Iarnród Éireann
Irish Rail

Rosslare ORE Hub

EIAR Environmental Topic Chapters

Chapter 11:

Benthic Ecology

venterra | GDG GAVIN & DOHERTY GEOSOLUTIONS | NICHOLAS O'DWYER an RSK company

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LIST OF ABBREVIATIONS

AA	Appropriate Assessment
ASC	Aquaculture Stewardship Council
oCEMP	(Outline) Construction Environmental Management Plan
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMODnet	European Marine Observation and Data Network
EPA	Environmental Protection Agency
EU	European Union
ICG-C	Intercessional Correspondence Group on Cumulative Effects
INIS	Invasive Non-Indigenous Species
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
ISO	International Organization for Standardization
JNCC	Joint Nature Conservation Committee
MarESA	Marine Evidence-based Sensitivity Assessment
MERC	MERC Consultants
MNCR	Marine Nature Conservation Review
MNC	Marine Stewardship Council
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
ORE	Offshore Renewable Energy
OSPAR	Oslo–Paris Convention for the Protection of the Marine Environment of the North-East Atlantic
PDB	Proposed Development Boundary
RMP	Record of Monuments and Places
RoRo	Roll-on Roll-off
SAC	Special Area of Conservation
SCI	Site of Community Importance
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
S-P-R	Source–Pathway–Receptor model
SSC	Suspended Sediment Concentration
ZoI	Zone of Influence

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11 BENTHIC ECOLOGY

11.1 INTRODUCTION

Iarnród Éireann – Irish Rail is applying for development permission for the Rosslare Offshore Renewable Energy Hub (hereafter the 'Proposed Development'), located immediately adjacent and to the northwest of the existing Rosslare Europort at Rosslare Harbour in County Wexford, which is operated by Iarnród Éireann. The Proposed Development includes capital dredging to achieve navigable depths for vessels delivering ORE components; land reclamation to create a storage area for these components; and construction of two new berths to facilitate loading and unloading of ORE components. The land reclamation works include infilling the existing small boat harbour, after the construction of a new small boat harbour. The Proposed Development also includes the installation of a new slipway and facility for local clubs, such as the Sea Scouts.

The purpose of the Proposed Development is to provide a facility for the efficient handling and storage, marshalling, staging and integration of ORE components to facilitate installation of offshore wind energy projects by ORE developers and operators. The Proposed Development is designed to provide facilities that accommodate a wide range of infrastructure uses, both for current requirements and anticipated future needs. For instance, the Proposed Development could be used for traditional port activities if required, including during periods of reduced ORE-related activity. Refer to EIAR Chapter 6: Project Description for further detail.

This chapter of the Environmental Impact Assessment Report (EIAR) presents the assessment of the likely significant effects of the Proposed Development on benthic ecology receptors arising from the construction and operation of the Proposed Development, both alone and cumulatively with other projects. The scope of this chapter was determined following issue of a scoping report to the following topic-relevant stakeholders (see EIAR Chapter 4 Scoping and Consultation for full details of consultation):

- National Parks and Wildlife Service

The assessment presented in this chapter is informed by the following EIAR chapters/technical appendices:

- Technical Appendix 7: Geotechnical Investigation Report
- Technical Appendix 8: Coastal Processes.
- Technical Appendix 11: Benthic Ecology
    - Appendix 1
    - Appendix 3 (go elsewhere to get it)

This chapter evaluates the importance of the benthic ecological resources present and defines the degree of significance of potential impacts resulting from the Proposed Development. In the context of the Benthic Ecology EIAR chapter, benthic ecology specifically refers to the assessment of ecological receptors and their habitats located below the high-water mark, including benthic habitats, flora, and fauna. The assessment addresses potential impacts from the construction and

operational phases of the Proposed Development on benthic species, habitats, and designated conservation areas occurring within or influenced by activities below the high-water mark. The report also identifies appropriate mitigation measures and defines residual impacts.

This chapter comprises of the following elements:

- Summary of relevant policy and guidance
- Summary of consultations with stakeholders
- Data sources used to characterise the Study Area
- Methodology followed in assessing the impacts of the Proposed Development
- Review of baseline conditions
- Assessment of likely effects arising from the construction and operation of the Proposed Development
- Identification of mitigation measures and/or monitoring requirements (if any) in respect of any significant effects (following the 'mitigation hierarchy' of avoidance, minimisation, restoration and offsets in consecutive order)
- Assessment of cumulative effects arising from the identification and consideration of additional projects and/or plans
- Summary of residual impact assessment determinations in the case of any additional mitigation measures identified during this process.

