e. restricted to the near -field and immediately adjacent far-field areas).
Duration	Sediment suspension is anticipated to be brief (i.e. in the order of hours/ up to days).
Frequency	Sediment disturbance will occur infrequently throughout the O&M phase.
Probability	The impact of released sediment bound contaminants upon the water quality receptors can reasonably be expected to occur (if contamination is present).
Consequence	Sediment plumes are expected to quickly dissipate after cessation of the activities, noting if there is any contaminant sediment, it will simultaneously be dispersed with the tidal currents. As such, it is not expected that a notable increase in the bioavailability of contaminants will occur with barely discernible changes to the water column.
Overall Magnitude	The potential magnitude of the predicted changes is rated as **Negligible**.

The significance of effects of the release of sediment bound contaminants from O&M activities on the identified receptors have been carefully assessed in accordance with the matrix provided in

7.9.2.24 Table 7.19.

7.9.2.25 The sensitivity of the wider marine environment has been assessed as **Negligible**. The magnitude of Impact 2 from O&M activities has been assessed as **Negligible**. Consequently, the significance of Impact 2 on the wider marine environment as a result of O&M activities is concluded to be **Imperceptible.**

7.9.2.26 The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**. The magnitude of Impact 2 from O&M activities has been assessed as **Negligible.** Consequently, the significance of Impact 2 on designated coastal and transitional waterbodies as a result of O&M activities is concluded to be **Not significant.**

7.9.2.27 The sensitivity of designated BWs has been assessed as **Low**. The magnitude of Impact 2 from O&M activities has been assessed as **Negligible**. Consequently, the significance of Impact 2 on designated BWs as a result of O&M activities is concluded to be **Not significant.**

PROPOSED MITIGATION

7.9.2.28 The significance of effect from Impact 2 during the O&M phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.2.29 Table 7.20 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

7.9.2.30 The significance of effect of Impact 2 during the O&M phase is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.2.31 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

Decommissioning phase

MAGNITUDE OF THE IMPACT

7.9.2.32 Activities associated with the decommissioning phase that will result in seabed sediment disturbance into the water column in volumes considered to be equal to, or less than, those disturbed during the construction phase (see Section 7.9.1.46). Therefore, the magnitude (and so significance) of the effect on MW&SQ resulting from decommissioning activities would be no greater than those assessed in the construction phase. The potential magnitude of the predicted change is explained in Table 7.28.

Table 7.28 Determination of the magnitude of Impact 2 during the decommissioning phase

Magnitude	Definition
Extent	The temporary impact of increased SSC, and so the potential release of sediment bound contaminants, from Proposed Development activities will be localised to within the ZoI (i.e. restricted to the near -field and immediately adjacent far-field areas).
Duration	The potential release of sediment bound contaminants will be restricted to the decommissioning phase of the Proposed Development (for which the offshore phase has a conservative assumption of 2 years) and will therefore be short-term (1 - 7 years), although works in any given discrete location and activity within the project boundary will be classified as temporary (considerably less than 1 year).
Frequency	Increased SSC will occur frequently in discrete areas throughout the decommissioning phase of the Proposed Development.
Probability	The impact of released sediment bound contaminants upon the water quality receptors can reasonably be expected to occur.
Consequence	Sediment plumes are expected to quickly dissipate after cessation of the activities, noting if there is any contaminated sediment, it will simultaneously be dispersed with the tidal currents. As such, it is not expected that a notable increase in the bioavailability of contaminants will occur with barely discernible changes to the water column.
Overall Magnitude	The potential magnitude of the predicted changes is rated as **Low adverse**.

SIGNIFICANCE OF EFFECT

The significance of effects of the release of sediment bound contaminants from decommissioning activities on the identified receptors have been carefully assessed in accordance with the matrix provided in

7.9.2.33 Table 7.19.

7.9.2.34 The sensitivity of the wider marine environment has been assessed as **Negligible**. The magnitude of Impact 2 from decommissioning activities has been assessed as **Low adverse.** Consequently, the significance of Impact 2 on the wider marine environment as a result of decommissioning activities is concluded to be **Imperceptible.**

7.9.2.35 The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**. The magnitude of Impact 2 from decommissioning activities has been assessed as **Low adverse**. Consequently, the significance of Impact 2 on designated coastal and transitional waterbodies as a result of decommissioning activities is concluded to be **Slight adverse.**

7.9.2.36 The sensitivity of designated BWs has been assessed as **Low.** The magnitude of Impact 2 from decommissioning activities has been assessed as **Low adverse**. Consequently, the significance of Impact 2 on designated BWs as a result of decommissioning activities is concluded to be **Slight adverse.**

PROPOSED MITIGATION

The significance of effect from Impact 2 from decommissioning activities is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.2.37 Table 7.20 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

The significance of effect from Impact 2 from decommissioning activities is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.2.38 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

7.9.3 Impact 3 - Accidental releases or spills of materials or chemicals.

7.9.3.1 There is a possibility that substances such as grease, oil, fuel, anti-fouling paints and grouting materials may be accidentally released into the marine environment. The Developer is committed to the use of best practice, due diligence, and pollution prevention guidelines at all times. All Project personnel and contractors will be required to be fully compliant with their responsibilities as defined by the relevant regulations and guidance, for example:

- The Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (as amended) (Schedule 4, Part 5);
- International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 (as amended). (Annex II, and Annex III regulations);
- International Convention for the Safety of Life at Sea (SOLAS) (Chapter VII);
- OSPAR Annex III: On the Prevention and Elimination of Pollution from Offshore Sources; and
- The Merchant Shipping (Prevention of Pollution by Garbage from Ships) Regulations 2020.

7.9.3.2 There will be an EMP covering all stages of the Proposed Development (See Volume III, Appendix 25.1). This, notably, includes a Marine Pollution Contingency Plan (MPCP) ensuring any potential risk of spillage or pollution is minimised. This commitment ensures the use of appropriate preventative measures and serves as an embedded mitigation against this type of pollution incidence. The MPCP concluded that the likelihood of spill incidents occurring with control measures in place were 'Low' or 'Very low'. If an accidental spill occurs, all relevant parties would be informed as required in the MPCP. Furthermore, any pre-empted discharges that could arise will be permitted and likely in small volumes, intermittent and would dilute and disperse quickly.

7.9.3.3 The transport and handling of chemicals and materials will be well-monitored. As mentioned in Chapter 4 (Description of Development), vessel fuelling and refuelling will typically take place in port. Vessel to vessel refuelling outside a port or harbour is a prescribed operation in the Irish Exclusive Economic Zone (EEZ) under the Sea Pollution (Amendment) Act 1999 (section 12) and requires a permit which will be obtained in advance as required. Crew Transfer Vessels (CTVs) will be refuelled at the Operations and Maintenance Facility (OMF) within Arklow's South Dock. Therefore, the vessel traffic and movement of materials/chemicals will be easily tracked.

7.9.3.4 Recently, Tornero and Hanke (2016) presented a generic list of potential chemicals released from offshore wind energy facilities, which includes aluminium, copper, zinc, iron, diuran, irgarol, hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs)), silicon fluids, mineral oils, (bio-) diesel, vegetable oils, synthetic esters, ethylene glycol, propylene glycol, and sulfuric acid. There is no data available about the total amount of chemical emissions from OWFs, but they are likely to be very low compared to chemical emissions from fossil energy related offshore platforms (e.g. UK oil & gas industry reported 102,500 t of chemical emissions in 2015 (Oil & Gas UK, 2016)) (Tornero & Hanke, 2016). This list of potential chemicals released from OWFs can be used to aid this assessment on the effect of accidental releases and spills from the Proposed Development activities.

SENSITIVITY OF THE RECEPTOR

7.9.3.5 The MW&SQ receptors have been split into three categories; the wider marine environment (i.e. non-designated sites of local importance), designated coastal and transitional waters (of international importance), and designated BW's (of international importance), to accurately identify their sensitivity. Within these categories, the specific receptor sites have been listed individually as their sensitivity may vary (e.g. the sensitivity of a designated coastal waterbody classified as 'Bad' will be higher than one classified as 'High' when assessing the accidental

release or spill of materials or chemicals since there would be a decreased tolerance and recoverability). The overall sensitivity of each MW&SQ receptor to the accidental or spills of materials or chemicals has been assessed in Table 7.29The overall sensitivity of each MW&SQ receptor to the accidental or spills of materials or chemicals has been assessed in Table 7.29. .

7.9.3.6 The MW&SQ Study Area, and wider regional marine environment, has been characterised in Section 7.5.2. All reports indicated a healthy baseline environment, characteristic of coastal areas connecting to the Irish Sea. The sensitivity of the wider marine environment is judged to possess a high capacity to accommodate the potential release or spills of chemicals or materials from the Proposed Development. Furthermore, there is no applicable quality status which may be affected by these works in the case of a potential release or spill of materials or chemicals. The wider marine environment is anticipated to recover fully, and any effect will be temporary, if at all. Therefore, the sensitivity of the wider marine environment is listed in Table 7.29.

7.9.3.7 All designated coastal waters were classified as 'High' except for Southwest Irish Sea (Has 11;12) which is classified as 'Good'. These classifications indicate stable, healthy, and resilient conditions with a capacity to adapt to the change where baseline conditions are already strong. The transitional waterbodies were all classified as 'Moderate' and two were 'at risk' of not meeting 'Good' quality status by 2027 under the requirements of the WFD. The designated coastal and transitional waterbodies are conservatively judged to have a moderate capacity to accommodate the potential accidental release or spills of chemicals or materials since increased chemical contamination has potential to alter the WFD quality status of the affected waterbody. The dispersion of any spilt materials is expected to occur naturally via tidal currents present in the Study Area and therefore, the designated coastal and transitional waters are anticipated to recover fully, and any effect will be temporary if at all. The overall sensitivity of coastal and transitional waterbodies is listed in Table 7.29.

7.9.3.8 Of the designated BWs, three were classified as 'Excellent' and three as 'Good' with a history of 'Excellent' status. The designated BWs water quality status is dependent on the monitoring of bacterial counts. Therefore, no source-receptor-pathway has been identified which could significantly affect bacterial counts at BWs. With that in mind, the accidental release or spills of materials or chemicals is not anticipated to alter the quality status of the BWs. The sensitivity of designated BWs is judged to possess a reasonable capacity to avoid and a high capacity to accommodate the potential release or spills of chemicals or materials from the Proposed Development. The designated BWs are anticipated to recover fully, and any effect will be temporary if at all. The overall sensitivity of BWs is listed in Table 7.29.