Terrestrial ecology is assessed separately in Chapter 10: Terrestrial Ecology of this EIAR. Avifaunal receptors are assessed separately in Chapter 14: Ornithology of this EIAR. Fish, turtles, marine mammals, and fisheries are addressed separately in Chapter 12: Fish, Shellfish and Turtle Ecology, Chapter 13: Marine Mammals and Chapter 15: Commercial Fisheries and Aquaculture, respectively.

This chapter is based on the findings of project-specific benthic ecological surveys undertaken at the Proposed Development and on a desk-based review of publicly available information.

A Stage 1 screening report for Appropriate Assessment (AA) and Stage 2 Natura Impact Statement (NIS) have been produced and are included in Volume 4 of this EIAR.

11.1.1 RELEVANT LEGISLATION AND GUIDELINES

Regulations and guidance pertaining to ecology and biodiversity are outlined in Chapter 2: Legislation and Policy Context of this EIAR. This section details the regulations and guidance specific to benthic ecology.

11.1.1.1 NATIONAL AND INTERNATIONAL LEGISLATION

- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive).
- Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011).
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive);
- European Communities (Water Policy) Regulations 2003. S.I. No. 722/2003.
- European Communities (Marine Strategy Framework) Regulations 2011. S.I. No. 249/2011.

11.1.1.2 RELEVANT POLICIES AND PLANS

- Convention for the protection of the marine environment of the north-east Atlantic (OSPAR Convention).
- National Marine Planning Framework. Project Ireland 2040. Government of Ireland.
- Ireland's Fourth National Biodiversity Action Plan 2023-2030.

11.1.1.3 GUIDANCE

- Guidelines on the information to be contained in Environmental Impact Assessment Reports. EPA, 2022.
- Marine Evidence-based Sensitivity Assessment (MarESA) – A Guide. Marine Life Information Network (MarLIN). Marine Biological Association of the UK, Plymouth, 2018.
- Guidelines for Ecological Impact Assessment in the UK and Ireland -Terrestrial, Freshwater, Coastal and Marine. CIEEM, 2022.
- Guidance on EIS and NIS Preparation for Offshore Renewable Energy Projects. By MacCabe Durney Barnes. Department of Communication, Climate Action and Environment/Sustainable Energy Authority of Ireland (2017).
- Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects Part 2 April 2018. Department of Communications, Climate Action and Environment.

11.2 ASSESSMENT METHODOLOGY

The zone of influence (ZoI) of a project is the area over which ecological features may be affected by biophysical changes as a result of a proposed project and associated activities. In the context of EIA, the ZoI is the area over which a project could affect the receiving environment such that it could potentially have significant effects on the receiving environment. Within the ZoI those receptors that are sensitive to change must be identified and considered.

To define the ZoI of a project, the potential for project related impacts on sensitive receptors must first be established. For this purpose, a Source-Path-Receptor (SPR) model was applied. The SPR model is a well-established model frequently applied to the analysis of project related impacts on ecosystems and has been applied to the assessment of the Proposed Development.

Using this approach all elements of the Proposed Development were reviewed to assess potential pathways and receptors which might be affected so that a ZoI could be established. This process is detailed in Table 11.12 and Table 11.13, and involved the following steps:

- The identification of sources of potential impacts, their scale and extent through identified pathways.
- Consideration of sensitive receptors and their dependent ecosystems within the receiving environment.
- Identifying and characterising project related impacts and their likely effects, direct, indirect and cumulative on the identified sensitive receptors).

Once the ZoI was established, the following steps were taken to assess the potential for likely significant effects on sensitive receptors:

1. The scale and scope of the Proposed Development was examined.
2. A desk review of the available literature was undertaken to assess the level of detailed information available for the benthic habitats and species within the benthic ecology ZoI (hereafter, for this chapter, referred to as the ZoI).
3. Benthic surveys of the Proposed Development Boundary (PDB) and a surrounding buffer zone (the area within the Foreshore Licence Area), hereafter, referred to as "the study area", were undertaken to address data gaps identified in the desk review.

Based on these elements an assessment of likely significant effects as described in section 11.2.3.1 was carried out.