Table 7.29 Sensitivity of MW&SQ receptors to the potential changes in water quality from the accidental release or spills of material of chemicals

MW&SQ Receptor	Specific site	Overall Sensitivity
Non-designated sites	Wider marine environment	Rated as **Negligible**
Designated coastal and transitional waterbodies	Brittas Bay (HA10)	Rated as **Medium**
	Killiney Bay (HA10)	Rated as **Medium**
	Southwest Irish Sea (Has 11;12)	Rated as **Medium**
	Owenavorragh Estuary	Rated as **Medium**
	Broad Lough	Rated as **Medium**
	Avoca Estuary	Rated as **Medium**

MW&SQ Receptor	Specific site	Overall Sensitivity
	Kilcoole Marsh	Rated as **Medium**
Designated BWs	Silver Strand Beach	Rated as **Low**
	Brittas Bay North Beach	Rated as **Low**
	Brittas Bay South Beach	Rated as **Low**
	Clogga Beach	Rated as **Low**
	Ballymoney, North Beach	Rated as **Low**
	Courtown, North Beach	Rated as **Low**
	Morriscastle	Rated as **Low**

Construction phase

MAGNITUDE OF IMPACT

7.9.3.9 There is a potential risk of the accidental spillage or release of materials such as grease, fuel and oils during construction work and from vessels associated with the Proposed Development. However, the Developer is committed to the use of pollution prevention guidelines at all times. As detailed in Table 7.20, an EMP (and MPCP) will be in place such that any potential risk is minimised. Any spills (if they were to occur) would be small and disperse quickly.

7.9.3.10 There are no discharges (continuous or intermittent) proposed during the construction phase, with the exception of drilling mud (see section 7.9.1.21). Moreover, any sewage will be transferred to shore when in port rather than released. The most impactful options for the volumes of chemicals and materials used in the construction/ infrastructure associated with the Proposed Development are presented in Volume II, Chapter 4: Description of Development.

7.9.3.11 Any quantities of accidentally released materials are likely to be small. Associated lateral and vertical dispersion rates are also expected to be high. The potential impacts will be temporary in nature and project controls will be in place (see Volume III, Appendix 25.1: Environmental Management Plan). The potential magnitude of any predicted change is outlined in Table 7.30

Table 7.30: Determination of the magnitude of Impact 3 during the construction phase

Magnitude	Definition
Extent	Any quantities of accidentally released or spills of materials or chemicals are likely to be small.
Duration	Duration of measurable concentrations would be temporary if accidental spills were to occur. Rapid lateral and vertical dispersion are anticipated resulting in rapid dilution of any spilt materials.
Frequency	Infrequent (if even to occur) as any leakage/ spillage would be accidental/ unintentional.
Probability	The impact is not anticipated to occur during the proposed construction activities as controls will be in place (

Magnitude	Definition
	Table 7.20).
Consequence	If accidental spills occurred, a reduction in water quality Is not anticipated to be sufficient to alter water quality or effect waterbody performance against their EQS.
Overall Magnitude	The potential magnitude of predicted changes to water quality is rated **Negligible**.

SIGNIFICANCE OF EFFECT

The Significance of effects of the accidental release or spills of materials or chemicals from construction activities on the identified receptors have been carefully assessed in accordance with the matrix provided in

7.9.3.12 Table 7.19.

7.9.3.13 The sensitivity of the wider marine environment has been assessed as **Negligible**. The magnitude of Impact 3 from construction activities has been assessed as **Negligible.** Consequently, the significance of Impact 3 on the wider marine environment from construction activities is concluded to be **Imperceptible.**

7.9.3.14 The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**. The magnitude of Impact 3 from construction activities has been assessed as **Negligible**. Consequently, the significance of Impact 3 on designated coastal and transitional waterbodies as a result of construction activities is concluded to be **Not significant.**

7.9.3.15 The sensitivity of designated BWs has been assessed as **Low**. The magnitude of Impact 3 from construction activities has been assessed as **Negligible**. Consequently, the significance of Impact 3 on designated BWs as a result of construction activities is concluded to be **Not significant.**

PROPOSED MITIGATION

The significance of effect from Impact 3 from construction activities is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.3.16 Table 7.20 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

The significance of effect from Impact 3 from construction activities is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.3.17 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

Operational and maintenance phase

MAGNITUDE OF THE IMPACT

7.9.3.18 There is a potential risk of the accidental spillage or release of materials such as grease, fuel and oils during maintenance work and from vessels (including refuelling) associated with the Proposed Development. However, the Developer is committed to the use of pollution prevention guidelines at all times. As detailed in

7.9.3.19 Table 7.20, an EMP (and MPCP) will be in place such that any potential risk is minimised. Any spills (if they were to occur) would be small and disperse quickly. No discharges (continuous or intermittent) are proposed during the O&M phase. Moreover, any sewage will be transferred to shore when in port rather than released. Accordingly, the magnitude (and so significance) of the effect on MW&SQ resulting from O&M activities would be no greater than those assessed for construction phases.

7.9.3.20 Therefore, the magnitude of accidental spillage or release of material or chemicals from O&M activities is assessed as **Negligible.**

Table 7.31 Determination of the magnitude of Impact 3 during the O&M phase

Magnitude	Definition
Extent	Any quantities of accidentally released o*r* spills of materials or chemicals are likely to be small.
Duration	Duration of measurable concentrations would be temporary if accidental spills were to occur. Rapid lateral and vertical dispersion are anticipated resulting in rapid dilution of any spilt materials.
Frequency	Infrequent (if even to occur) as any leakage/ spillage would be accidental/ unintentional.
Probability	The impact is not anticipated to occur during the proposed construction activities as controls will be in place (Table 7.20).
Consequence	If accidental spills occurred, a reduction in water quality Is not anticipated to be sufficient to alter water quality or effect waterbody performance against their EQS.
Overall Magnitude	The potential magnitude of predicted changes to water quality is rated **Negligible**.

SIGNIFICANCE OF EFFECT

The Significance of effects of the accidental release or spills of materials or chemicals from O&M activities on the identified receptors have been carefully assessed in accordance with the matrix provided in

7.9.3.21 Table 7.19.

7.9.3.22 The sensitivity of the wider marine environment has been assessed as **Negligible**. The magnitude of Impact 3 from O&M activities has been assessed as **Negligible**. Consequently, the significance of Impact 3 on the wider marine environment from O&M activities is concluded to be **Imperceptible.**

7.9.3.23 The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**. The magnitude of Impact 3 from O&M activities has been assessed as **Negligible.** Consequently, the significance of Impact 3 on designated coastal and transitional waterbodies as a result of O&M activities is concluded to be **Not significant.**

7.9.3.24 The sensitivity of designated BWs has been assessed as **Low**. The magnitude of Impact 3 from O&M activities has been assessed as **Negligible**. Consequently, the significance of Impact 3 on designated BWs as a result of O&M activities is concluded to be **Not significant.**

PROPOSED MITIGATION

The significance of effect from Impact 3 from O&M activities is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.3.25 Table 7.20 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

The significance of effect from Impact 3 from O&M activities is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.3.26 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

Decommissioning phase

MAGNITUDE OF THE IMPACT

7.9.3.27 Activities associated with the decommissioning phase that have to potential to result in accidental release or spills of materials or chemicals into the water column are considered to be equal to, or less than, those during the construction phase. Specific decommissioning activities are outlined in Volume III, Appendix 4.1: Rehabilitation Schedule. Therefore, the magnitude (and so significance) of the effect on MW&SQ resulting from decommissioning activities would be no greater than those assessed in the construction phase. As previously stated, best practice and pollution prevention guidelines are factored in within all design phases and are applicable at all times. Furthermore, it is not anticipated that any accidental release or spill would affect the waterbody's performance against its EQSs as the potential impacts will be temporary in nature. The potential magnitude of the predicted change is explained in Table 7.32.

Table 7.32 Determinate of the magnitude of Impact 3 during the decommissioning phase

Magnitude	Definition
Extent	Any quantities of accidentally released o*r* spills of materials or chemicals are likely to be small.
Duration	Duration of measurable concentrations would be temporary if accidental spills were to occur. Rapid lateral and vertical dispersion are anticipated resulting in rapid dilution of any spilt materials.
Frequency	Infrequent (if even to occur) as any leakage/ spillage would be accidental/ unintentional.
Probability	The impact is not anticipated to occur during the proposed construction activities as controls will be in place (Table 7.20).
Consequence	If accidental spills occurred, a reduction in water quality Is not anticipated to be sufficient to alter water quality or effect waterbody performance against their EQS.
Overall Magnitude	The potential magnitude of predicted changes to water quality is rated **Negligible**.

SIGNIFICANCE OF EFFECT

The significance of effects of the accidental release or spill of materials or chemicals from decommissioning activities on the identified receptors have been carefully assessed in accordance with the matric provided in

7.9.3.28 Table 7.19

7.9.3.29 The sensitivity of the wider marine environment has been assessed as **Negligible**. The magnitude of Impact 3 from decommissioning activities has been assessed as **Negligible.** Consequently, the significance of Impact 3 on the wider marine environment from decommissioning activities is concluded to be **Imperceptible.**

7.9.3.30 The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**. The magnitude of Impact 3 from decommissioning activities has been assessed as **Negligible**. Consequently, the significance of Impact 3 on designated coastal and transitional waterbodies as a result of decommissioning activities is concluded to be **Not significant.**

7.9.3.31 The sensitivity of designated BWs has been assessed as **Low**. The magnitude of Impact 3 from decommissioning activities has been assessed as **Negligible**. Consequently, the significance of Impact 3 on designated BWs as a result of decommissioning activities is concluded to be **Not significant.**

PROPOSED MITIGATION

The significance of effect of Impact 3 from decommissioning activities is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.3.32 Table 7.20 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

The significance of effect of Impact 3 from decommissioning activities is not significant in EIA terms. Therefore, no additional mitigation to that already identified in

7.9.3.33 Table 7.20 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of MW&SQ.

7.10 Assessment of Project Design Option 2

7.10.1 Impact 1 – Deterioration in water quality due to suspension of sediments

7.10.1.1 The assessment of Project Design Option 1 is applicable for Project Design Option 2 for a consideration of Impact 1; the Project Design Envelope for installation (seabed preparation; cable preparation) for the two Proposed Developments are the same. Therefore, for a consideration of Impact 1 for Project Design Option 2, the reader is directed to Section 7.9.1.

7.10.2 Impact 2 – Release of sediment bound contaminants from disturbed sediments

7.10.2.1 The assessment of Project Design Option 1 is applicable for Project Design Option 2 for a consideration of Impact 2; the parameters for installation (seabed preparation; cable preparation) for the two Project Design Options are the same. Therefore, for a consideration of Impact 2 for Project Design Option 2, the reader is directed to Section 7.9.2

7.10.3 Impact 3 - Accidental release or spills of materials or chemicals

7.10.3.1 The assessment of Project Design Option 1 is applicable for Project Design Option 2 for a consideration of Impact 3; the parameters for vessel traffic and consumables required for the two Project Design Options were estimates and consequently, are the same. Therefore, for a consideration of Impact 2 for Project Design Option 2, the reader is directed to Section 7.9.3.

7.11 Cumulative impacts assessment methodology

7.11.1 Methodology

7.11.1.1 The CIA takes into account the impacts associated with the Proposed Development together with other proposed and reasonably foreseeable projects, plans and existing and permitted projects. The projects and plans selected as relevant to the CIA presented within this chapter are based upon the results of a screening exercise (see Volume III, Appendix 3.2: Cumulative Impact Assessment Screening). Each project and plan has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon, effect-receptor pathways and the spatial/temporal scales involved, where the process is explained in Table 7.33.

7.11.1.2 A tiered approach is adopted to provide an assessment of the Proposed Development as a whole. The tiering methodology is provided in Volume III, Appendix 3.2: CIA Screening.

7.11.1.3 The search area for MW&SQ in terms of the CIA has been determined as two tidal ellipses (approximately 22 km). A tidal excursion ellipse may be defined as the path followed by a water particle in one complete tidal cycle. Any location beyond the spring tidal excursion distance is unlikely to experience any measurable change in SSC from a sediment plume caused by Proposed Development activities. Therefore, when taking other developments into consideration, two tidal ellipses conservatively encompass any potential for spatial overlap in terms of impacts to MW&SQ receptors.

7.11.1.4 The specific projects scoped into this CIA for MW&SQ, and the tiers into which they have been allocated are presented in Table 7.33. The operational projects included within the table are included due to their completion/ commission subsequent to the data collection process for the Proposed Development and as such not included within the baseline characterisation. Other

elements of the overall project are also assessed in this section, namely the Onshore Grid Infrastructure, Operations and Maintenance Facility and EirGrid Upgrade Works.

7.11.1.5 Due to the commitments made by the Developer in respect of the Foreshore Licence FS007339 and Foreshore Licence Application FS007555 (Table 7.20), FS007339 and FS007555 have been screened out of the cumulative impact assessment.

Phase One Projects

7.11.1.6 All Phase One projects have been awarded a Maritime Area Consent (MAC), however at the time of writing, none had formally submitted applications for planning consent and as such, have not been awarded consent within the timescales of submission of the EIAR for ABWP2. Notwithstanding this, due to the likely similar development timelines of the Phase One projects and the resultant risk associated with cumulative effects, there is a requirement to assess Phase One projects within the EIAR, as appropriate and as information allows.

Table 7.33 List of other projects and plans considered within the Cumulative Impact Assessment

Project/Plan	Status	Distance from Array Area (km)	Distance from Cable Corridor and Working Areas (km)	Description of Project/Plan	Dates of Construction	Dates of Operation	Justification for screening in
Tier 1							
Arklow Onshore Grid Infrastructure (Arklow OGI)	Approved	10.2	0.0	Proposed development will comprise of onshore grid infrastructure including 220kV export cable circuits and fibre optic cables, new 220kV Geographic Information System (GIS) substation at Shelton Abbey and overhead line connection and all associated ancillary works.	2026-2030	2030 - uncertain	Potential temporal overlap with the Proposed Development construction phase.

Project/Plan	Status	Distance from Array Area (km)	Distance from Cable Corridor and Working Areas (km)	Description of Project/Plan	Dates of Construction	Dates of Operation	Justification for screening in
Arklow Bank Wind Park 2 Operations and Maintenance Facility Onshore and Nearshore infrastructure and associated works (ABWP2 OMF)	Approved	11.9	4.3	Relates to ABWP2. As part of the works, a pontoon is proposed along with up to 4 cranes for loading & unloading of vessels. Additionally, dredging of approximately 6,000 m3 of material from the nearshore is also proposed, to provide for navigational depth, berthing area and manoeuvring area for vessels.	2026 - 2030	2030 - uncertain	Potential temporal overlap with the Proposed Development construction phase.

Project/Plan	Status	Distance from Array Area (km)	Distance from Cable Corridor and Working Areas (km)	Description of Project/Plan	Dates of Construction	Dates of Operation	Justification for screening in
Arklow Bank Wind Park 1 (Arklow Offshore Array)	Operational	0	0.5	Constructed in 2003/04 consisting of seven wind turbines with a capacity of 25.2 Megawatt (MW). Included as part of the baseline environment with potential for ongoing impact to the Proposed Development.	Complete	2003/4 - uncertain	Temporal overlap with Proposed Development construction, O&M and decommissioning phases.
Arklow Bank Power Cable	Active	0.0	0.0	Export cable	Complete	2003/4 - uncertain	Potential for temporal overlap with Proposed Development construction, O&M and decommissioning phases.

Project/Plan	Status	Distance from Array Area (km)	Distance from Cable Corridor and Working Areas (km)	Description of Project/Plan	Dates of Construction	Dates of Operation	Justification for screening in
Hibernia Atlantic Telecom Cable	Active	15.4	14.8	Part of a transatlantic submarine cable system in the North Atlantic Ocean, connecting Canada, the United States, Ireland and the United Kingdom.	Complete	2021 - uncertain	Potential for temporal overlap with Proposed Development construction, O&M and decommissioning phases.
Irish Mussel Seed Company Ltd.	Operational	9.9	5.3	Aquaculture site for Blue Mussels (approximately 65.97 ha)	Complete	Ongoing	Potential for temporal overlap with Proposed Development construction, O&M and decommissioning phases.
Arklow Wastewater Treatment Plant	Active	10.79	3.38	The Project (proposed development) will comprise a new Wastewater	2022 - 2025	Ongoing	Potential for temporal overlap with Proposed Development construction, O&M and

Project/Plan	Status	Distance from Array Area (km)	Distance from Cable Corridor and Working Areas (km)	Description of Project/Plan	Dates of Construction	Dates of Operation	Justification for screening in
				Treatment Plant (WwTP), associated infrastructure including the interceptor sewer network and marine outfalls as well as an upgrade to the existing coastal revetment.			decommissioning phases.
Tier 2							
Arklow Flood relief scheme (referred to as Arklow FRS)	Conditionally Approved	11.46	4.02	Wicklow County Council (WCC), funded by the Office of Public Works (OPW), proposes to undertake engineering works along the Avoca River and surrounds to mitigate the risk of	2024 - 2028	2028 – uncertain	Potential for temporal overlap with the Proposed Development construction, O&M and decommissioning phase.

Project/Plan	Status	Distance from Array Area (km)	Distance from Cable Corridor and Working Areas (km)	Description of Project/Plan	Dates of Construction	Dates of Operation	Justification for screening in
				flooding in the Arklow town area in County Wicklow.			
Tier 3							
ABWP1 Decommissioning Assumptions		0.0	0.5		Complete	Anticipating decommissioning between 2025 – 2027 (assumed duration of 4 months)	Potential for temporal overlap with the Proposed Development construction phase.
Phase One							
Codling Wind Park (formerly known as Codling I and Codling II)	Early planning	18.2	17.3	Application expected to be made under the Maritime Area Planning (MAP) Act 2021.	2026 - 2028	2029 - uncertain	Potential for temporal overlap with Proposed Development construction, O&M and decommissioning phases.

7.11.1.7 The potential impacts, development phase, and the list of projects / plans with which the two Project Design Options have been cumulatively assessed are presented in Table 7.34.

Table 7.34: Cumulative assessment impacts, phases, scenarios, and projects to be considered cumulatively

Potential cumulative impact	Phase			Projects considered cumulatively	Justification for projects considered cumulatively
	C	O	D		
Deterioration in water quality due to suspension of sediments	✓	✓	✓	Project parameters associated with Project Design Option 1 or 2 plus the following projects: Tier 1 • Arklow OGI; • ABWP2 OMF; • ABWP1 Offshore Array; • ABWP1 Power Cable; • Hibernia Atlantic Telecom; and • Arklow Wastewater Treatment Plant. Tier 2 • Arklow FRS Tier 3 • ABWP1 Decommissioning Assumptions Phase One • Codling Wind Park	If these intermittent activities overlap temporally with either the construction or O&M activities of the Proposed Development, there is potential for cumulative SSC to occur.
Release of sediment bound contaminants from disturbed sediments	✓	✓	✓	Project parameters associated with Project Design Option 1 or 2 plus the following projects: Tier 1 • Arklow OGI; • ABWP2 OMF; • ABWP1 Offshore Array; • ABWP1 Power Cable; • Hibernia Atlantic Telecom; and • Arklow Wastewater Treatment Plant. Tier 2 • Arklow FRS Tier 3 • ABWP1 Decommissioning Assumptions Phase One • Codling Wind Park	If these intermittent activities overlap temporally with either the construction or O&M activities of the Proposed Development, there is potential for any sediment-bound contaminants to act cumulatively.

Potential cumulative impact	Phase			Projects considered cumulatively	Justification for projects considered cumulatively
	C	O	D		
Accidental release or spills of materials or chemicals	✓	✓	✓	Project parameters associated with Project Design Option 1 or 2 plus the following projects: Tier 1 • Arklow OGI; • ABWP2 OMF; • ABWP1 Offshore Array; • ABWP1 Power Cable; • Hibernia Atlantic Telecom; • Arklow Wastewater Treatment Plant; and • Irish Mussel Seed Company Ltd. Tier 2 • Arklow FRS Tier 3 • ABWP1 Decommissioning Assumptions Phase One • Codling Wind Park	If these intermittent activities overlap temporally with either the construction or O&M activities of the Proposed Development, there is potential for greater vessel traffic and larger volumes of chemicals/ materials in the marine environment at one time, cumulatively increasing the opportunities for accidental release or spills.

7.12 Cumulative impact assessment

7.12.1.1 A description of the significance of cumulative effects upon MW&SQ arising from each identified impact is given below.

7.12.2 Project Design Option 1 and 2 - Impact 1 – Deterioration in water quality due to suspension of sediments

SENSITIVITY OF THE RECEPTOR

7.12.2.1 As outlined in Section 7.9.1, temporary increases in SSC could potentially result in a reduction in water clarity, a reduction in primary production, an increase in bacterial growth, increased nutrients within the water column and a reduction in dissolved oxygen concentrations.

7.12.2.2 The potential sensitivity of the MW&SQ receptors are the same as outlined in Table 7.21 for Project Design Option 1 and 2. In summary, the sensitivity of the wider marine environment is rated as **Low**. The sensitivity of designated coastal and transitional waterbodies is rated as **Low.** The sensitivity of designated BWs is rated as **Medium.**

Construction phase

TIER 1

MAGNITUDE OF THE IMPACT

7.12.2.3 The Tier 1 projects identified as having the potential to cumulatively impact water quality due to the suspension of sediments (i.e. increased SSC) has been assessed with Project Design Options 1 and 2 and the potential magnitude of impact is discussed here. Firstly, given the low levels of sediment dispersion as demonstrated by project-specific sediment assessment, alongside the location of the majority of the other projects, there is not anticipated to be a notable spatial overlap with concentrated sediment plumes created from Tier 1 project activities. However, given the proximity of the listed Tier 1 projects, there is potential of a spatial and temporal overlap with the construction phase of the Proposed Development which may lead to a cumulative increase in SSC. The potential impacts, development phase, and the list of projects/ plans with which both Project Design Options have been cumulatively assessed are shown in Table 7.34.

7.12.2.4 ABWP2 OMF is a project required for the operation of the Proposed Development, where construction activities have the potential to temporally and physically overlap with construction activities of the Proposed Development that may lead to a cumulative increase in SSC. Of note, the ABWP2 OMF is largely based on land where construction and O&M activities pose no effect-receptor pathways in terms of MW&SQ. However, there is potential for increased SSC to occur as a result of the installation of the pontoon and associated dredging of approximately 6,000 m^3 of material from the nearshore during the construction of ABWP2 OMF. Any changes to SSC during the construction and O&M activities of the ABWP2 OMF development are expected to be temporary and intermittent, with any resultant sediment plumes expected to quickly dissipate following cessation of activities. It is not anticipated that these small scale, temporary sediment plumes will act cumulatively with those expected from the Proposed Development activities.

7.12.2.5 Due to uncertainty associated with the exact timings (day/month) of other plans and projects, there is insufficient data on project scale or timings on which to undertake a fully quantitative assessment. It is considered highly unlikely that each of the identified projects (particularly those already in operation) would be undertaking routine maintenance work analogous to Proposed Development construction activities, in particular asset reburial or repairs, as these are infrequent occurrences during the lifetime of developments (e.g. reburial/ repair of operational subsea cables such as: ABWP1 Power Cable or Hibernia Power Cable). In addition, it is noted that in line with The United Nations Convention on the Law of the Sea (UNCLOS) cable installation vessels typically request a one nautical mile (c. 1.85km) area of avoidance when installing or handling cables reducing the likelihood of cumulative sediment disturbances. All Tier 1 projects, other than ABWP2 OMF and Arklow Wastewater Treatment Plant are reported as already fully operational. Any impacts from operational Tier 1 projects in Table 7.34 are likely to be short-lived and of localised extent, with limited opportunity to overlap with the Proposed Development's activities.

7.12.2.6 Of note, is the construction of Arklow Wastewater Treatment Plant that is expected to be fully operational by 2025. Therefore, construction is not likely to temporally overlap with construction of the Proposed Development. However, the proposed long sea outfall of the Wastewater Treatment Plant will generate a small plume where effluents are released at a discharge site. Additionally, effluents are likely to contain bacterial content which is released into the water column and has potential to impact MW&SQ receptors (e.g. change the quality status of nearby designated BWs). However, the Arklow Wastewater Treatment Plant EIA Appendix 15.2: Outfall Study stated that any plume resulting from the outfall discharge was calculated to extend 200m to the North from the proposed outfall on the flood tide and about 100m to the South on the ebb and have an overall width of about 40m (Irish Hydrodata Limited, 2018). Moreover, the two closest designated BWs to the assessed discharge point were 3 km South (Clogga Beach) and 9 km

North (Brittas Bay). By modelling the potential bacterial discharge using conservatively high concentrations (*E.coli* = 1x106 cfu/100ml and IE = 2x105 cfu/100ml), it was found that any contamination in Brittas Bay or Clogga Beach arising from the outfall point would be well below the limits set out in the Bathing Water Directive (Irish Hydrodata Limited, 2018). It should also be noted that the implementation of such Wastewater Treatment Plants and potential outfall/ discharge points will have a significant positive effect on water quality in the surrounding area where it will replace existing and untreated outfalls and overflows. Overall, sediment plumes from Arklow Wastewater Treatment Plant when assessed with the Proposed Development are not anticipated to cumulatively increase SSC or cause notable effect to bacterial count at designated BWs. Therefore, no cumulative impact to MW&SQ receptors are expected.

7.12.2.7 The assessment undertaken for the Proposed Development alone shows that in almost all cases, sediment plumes are indistinguishable from background levels after 10 hours. On this basis, although there is potential for sediment plumes from Proposed Development activities to interact with those from Tier 1 projects, any overlap is expected to be short-lived and affect the near-field only. Moreover, the sediment plumes generated by Tier 1 projects are expected to behave in a similar pattern as sediments disturbed by the Proposed Development due to anticipated similarities in construction and/ or O&M activities, with a similar environmental setting and sediment characteristics. The potential increases in SSC, when considered cumulatively, are still anticipated to be within the natural variation of the MW&SQ Study Area, with no additive effects expected to water clarity or bacterial mortality. Therefore, when assessed cumulatively with the Proposed Development, the magnitude of the impact is considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.8 Table 7.19. Where the magnitude of Impact 1 from construction activities acting cumulatively with Tier 1 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.9 Therefore, the significance of effect of Impact 1 from the construction of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

TIER 2

MAGNITUDE OF THE IMPACT

7.12.2.10 Only one Tier 2 project (i.e. Arklow FRS) was identified as having the potential to cumulatively impact water quality due to the suspension of sediments when considered with the Proposed Development. This section assesses Arklow FRS with Project Design Options 1 and 2 and Tier 2 projects (Table 7.34).

7.12.2.11 The construction of Arklow Flood relief scheme will predominantly take place upstream of the Avoca Estuary in the Avoca River. Construction activities of Arklow FRS may disturb the sediment in the riverbed and thus increase suspended solids concentrations in the Avoca Estuary. Sediment plume will be experiences during dredging, in-channel construction works such as construction of bunds, temporary haul roads and causeway when machinery disturbs the riverbed. The Arklow FRS EIA stated that a moderate (not significant) temporary negative impact on water quality in the Avoca River from increase siltation may occur during its construction. It was also reported that impacts on coastal waters during the construction of the proposed scheme relate primarily to the excavation and potential dispersion of sediments. For this reason, several measures were actioned in the CSEMP for the application of the development which outlined specifically:

- “Dredging works in the river will be confined to either the northern half or the southern half of the channel at any one time to minimise impact of suspended sediment in water.”
- “Dredging works in the river will be limited to 10 hours per day to allow 14 hours for water to clear…”
- “Restricting the dredging hours, as described above, will also limit the impact on coastal waters off the mouth of the estuary. Moreover, sediment plumes emanating from the Avoca River estuary are an existing feature of high flows in the Avoca River.”

7.12.2.12 The Avoca River, for the great majority of the tidal cycle is expected to flow in an easterly direction (ca 10 hours) where sediment laden water is washed downstream and out to sea. As such, the low tidal exchange rate brought about by the near-by tidal node, velocities will be very weak and are not anticipated to transport sediment particles far from the dredge site. Overall, any disturbed sediment caused by Arklow FRS are not anticipated to cumulatively increase SSC when assessed with the Proposed Development and Tier 1 projects. Therefore, no cumulative impact to MW&SQ receptors are expected.

7.12.2.13 The assessment undertaken for the Proposed Development alone shows that in almost all cases, sediment plumes are rapidly indistinguishable from background levels. On this basis, although there is limited potential for sediment plumes from Proposed Development construction activities to interact with those from Tier 1 and Tier 2 resulting in seabed disturbance, any overlap is expected to be short-lived and infrequent (if any). The potential increases in SSC, when considered cumulatively, are still anticipated to be within the natural variation of the MW&SQ

Study Area, where no additive effect is expected to water clarity or bacterial mortality. Hence, even with the addition of Tier 2 projects, the magnitude of the impact is considered to stay the same as the assessment of the Proposed Development and Tier 1 projects. Therefore, when assessed cumulatively with the Proposed Development, the magnitude of the impact is considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

7.12.2.14 The significance of effect has been carefully assessed in accordance with the matrix provided in Table 7.18. Where the magnitude of Impact 1 from construction activities acting cumulatively with Tier 1 and Tier 2 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.15 Therefore, the significance of effect of Impact 1 from the construction of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 and Tier 2 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

TIER 3

MAGNITUDE OF THE IMPACT

7.12.2.16 In the case of ABWP1 potentially seeking consent for a license for the decommissioning of the existing 7 WTGs in the near future, an assumption of decommissioning will be assessed on a precautionary basis (i.e. potential overlap of 1 year with the construction of the Proposed Development, where the assumed decommissioning duration is of 4 months). There is potential for certain ABWP1 decommissioning activities to increase SSC and therefore it is important to take these into consideration if there is to be a temporal overlap with the Proposed Development.

7.12.2.17 Of note, is the monopiles and seabed remediation. It is anticipated that ABWP1 monopiles will be cut with an internal cutting tool at a depth of approximately 3 m below the mudline, where it is anticipated that all lifts are 300t or less, which given monopile dimensions is conservative. Seabed remediation is likely to include export and inter-connector cables being left *in situ* and monopile areas backfilled with local material from scour protection area then over trawled to level. Based off these assumptions, there is a possibility that sediment plumes may act cumulatively with those created during the construction phase of the Proposed Development. However, since majority of cables will be left *in situ*, greatest disturbed sediment will take place near the ABWP1 Offshore Array and are unlikely to reach designated BWs. Moreover, from the assessment undertaken for the Proposed Development alone, in almost all cases, sediment plumes are rapidly indistinguishable from background levels. On this basis, although there presents limited potential for sediment plumes from Proposed Development construction activities to interact with those from Tier 1, Tier 2 and Tier 3 resulting in seabed disturbance, any overlap is expected to be short-lived and infrequent. The potential increases in SSC, when considered cumulatively, are still anticipated to be within the natural variation of the MW&SQ Study Area, where no additive effect is expected to water clarity or bacterial mortality. Hence, even with the addition of Tier 3 projects, the magnitude of the impact is considered to stay the same as the assessment of the Proposed Development, Tier 1 and Tier 2 projects. Therefore, when assessed cumulatively with the Proposed Development, the magnitude of the impact is considered to be **Low** for both Project Design Options.

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.18 Table 7.19. Where the magnitude of Impact 1 from construction activities acting cumulatively with Tier 1, Tier 2, and Tier 3 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.19 Therefore, the significance of effect of Impact 1 from the construction of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, and Tier 3 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.2.20 Due to the similarity in estimated development timelines, construction activities and resultant risks associated with cumulative effects, Phase One projects have potential to disturb sediment that may lead to a cumulative increase in SSC. Only one Phase One project (i.e. Codling Wind Park) was within proximity of the Proposed Development with a spatial and temporal overlap that could result in cumulative increased SSC.

7.12.2.21 In the instance of two or more separately formed plumes that meet and coalesce, the physical laws of dispersion theory mean concentrations within the plumes are not additive but instead a larger plume is created with regions of potentially differing concentration representative of the separate respective plumes. In contrast, in the case of plumes formed by a dredging vessel operating within the plume created by foundation installation or bed preparation activities (or vice versa), the two plumes would be additive, creating a plume with higher SSC. The assessment undertaken for the Proposed Development alone shows that in almost all cases, sediment plumes are rapidly indistinguishable from background levels. On this basis, although there is limited potential for sediment plumes from Proposed Development activities to interact with those from Tier 1, Tier 2, Tier 3 and Phase One activities resulting in seabed disturbance, any overlap is expected to be short-lived. Furthermore, it should be noted that given the ambiguity of construction programme durations, paired with the relative distances, it is unlikely that a simultaneous temporal and spatial overlap would frequently occur.

7.12.2.22 The potential increases in SSC, when considered cumulatively, are still anticipated to be within the natural variation of the MW&SQ Study Area, where no additive effect is expected to water clarity or bacterial mortality. Hence, even with the addition of Phase One projects, the magnitude of the impact is considered to stay the same as the assessment of the Proposed Development, Tier 1, Tier 2 and Tier 3 projects. Therefore, when assessed cumulatively with the Proposed Development, the magnitude of the impact is considered to be **Low** for both project design options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.23 Table 7.19. Where the magnitude of Impact 1 from construction activities acting cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.24 Therefore, the significance of effect of Impact 1 from the construction of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Slight adverse**, which is not significant in EIA terms.

Operational and maintenance phase

TIER 1

MAGNITUDE OF THE IMPACT

7.12.2.25 Whilst activities associated with the Proposed Development during the O&M phase will result in seabed disturbances into the water column, primarily through cable protection and reburial works, if required, the volumes disturbed are much less than those disturbed during the construction phase. Moreover, all identified Tier 1 projects are expected to be fully operational by the O&M phase of the Proposed Development further reducing the likelihood of cumulative increased SSC. For example, construction of ABWP2 OMF was noted to have potential of increased SSC due to the installation of a pontoon and associated dredging of approximately 6,000 m^3 of material from the nearshore during the construction of ABWP2 OMF. However, this potential cumulative interaction is dependent on the temporal overlap of ABWP2 construction phase and the Proposed Development construction phase, so there is no potential for sequential cumulative effects. Since Tier 1 projects are expected to be in the O&M phase, the overall probability of cumulative increases in SSC is substantially reduced compared to the potential overlaps assessed during the construction phase of the Proposed Development. Therefore, the potential increases in SSC, when considered cumulatively, are still anticipated to be within the natural variation of the MW&SQ Study Area, where no additive effect is expected to water clarity or bacterial mortality. When assessed cumulatively with the O&M phase of the Proposed Development, the magnitude of the impact is conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.26 Table 7.19. Where the magnitude of Impact 1 from O&M activities acting cumulatively with Tier 1 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.27 Therefore, the significance of effect of Impact 1 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

TIER 2

MAGNITUDE OF THE IMPACT

7.12.2.28 Only one Tier 2 project, Arklow FRS, was identified with potential for spatial overlap. However, Arklow FRS is expected to be fully constructed by the O&M phase of the Proposed Development, alleviating any of the sediment disturbance from construction works. However, it should be noted that the implementation of maintenance works is essential throughout the approximate 50-year plus lifespan of the FRS which is required to contribute to a positive long-term effect to flood risk. In particular, maintenance dredging was reported as a requirement approximately every ten years but will be based more accurately riverbed surveys. This maintenance work may result in suspended sediment flowing out to the Avoca Estuary, in much smaller volumes than is expected with construction, and not in concentrations that will act cumulatively with the Proposed Development. Moreover, the Arklow FRS EIA (Appendix 15.2: Dredge Material and Management Study) stated that dredged material for disposal at sea is only to be considered if material cannot be reused, recycled or recovered. Therefore, no cumulative increase in SSC is expected with Tier 2 projects, where no additive effect is anticipated in regard to water clarity or bacterial mortality. When assessed cumulatively with the O&M phase of the Proposed Development, the magnitude of the impact is conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

7.12.2.29 The significance of effect has been carefully assessed in accordance with the matrix provided in Table 7.18. Where the magnitude of Impact 1 from O&M activities acting cumulatively with Tier 1 and Tier 2 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.30 Therefore, the significance of effect of Impact 1 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 and Tier 2 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

TIER 3

MAGNITUDE OF THE IMPACT

7.12.2.31 There is no temporal overlap between the O&M phase of the Proposed Development and any listed Tier 3 projects. Therefore, there is no change in cumulative assessment from Tier 1 and Tier 2 projects.

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.32 Table 7.19. Where the magnitude of Impact 1 from O&M activities acting cumulatively with Tier 1, Tier 2 and Tier 3 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low;**
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.33 Therefore, the significance of effect of Impact 1 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2 and Tier 3 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.2.34 Whilst activities associated with the Proposed Development during the O&M phase will result in seabed disturbances into the water column, primarily through cable protection and reburial works, if required, the volumes disturbed are much less than those disturbed during the construction phase for both developments during the O&M phase. Moreover, Codling Wind Park is expected to be operational by the O&M phase of the Proposed Development further reducing the likelihood of cumulative increased SSC. No cumulative increase in SSC is expected with Phase One projects, where no additive effect is anticipated in regard to water clarity or bacterial mortality. When assessed cumulatively with the O&M phase of the Proposed Development, the magnitude of the impact is conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.35 Table 7.19. Where the magnitude of Impact 1 from O&M activities acting cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.36 Therefore, the significance of effect of Impact 1 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Slight adverse**, which is not significant in EIA terms.

Decommissioning phase

TIER 1

MAGNITUDE OF THE IMPACT

7.12.2.37 Activities associated with the Proposed Development during the decommissioning phase will result in seabed sediment disturbance into the water column, the volumes of which are considered to be equal to, or less than, those disturbed during the construction phase. Additionally, Tier 1 projects are likely to be fully operational or decommissioned (i.e. dates are uncertain), in which case the cumulative effects are also considered to be equal to, or less than, those assessed in the construction phase of the Proposed Development.

7.12.2.38 Given that the cumulative magnitude of effect during the construction phase has been assessed as Low, impacts arising as a result of disturbed sediment during the decommissioning phase are also considered to be Low. Therefore, when considered cumulatively with the Proposed Development and Tier 1 projects, the magnitude of the impact is considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.39 Table 7.19. Where the magnitude of Impact 1 from decommissioning activities acting cumulatively with Tier 1 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.40 Therefore, the significance of effect of Impact 1 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

TIER 2

MAGNITUDE OF THE IMPACT

7.12.2.41 Only one Tier 2 project, Arklow FRS, was identified within the MW&SQ Study Area and is expected to be fully constructed well before the decommissioning phase of the Proposed Development. Aklow FRS is expected to have a minimum 50-year design life. However, it should be noted that the implementation of maintenance works is essential throughout the lifespan of the FRS. In particular, maintenance dredging was reported as a requirement approximately every ten years but will be based more accurately on riverbed surveys. This maintenance work may result in suspended sediment flowing out to the Avoca Esturay, in much smaller volumes than is expected with construction, and not in concentrations that will act cumulatively with the Proposed Development.

7.12.2.42 No additive effect is expected by Tier 2 projects in terms of increased SSC or resulting effects to water quality. Therefore, there is no anticipated reduction in water clarity or bacterial mortality from The Proposed Development and Tier 2 projects. When assessed cumulatively with the decommissioning phase of the Proposed Development, the magnitude of the impact is conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.43 Table 7.19. Where the magnitude of Impact 1 from decommissioning activities acting cumulatively with Tier 1 and Tier 2 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.44 Therefore, the significance of effect of Impact 1 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 and Tier 2 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

TIER 3

MAGNITUDE OF IMPACT

7.12.2.45 There is no temporal overlap between the decommissioning phase of the Proposed Development and any listed Tier 3 projects. Therefore, there is no change in cumulative assessment from Tier 1 and Tier 2 projects.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.46 Table 7.19. Where the magnitude of Impact 1 from decommissioning activities acting cumulatively with Tier 1, Tier 2 and Tier 3 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as Low; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.47 Therefore, the significance of effect of Impact 1 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2 and Tier 3 projects is expected to be **Slight adverse**, which is not significant in EIA terms.

PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.2.48 Activities associated with the Proposed Development during the decommissioning phase will result in seabed sediment disturbance into the water column, the volumes of which are considered to be equal to, or less than, those disturbed during the construction phase. Moreover, it is uncertain whether Codling Wind Park will be operational or decommissioned, where both are less likely to increase SSC than the assessment carried out for the overlapping construction phases. Further, when considered cumulatively Tier 1, Tier 2 and Phase One projects, the magnitude of the impact is considered to be **Low** for both Project Design Options during the decommissioning phase.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.2.49 Table 7.19. Where the magnitude of Impact 1 from decommissioning activities acting cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Low**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Low**; and
- The sensitivity of designated BWs has been assessed as **Medium**.

7.12.2.50 Therefore, the significance of effect of Impact 1 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Slight adverse**, which is not significant in EIA terms.

7.12.3 Project Design Option 1 and 2 - Impact 2 – Release of sediment bound contaminants from disturbed sediments

SENSITIVITY OF THE RECEPTOR

7.12.3.1 As outlined in Section 7.9.2, the release of sediment bound contaminant from activities disturbing the sediment could lead to an increased contaminant bioavailability with the potential for ecotoxicological effects.

7.12.3.2 The potential sensitivity of the MW&SQ receptors will be the same as outlined in Table 7.25 for Project Design Option 1 and 2. In summary, the sensitivity of the wider marine environment is rated as **Negligible**. The sensitivity of designated coastal and transitional waterbodies is rated as **Medium**. The sensitivity of designated BWs is rated as **Low.**

Construction phase

TIER 1

MAGNITUDE OF THE IMPACT

7.12.3.3 The sediment plumes generated by Tier 1 projects considered here, are anticipated to behave in a similar pattern as the sediments being disturbed for the Proposed Development due to expected similarities in operational design (i.e. cable reburial/ repair) combined with a similar environmental setting and sediment characteristics. Due to proximity, a generalised assumption can be made that contaminants present in sediment from the wider marine area will have followed a similar environmental fate to those in the MW&SQ Study Area of the Proposed Development. Therefore, it is unlikely that any unaccounted-for contaminants would be introduced by the potential cumulative sediment plumes.

7.12.3.4 If two plumes were to act cumulatively, this may have potential to increase bioavailability of contaminants in the water column, increasing the likelihood of effect on identified receptors. However, the potential increases in SSC, when considered cumulatively, are still anticipated to be within the natural variation of the MW&SQ Study Area. Moreover, surveys from the Array Area (see Table 7.12) have indicated that sediment contamination levels were all comparable to the wider regional background, not considered to be of low quality, and will not result in significant effect-receptor pathways if made bioavailable.

7.12.3.5 Typically, whilst very small sediment-bound contaminant concentrations enter to the dissolved phase, the vast majority remain adhered to the sediment particles when temporarily entering suspension in the water column. Similar to the assessment of the Proposed Development alone, the sediment (and associated contaminants) from construction activities is expected to rapidly disperse with tidal currents. Therefore, any increase in contaminant bioavailability that could lead to ecotoxicological effects is not expected. When assessed cumulatively with the Proposed

Development, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.6 Table 7.19. Where the magnitude of Impact 2 from construction activities acting cumulatively with Tier 1 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.7 Therefore, the significance of effect of Impact 2 from the construction phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

TIER 2

MAGNITUDE OF THE IMPACT

7.12.3.8 Only one Tier 2 project, specifically Arklow FRS, has been identified as having potential to affect water quality due to the re-suspension of sediment-bound contaminants when evaluated alongside the Proposed Development and Tier 1 projects (refer to Table 7.3). The construction of Arklow FRS is primarily planned upstream of the Avoca Estuary in the Avoca River. As detailed in Impact 1, the construction activities of Arklow FRS are not expected to cumulatively increase SSC when considered alongside the Proposed Development and Tier 1 projects. The potential disturbance of sediment (and so suspension of sediment-bound contaminants) when considered cumulatively, are still anticipated to be within the natural variation of the MW&SQ Study Area. In addition, any sediment-bound contaminants are not likely to be in suspension past normal storm conditions and therefore it is concluded that no cumulative impact on water quality receptors are expected.

7.12.3.9 Of note is the potential introduction of sediment bound contaminants from the disturbed riverbed. Since the Arklow River naturally flows into the Irish Sea, any additional contaminants from the Arklow FRS are not expected beyond the existing pollution from the river. Furthermore, the levels of heavy metals in the estuarine material to be dredged (i.e. during construction or maintenance of Arklow FRS) were not predicted at levels that warranted special disposal facilities. The Arklow FRS EIA concluded that annual maintenance dredging activities will result in an imperceptible temporary negative effect. Consequently, given that any sediment plumes are not believed to act cumulatively, and Arklow FRS is not anticipated to introduce new contaminants, the probability of cumulative release of sediment bound contaminants is small. When assessed cumulatively with the construction phase of the Proposed Development and Tier 1 projects, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF THE EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.10 Table 7.19. Where the magnitude of Impact 2 from construction activities acting cumulatively with Tier 1 and Tier 2 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.11 Therefore, the significance of effect of Impact 2 from the construction phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 and Tier 2 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

TIER 3

MAGNITUDE OF THE IMPACT

7.12.3.12 Upon assessment of Impact 1, it was determined that there is limited potential for seabed disturbance from construction activities to intersect with those from Tier 1, Tier 2 and Tier 3 in a way that leads to cumulative sediment plumes. Additionally, any potential overlap is expected to be short-lived, infrequent, and anticipated to fall within the natural variability of the MW&SQ Study Area. The most considerable seabed disturbance is expected to occur near the ABWP1 Offshore Array, primarily due to the cutting and removal of monopiles. However, surveys conducted in the Proposed Development Array Area (Table 7.12) have indicated that sediment contamination levels were all comparable to the wider regional background, not considered to be of low quality, and will not result in significant effect-receptor pathways if given the opportunity to become bioavailable. Furthermore, given that the majority of ABWP1 cables are expected to remain in place, the likelihood of any notable release of sediment-bound contaminants occurring in volumes or concentrations high enough to impact the quality status of designated coastal and transitional waterbodies is low. When assessed cumulatively with the construction phase of the Proposed Development and Tier 1 and Tier 2 projects, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.13 Table 7.19. Where the magnitude of Impact 2 from construction activities acting cumulatively with Tier 1, Tier 2 and Tier 3 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.14 Therefore, the significance of effect of Impact 2 from the construction phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2 and Tier 3 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.3.15 Due to the similarity in estimated development timelines, construction activities and resultant risks associated with cumulative effects, Phase One projects have potential to disturb sediment that may lead to a cumulative increase in SSC. Only one Phase One project (i.e. Codling Wind Park) was within proximity of the Proposed Development with a spatial and temporal overlap that could result in cumulative resuspension of sediment bound contaminants.

7.12.3.16 The assessment undertaken for the Proposed Development alone shows that in almost all cases, sediment plumes are rapidly indistinguishable from background levels. On this basis, although there is limited potential for sediment plumes from Proposed Development activities to interact with those from Tier 1, Tier 2, Tier 3 and Phase One activities resulting in seabed disturbance, any overlap is expected to be short-lived and infrequent. Due to proximity, a generalised assumption can be made that contaminants present in sediment from the wider marine area will have followed a similar environmental fate to those in the Study Area of the Proposed Development. Therefore, it is unlikely that any unaccounted-for contaminants would be introduced by potential cumulative sediment plumes.

7.12.3.17 Furthermore, only very small sediment-bound contaminant concentrations enter to the dissolved phase, the vast majority remain adhered to the sediment particles when temporarily entering suspension in the water column. Similar to the assessment of the Proposed Development alone, the sediment (and associated contaminants) from construction activities is expected to rapidly disperse with tidal currents. Therefore, any increase in contaminant bioavailability that could lead to ecotoxicological effects is not expected. When assessed cumulatively with the construction phase of the Proposed Development and Tier 1, Tier 2 and Tier 3 projects, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.18 Table 7.19. Where the magnitude of Impact 2 from construction activities acting cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.19 Therefore, the significance of effect of Impact 2 from the construction phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

Operational and maintenance phase

TIER 1

MAGNITUDE OF THE IMPACT

7.12.3.20 Whilst activities associated with the Proposed Development during the O&M phase will result in resuspension of sediment (and potential accompanying contaminants), the volumes disturbed are notably less than those disturbed during the construction phase. This will primarily occur through cable protection and reburial works, if required. In regard to the O&M phase of the Proposed Development and Tier 2 projects, there is no anticipated sequential cumulative effects. When assessed cumulatively with the O&M phase of the Proposed Development, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Negligible** for both Project Design Options.

SIGNIFICANCE OF THE EFFECT

7.12.3.21 The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.22 Table 7.19. Where the magnitude of Impact 2 from O&M activities acting cumulatively with Tier 1 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.23 Therefore, the significance of effect of Impact 2 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

TIER 2

MAGNITUDE OF THE IMPACT

7.12.3.24 Only one Tier 2 project, Arklow FRS, was identified with potential for spatial overlap. However, Arklow FRS is expected to be fully constructed by the O&M phase of the Proposed Development, alleviating any of the sediment disturbance from construction works. However, it should be noted that the implementation of maintenance works is essential throughout the approximate 50-year plus lifespan of the FRS which is required to contribute to a positive long-term effect to flood risk. In particular, maintenance dredging was reported as a requirement approximately every ten years but will be based more accurately riverbed surveys. This maintenance work may result in re-suspended sediments (and associated contaminants) flowing out to the Avoca Esturay, in much smaller volumes than is expected with construction, and not in concentrations that will act cumulatively with the Proposed Development. Therefore, sediment plumes are not believed to act cumulatively, and Arklow FRS is not anticipated to introduce new contaminants, the probability of cumulative release of sediment bound contaminants is small. No additive effect is expected by Tier 2 projects in terms of re-suspension of sediment bound contaminants. When assessed cumulatively with the O&M phase of the Proposed Development and Tier 1 projects, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Negligible** for both Project Design Options.

SIGNIFICANCE OF THE EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.25 Table 7.19. Where the magnitude of Impact 2 from O&M activities acting cumulatively with Tier 1 and Tier 2 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.26 Therefore, the significance of effect of Impact 2 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 and Tier 2 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

TIER 3

MAGNITUDE OF THE IMPACT

7.12.3.27 There is no temporal overlap between the O&M phase of the Proposed Development and any listed Tier 3 project. Therefore, there is no change in cumulative assessment from Tier 1 and Tier 2 projects.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.28 Table 7.19. Where the magnitude of Impact 2 from O&M activities acting cumulatively with Tier 1, Tier 2, and Tier 3 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.29 Therefore, the significance of effect of Impact 2 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2 and Tier 3 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.3.30 Whilst activities associated with the Proposed Development during the O&M phase will result in seabed disturbances (and so potential release of sediment bound contaminants), primarily through cable protection and reburial works, if required, the volumes disturbed are much less than those disturbed during the construction phase. Codling Wind Park is expected to be operational by the O&M phase of the Proposed Development further reducing the likelihood of cumulative release of sediment-bound contaminants. Moreover, due to proximity, a generalised assumption can be made that contaminants present in sediment from the wider marine area will have followed a similar environmental fate to those in the Study Area of the Proposed Development. Therefore, it is unlikely that any unaccounted-for contaminants would be introduced by potential cumulative sediment plumes. When assessed cumulatively with the O&M phase of the Proposed Development and Tier 1, Tier 2 and Tier 3 projects, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Negligible** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.31 Table 7.19. Where the magnitude of Impact 2 from O&M activities acting cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.32 Therefore, the significance of effect of Impact 2 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

Decommissioning phase

TIER 1

MAGNITUDE OF THE IMPACT

7.12.3.33 Activities associated with the Proposed Development during the decommissioning phase will result in resuspension of sediment (and potential accompanying contaminants), the volumes of which are considered to be equal to, or less than, those disturbed during the construction phase. Tier 1 projects are likely to be in operation or decommissioned (i.e. dates are uncertain), in which case the cumulative effects are also considered to be equal to, or less than, those assessed in the construction phase of the Proposed Development.

7.12.3.34 Given that the magnitude of effect during the construction phase has been assessed as Low, impacts arising as a result of disturbed sediment during the decommissioning phase are also conservatively considered to be Low. When assessed cumulatively with the decommissioning phase of the Proposed Development, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.35 Table 7.19. Where the magnitude of Impact 2 from decommissioning activities acting cumulatively with Tier 1 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.36 Therefore, the significance of effect of Impact 2 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

TIER 2

MAGNITUDE OF THE IMPACT

7.12.3.37 Only one Tier 2 project, Arklow FRS, was identified with potential for spatial overlap. However, Arklow FRS is expected to be fully constructed by the decommissioning phase of the Proposed Development, alleviating any of the sediment disturbance from construction works. However, it should be noted that the implementation of maintenance works is essential throughout the approximate 50-year plus lifespan of the FRS which is required to contribute to a positive long-term effect to flood risk. In particular, maintenance dredging was reported as a requirement approximately every ten years but will be based more accurately riverbed surveys. This maintenance work may result in re-suspended sediments (and associated contaminants) flowing out to the Avoca Esturay, in much smaller volumes than is expected with construction, and not in concentrations that will act cumulatively with the Proposed Development. Therefore, no additive effect is expected by Tier 2 projects in terms of re-suspension of sediment bound contaminants. When assessed cumulatively with the decommissioning phase of the Proposed Development and Tier 1, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OFEFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.38 Table 7.19. Where the magnitude of Impact 2 from decommissioning activities acting cumulatively with Tier 1 and Tier 2 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.39 Therefore, the significance of effect of Impact 2 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 and Tier 2 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

TIER 3

MAGNITUDE OF THE IMPACT

7.12.3.40 There is no temporal overlap between the decommissioning phase of the Proposed Development and any listed Tier 3 projects. Therefore, there is no change in cumulative assessment from Tier 1 and Tier 2 projects.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.41 Table 7.19. Where the magnitude of Impact 2 from decommissioning activities acting cumulatively with Tier 1, Tier 2 and Tier 3 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.42 Therefore, the significance of effect of Impact 2 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2 and Tier 3 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.3.43 Activities associated with the Proposed Development during the decommissioning phase will result in seabed sediment disturbance (and so potential release of sediment-bound contaminants), the volumes of which are considered to be equal to, or less than, those disturbed during the construction phase. Moreover, it is uncertain whether Codling Wind Park will be operational or decommissioned, where both are less likely to increase SSC than the assessment carried out of the overlapping construction phases (see Section 7.12.3.15 *et seq.*). When assessed cumulatively with the decommissioning phase of the Proposed Development and Tier 1, Tier 2 and Tier 3 projects, the magnitude of the impact on water and sediment quality receptors are conservatively considered to be **Low** for both Project Design Options.

SIGNIFICANCE OF THE EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.3.44 Table 7.19. Where the magnitude of Impact 2 from decommissioning activities acting cumulatively with Tier, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.3.45 Therefore, the significance of effect of Impact 2 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

7.12.4 Project Design Option 1 and 2 - Impact 3 – Accidental release or spills of materials or chemicals

SENSITIVITY OF THE RECEPTOR

7.12.4.1 As outlined in Section 7.9.3, accidental release or spills of materials or chemicals have the potential to diminish water quality by introducing contaminants into the water column.

7.12.4.2 The potential sensitivity of the MW&SQ receptors will be the same as outlined in Table 7.29 for Project Design Option 1 and 2. In summary, the sensitivity of the wider marine environment is rated as **Negligible**. The sensitivity of designated coastal and transitional waters is rated as **Medium**. The sensitivity of designated BWs is rated as **Low.**

Construction Phase

TIER 1

MAGNITUDE OF THE IMPACT

7.12.4.3 There may be a potential risk of accidental spillage or release of materials such as grease, fuel and oils during maintenance work and from vessels (including refuelling) associated with the Proposed Development. There will be an EMP covering all stages of the Project Development (See Volume III, Appendix 25.1). This, importantly, will include a MPCP which will ensure any potential risk of spillage or pollution is minimised. This commitment ensures the use of appropriate preventative measures and serves as an embedded mitigation against this type of pollution incidence. If an accidental spill occurs, all relevant parties would be informed as required in the MPCP. Furthermore, any pre-empted discharges that could arise will be permitted and likely in small volumes, intermittent and would dilute and disperse quickly.

7.12.4.4 The transport and handling of chemicals and materials will be well-monitored. As mentioned in Chapter 4 (Description of Development), vessel fuelling and refuelling will typically take place in port. Vessel to vessel refuelling outside a port or harbour is a prescribed operation in the Irish EEZ under the Sea Pollution (Amendment) Act 1999 (section 12) and requires a permit which will be obtained in advance as required. CTV's will be refuelled at the ABWP2 OMF within Arklow's South Dock. Therefore, the vessel traffic and movement of materials/chemicals will be easily tracked.

7.12.4.5 All other projects will have to follow the same legislation regarding chemical use. For any projects that may be permitted waste disposal, dumping at sea or release of chemicals, the procedure will be well maintained following the guidance and legislation set out by the Irish government. Of note, is the mussel aquaculture site since feed is generally perceived to be one of the major risk factors in aquaculture production of fish and crustaceans. However, mussels consume food that occurs naturally in the environment and are not supplied with commercial aquafeeds. Also, mussels are

not treated with chemicals or veterinary medicines unlike in other forms of aquaculture. Therefore, there will be no inputs that would act cumulatively with any accidental spills or releases.

7.12.4.6 Accidental spills are purposely avoided with stringent management plans in place (such as the EMP and MPCP). Therefore, while the other projects may temporally overlap with the construction of the Proposed Development, in turn increasing vessel traffic and creating increased 'availability' of materials, any spill or release would be unintentional. Any quantities of accidentally released materials are likely to be small. Furthermore, associated lateral and vertical dispersion rates are expected to be high. The potential impacts will be temporary in nature and project controls will be in place to minimise the likelihood of a Tier 2 or Tier 3 event (see MPCP). However, in the chance that an accidental spill or release were to occur in a way that could act cumulatively this may lead to an adverse effect on water quality. Due to the large variability of chemicals and materials that are required for the Proposed Development and concurrent projects, it is not viable to quantitatively assess the potential for bioavailability and resulting toxicological effects of spills and releases. Of note, is the potential for chemicals to work synergistically where two or more chemicals act together to create a greater effect than that of the individual chemical alone. The likelihood that the Proposed Development and another project were to release chemicals or materials simultaneously, or in volumes that could lead to any notable effects on MW&SQ is very unlikely, yet still a possibility. Therefore, when assessed cumulatively with the Proposed Development, the magnitude of accidental spillage or release of material or chemicals from construction activities is assessed as **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.4.7 Table 7.19. Where the magnitude of Impact 3 from construction activities acting cumulatively with Tier 1 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.4.8 Therefore, the significance of effect of Impact 3 from the construction phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

TIER 2

MAGNITUDE OF THE IMPACT

7.12.4.9 Tier 2 project, Arklow FRS, is not expected to have a cumulative effect on the accidental release or spills of materials or chemicals because all nearby projects are mandated to adhere to the same guidelines and guidance outlined by the Irish government. This uniform guidance ensures consistency in safety measures and protocols across all projects, minimising the likelihood of cumulative impacts from multiple developments.

7.12.4.10 The magnitude of impact on water and sediment quality receptors is not anticipated to change from the assessment of the Proposed Development and Tier 1 projects together (see 7.12.4.6).

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.4.11 Table 7.19. Where the magnitude of Impact 3 from construction activities acting cumulatively with Tier 1 and Tier 2 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.4.12 Therefore, the significance of effect of Impact 3 from the construction phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1 and Tier 2 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

TIER 3

MAGNITUDE OF THE IMPACT

7.12.4.13 Tier 3 plan, ABWP1 Decommissioning Assumptions, is not expected to have a cumulative effect on the accidental release or spills of materials or chemicals because all nearby projects are mandated to adhere to the same guidelines and guidance outlined by the Irish government. This uniform guidance ensures consistency in safety measures and protocols across all projects, minimising the likelihood of cumulative impacts from multiple developments. Moreover, the contingency in the Proposed Developments construction vessel movements mean that the vessels required for ABWP1 are accounted for in the assessment of the Proposed Development alone.

7.12.4.14 The magnitude of impact on water and sediment quality receptors is not anticipated to change from the assessment of the Proposed Development, Tier 1 and Tier 2 projects together (see 7.12.4.6).

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.4.15 Table 7.19. Where the magnitude of Impact 3 from construction activities acting cumulatively with Tier 1, Tier 2 and Tier 3 projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.4.16 Therefore, the significance of effect of Impact 3 from the construction phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2 and Tier 3 projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.4.17 Phase One plan, Codling Wind Farm, is not expected to have a cumulative effect on the accidental release or spills of materials or chemicals because all nearby projects are mandated to adhere to the same guidelines and guidance outlined by the Irish government. This uniform guidance ensures consistency in safety measures and protocols across all projects, minimising the likelihood of cumulative impacts from multiple developments.

7.12.4.18 The magnitude of impact on water and sediment quality receptors is not anticipated to change from the assessment of the Proposed Development, Tier 1, Tier 2 and Tier 3 projects together (see 7.12.4.6).

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.4.19 Table 7.19. Where the magnitude of Impact 3 from construction activities acting cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.4.20 Therefore, the significance of effect of Impact 3 from the construction phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

Operational and maintenance phase

TIER 1, TIER 2, TIER 3 AND PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.4.21 There may be a potential risk of accidental spillage or release of materials such as grease, fuel and oils during maintenance work, and from vessels (including refuelling) associated with the Proposed Development and/ or other projects/plans. All nearby projects are mandated to adhere to the same guidelines and guidance outlined by the Irish government. This uniform guidance ensures consistency in safety measures and protocols across all projects, minimising the likelihood of cumulative impacts from multiple developments. The Developer is committed to the use of pollution prevention guidelines and compliance with relevant legislation at all times. For the Proposed Development an EMP (and MPCP) will be in place such that any potential risk is minimised. Any spills (if they were to occur) would be small and disperse quickly. No discharges (continuous or intermittent) are proposed during the O&M phase.

7.12.4.22 The likelihood of release or spills or materials or chemicals from the O&M phase is substantially reduced from the construction phase of the Proposed Development. For example, the total vessel return trips during the construction phase are estimated at 1,797 per year, where the total vessel return trips for the O&M phase are estimated at 1,359 per year. Of note, the projection of vessel trips for the O&M phase is estimated on 56 assets which is conservatively high based on what is predicted. Accordingly, the magnitude (and so significance) of the effect on MW&SQ resulting from O&M activities would be no greater than those assessed for construction phase.

7.12.4.23 When assessed cumulatively with other projects, the effects are not expected to be additive since the impact in question is not expected to occur, localised in extent and temporary in nature. While there will be notably reduced vessel traffic from the construction to the O&M phase of the Proposed Development, and therefore less capacity for accidental release or spills of materials or chemicals, the magnitude of effect stays the same in the instance an accidental release or spill of materials or chemicals may occur. Moreover, all Tier 1, Tier 2, Tier 3 and Phase One projects are anticipated to be fully operational or decommissioned by the O&M phase of the Proposed Development, further reducing the vessel traffic from the construction of other projects. Therefore, when assessed cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects the magnitude of accidental spillage or release of material or chemicals from O&M activities is assessed as **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.4.24 Table 7.19. Where the magnitude of Impact 3 from O&M activities acting cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.4.25 Therefore, the significance of effect of Impact 3 from the O&M phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

Decommissioning phase

TIER 1, TIER 2, TIER 3 AND PHASE ONE

MAGNITUDE OF THE IMPACT

7.12.4.26 There may be a potential risk of accidental spillage or release of materials such as grease, fuel and oils during decommissioning work and from vessels associated with the Proposed Development and/ or other projects/plans. All nearby projects are mandated to adhere to the same guidelines and guidance outlined by the Irish government. This uniform guidance ensures consistency in safety measures and protocols across all projects, minimising the likelihood of cumulative impacts from multiple developments. The Developer is committed to the use of pollution prevention guidelines and compliance with relevant legislation at all times. For the Proposed Development an EMP (and MPCP) will be in place such that any potential risk is minimised. Any spills (if they were to occur) would be small and disperse quickly. No discharges (continuous or intermittent) are proposed during the decommissioning phase.

7.12.4.27 When assessed cumulatively with other projects, the effects are not expected to be additive since the impact in question is not expected to occur, localised in extent and temporary in nature. As the decommissioning activities are generally anticipated to be a reversal of those in construction, the potential impacts during decommissioning are considered to be similar or less than during construction. Moreover, all Tier 1, Tier 2, Tier 3 and Phase One projects are anticipated to be fully operational or decommissioned by the decommissioning phase of the Proposed Development, further reducing the vessel traffic from the construction of other projects. Therefore, when assessed cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects the magnitude of accidental spillage or release of material or chemicals from decommissioning activities is assessed as **Low** for both Project Design Options.

SIGNIFICANCE OF EFFECT

The significance of effect has been carefully assessed in accordance with the matrix provided in

7.12.4.28 Table 7.19. Where the magnitude of Impact 3 from decommissioning activities acting cumulatively with Tier 1, Tier 2, Tier 3 and Phase One projects is deemed **Low** for both Project Design Options:

- The sensitivity of the wider marine environment has been assessed as **Negligible**;
- The sensitivity of designated coastal and transitional waterbodies has been assessed as **Medium**; and
- The sensitivity of designated BWs has been assessed as **Low**.

7.12.4.29 Therefore, the significance of effect of Impact 3 from the decommissioning phase of either Project Design Option 1 or Project Design Option 2, cumulatively with the Tier 1, Tier 2, Tier 3 and Phase One projects is expected to be **Imperceptible** to **Slight adverse**, which is not significant in EIA terms.

7.13 Transboundary effects

7.13.1.1 The Array Area and Cable Corridor and Working Area are located wholly within Irish territorial waters. It is anticipated, based on an understanding of the baseline environment (e.g. tidal regime and sediment types), that impacts from sediment disturbance as a result of the installation and maintenance of foundations and cables are likely to be localised and temporary in nature. Any impacts on MW&SQ from the presence of the foundation structures will be confined to the localised area of the footprint of the Proposed Development.

7.13.1.2 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to MW&SQ from the Proposed Development upon the interests of other states.

7.14 Summary of effects

7.14.1.1 This chapter has investigated the potential effects on MW&SQ receptors arising from the Proposed Development. The range of potential impacts and associated effects has been informed by the Scoping Opinion and consultation responses from stakeholders, alongside reference to existing legislation and guidance.

7.14.1.2 The assessment has been undertaken in the three following stages:

- The identification of the project parameters for Project Design Option 1 and 2 from the Offshore Project Description (Volume II, Chapter 4: Description of Development);
- The determination of the baseline physical environment (including potential changes over the Proposed Development lifetime due to natural variation); and
- Assessment of changes to MW&SQ arising from the project design options both for the Proposed Development on its own and in conjunction with other built and consented projects.

7.14.1.3 In order to assess the potential changes relative to the baseline (existing) coastal and marine environment, a combination of complementary approaches have been adopted for this MW&SQ assessment. These include:

- The 'evidence base' containing monitoring data collected during the construction and O&M of other developments (especially in similar environmental settings); and
- Analytical assessments of project-specific data.

7.14.1.4 A wide range of potential changes to MW&SQ have been considered, including short-term sediment disturbance due to construction, O&M and decommissioning activities, alongside the accidental release or spills of materials or chemicals across all phases of the Proposed Development.

7.14.1.5 Using a precautionary assessment approach, it has been found that for all receptor groups, the level of effect significance is assessed as **Imperceptible** to **Slight adverse** for all phases of

development (Table 7.35 and Table 7.36). Accordingly, all the potential effects to MW&SQ receptors are therefore considered Not Significant in terms of the EIA Regulations and no additional measures have been suggested for the Proposed Development.

Table 7.35: Summary of potential environmental impacts, mitigation and monitoring for Project Design Option 1

Description of impact	Phase C	Phase O	Phase D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Impact 1 – Deterioration in water quality due to suspension of sediments	✓	✓	✓	An Environmental Management Plan (EMP) will be implemented (Volume III, Appendix 25.1); Scour protection will be installed as described in Volume II, Chapter 4: Description of Development; Preparation and Implementation of an Operational and Maintenance (O&M) Plan; and Development of and adherence to a Rehabilitation Schedule (RS). Full details of factored-in measures can be found in Section 7.7.3.	C: **Low** O: **Negligible** D: **Low**	C: **Low** to **Medium** O: **Low** to **Medium** D: **Low** to **Medium**	C: **Slight adverse** (**not significant** in EIA terms) O: **Not significant** (**not significant** in EIA terms) D: **Slight adverse** (**not significant** in EIA terms)	None	C: **Slight adverse** (**not significant** in EIA terms) O: **Not significant** (**not significant** in EIA terms) D: **Slight adverse** (**not significant** in EIA terms)	N/A

Description of impact	Phase C	Phase O	Phase D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Impact 2 – Release of sediment bound contaminants from disturbed sediments.	✓	✓	✓	An Environmental Management Plan (EMP) will be implemented (Volume III, Appendix 25.1); Scour protection will be installed as described in Volume II, Chapter 4: Description of Development; Preparation and Implementation of an Operational and Maintenance (O&M) Plan; and Development of and adherence to a RS. Full details of factored-in measures can be found in Section 7.7.3.	C: **Low** O: **Negligible** D: **Low**	C: **Negligible** to **Medium** O: **Negligible** to **Medium** D: **Negligible** to **Medium**	C: **Imperceptible** to **Slight adverse** (**not significant** in EIA terms) O: **Imperceptible** to **Not significant** (**not significant** in EIA terms) D: **Imperceptible** to **Slight adverse** (**not significant** in EIA terms)	None	C: **Imperceptible** to **Slight adverse** (**not significant** in EIA terms) O: **Imperceptible** to **Not significant** (**not significant** in EIA terms) D: **Imperceptible** to **Slight adverse** (**not significant** in EIA terms)	N/A
Impact 3 - Accidental releases	✓	✓	✓	An Environmental Management Plan (EMP) will be	C: **Negligible**	C: **Negligible** to **Medium**	C: **Imperceptible** to **Not**	None	C: **Imperceptible** to **Not**	N/A

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
or spills of materials or chemicals.		implemented (Volume III, Appendix 25.1); A MPCP will be included in the EMP to ensure plans are in place to manage any marine pollution spills and including key emergency contact details; and Development of and adherence to a Vessel Management Plan (VMP). Full details of factored-in measures can be found in Section 7.7.3.	O: **Negligible** D: **Negligible**	O: **Negligible** to **Medium** D: **Negligible** to **Medium**	**significant** (**not significant** in EIA terms) O: **Imperceptible** to **Not significant** (**not significant** in EIA terms) D: **Imperceptible** to **Not significant** (**not significant** in EIA terms)		**significant** (**not significant** in EIA terms) O: **Imperceptible** to **Not significant** (**not significant** in EIA terms)) D: **Imperceptible** to **Not significant** (**not significant** in EIA terms)	

Table 7.36: Summary of potential environmental impacts, mitigation and monitoring for Project Design Option 2

Description of impact	Phase			Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
	C	O	D							
Impact 1 – Deterioration in water quality due to suspension of sediments	✓	✓	✓	An Environmental Management Plan (EMP) will be implemented (Volume III, Appendix 25.1); Scour protection will be installed as described in Volume II, Chapter 5: Description of Development; Preparation and Implementation of an Operational and Maintenance (O&M) Plan; and Development of and adherence to a RS. Full details of factored-in measures can be found in Section 7.7.3.	C: **Low** O: **Negligible** D: **Low**	C: **Low** to **Medium** O: **Low** to **Medium** D: **Low** to **Medium**	C: **Slight adverse** (**not significant** in EIA terms) O: **Not significant** (**not significant** in EIA terms) D: **Slight adverse** (**not significant** in EIA terms)	None	C: **Slight adverse** (**not significant** in EIA terms) O: **Not significant** (**not significant** in EIA terms) D: **Slight adverse** (**not significant** in EIA terms)	N/A

Description of impact	Phase			Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
	C	O	D							
Impact 2 – Release of sediment bound contaminants from disturbed sediments.	✓	✓	✓	An Environmental Management Plan (EMP) will be implemented (Volume III, Appendix 25.1); Scour protection will be installed as described in Volume II, Chapter 5: Description of Development; Preparation and Implementation of an Operational and Maintenance (O&M) Plan; and Development of and adherence to a RS. Full details of factored-in measures can be found in Section 7.7.3.	C: **Low** O: **Negligible** D: **Low**	C: **Negligible** to **Medium** O: **Negligible** to **Medium** D: **Negligible** to **Medium**	C: **Imperceptible** to **Slight adverse** (**not significant** in EIA terms) O: **Imperceptible** to **Not significant** (**not significant** in EIA terms) D: **Imperceptible** to **Slight adverse** (**not significant** in EIA terms)	None	C: **Imperceptible** to **Slight adverse** (**not significant** in EIA terms) O: **Imperceptible** to **Not significant** (**not significant** in EIA terms) D: **Imperceptible** to **Slight adverse** (**not significant** in EIA terms)	N/A
Impact 3 - Accidental releases or spills of	✓	✓	✓	An Environmental Management Plan (EMP) will be	C: **Negligible**	C: **Negligible** to **Medium**	C: **Imperceptible** to **Not**	None	C: **Imperceptible** to **Not**	N/A

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
materials or chemicals.		implemented (Volume III, Appendix 25.1); A MPCP will be included in the EMP to ensure plans are in place to manage any marine pollution spills and including key emergency contact details; and Development of and adherence to a VMP. Full details of factored-in measures can be found in Section 7.7.3.	O: **Negligible** D: **Negligible**	O: **Negligible** to **Medium** D: **Negligible** to **Medium**	**significant** (**not significant** in EIA terms) O: **Imperceptible** to **Not significant** (**not significant** in EIA terms) D: **Imperceptible** to **Not significant** (**not significant** in EIA terms)		**significant** (**not significant** in EIA terms) O: **Imperceptible** to **Not significant** (**not significant** in EIA terms)) D: **Imperceptible** to **Not significant** (**not significant** in EIA terms)	

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