11.2.1 STATEMENT OF COMPETENCE

This chapter was prepared by Louise Scally and Nick Pfeiffer of MERC Consultants. MERC are a specialist marine ecological survey and consultancy firm. Core staff have more than 60 years of combined experience and specialist knowledge in relation to Irish aquatic habitats and species, in addition to the assessment and management of conservation interests. MERC was responsible for preparing the NPWS national monitoring of marine Annex I habitats for compliance under Article 17 of the EU Habitats Directive in the period 2015-2019. In this context MERC was responsible for the assessment and reporting of marine Annex I habitats in Ireland and were the authors of all Article 17 reports and overarching site monitoring reports. MERC are currently engaged in conducting surveys and preparing the relevant reports for the current national (2022-2025) monitoring cycle on behalf of the National Parks and Wildlife Service.

Louise Scally MCIEEM is a professional marine ecologist. She completed a M.Sc. in ecology and taxonomy at Trinity College Dublin in 1989 and a Ph.D. in taxonomy also at Trinity College Dublin in 2001. She is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). For the last 20 years she has specialised in the ecology of marine ecosystems. She has

specialised in the assessment of benthic habitats with a focus on intertidal and subtidal reef habitats and sensitive seabed species and habitats. Over the last 15 years she has conducted extensive marine monitoring surveys and assessments of EU Habitats Directive marine Annex I habitats and their associated species within European sites in Ireland to assist with compliance monitoring obligations under the EU Habitats Directive.

Nick Pfeiffer MCIEEM is a professional marine ecologist with a wide range of experience in the ecology, survey, and monitoring of marine habitats and species in Ireland. He completed a Diploma in Science at Galway Regional Technical College in 1987 and a B.Sc. in Biological Sciences at Plymouth University in 1989. He is a full member of the CIEEM. He has extensive experience in the monitoring of benthic habitats and species in Ireland and was lead scientist for the mapping of sensitive subtidal species across a range of European sites in Ireland from 2006 to 2010. Over the last twelve years he has also conducted assessments on the anthropogenic impacts of shellfish aquaculture, pelagic and demersal fisheries on the marine environment in his role as a lead auditor for the Aquaculture Stewardship Council (ASC) and Marine Stewardship Council (MSC).

11.2.2 CONSULTATION

The project team had a consultation call with the National Parks and Wildlife Service (NPWS) on 4th September 2023. The project team presented the scope of benthic ecology surveys proposed to collect data to inform the EIAR chapter. NPWS agreed the scope of surveys was appropriate and advised that sufficient grab sampling should be undertaken to characterise the benthic habitats and communities present. Based on this consultation with NPWS, an extensive and appropriate benthic grab sampling campaign was undertaken. See Chapter 4: Scoping and Consultation for further details of the consultations undertaken.

11.2.3 DATA SOURCES

The Table 11.1 provides a list of the data sources, additional to the data generated by the site-specific surveys conducted, used to inform the assessment of benthic ecology within the ZoI.

Table 11.1: Data sources used in this chapter

Source	Data description
Rosslare Europort ORE Hub benthic ecology Technical Report (EIAR Technical Appendix 11).	Subtidal macrofaunal data, Drop down video surveys, Intertidal habitat surveys
Rosslare Europort Offshore Wind Hub Geophysical Survey report. Hydromaster, 2022.	Bathymetry
INFOMAR Seabed Survey (2020). INFOMAR Bathymetry (Multibeam and Lidar) INSS/INFOMAR (INFOMAR, 2020).	Bathymetry and sediment profiling
Seabed Habitat (EMODnet Seabed Habitats, 2019)	Broad habitat classification
AQUAFACT (2000). Rosslare Harbour Waste Water Treatment Plant: Environmental Survey. Prepared on behalf of E. G. Pettit & Co. Unpublished Report.	Intertidal habitat description

Source	Data description
AQUAFACT (2008). Report on analysis of sediment samples from Rosslare Europort, Co. Wexford. May 2008. Report prepared for RPS Consulting Engineers.	Subtidal macrofaunal data

11.2.3.1 DESKTOP REVIEW

As detailed in EIAR Technical Appendix 11, a desktop review of the available information for the Proposed Development area was carried out to collate and assess the existing benthic baseline data available. Additional information for the wider environs, to include a radius, extending approximately 20km out from the Proposed Development area, was included. This radius was considered appropriate relative to the scale and scope of the Proposed Development.

The sources accessed and reviewed included the following:

- Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR): Bathymetry, seabed and sediment data.
- European Marine Observation and Data Network (EMODnet): EUSeaMap Predictive broadscale habitat map.
- National Biodiversity Data Centre: Species and habitat data.
- Rosslare Europort ORE Hub site specific multibeam survey data.
- Rosslare Europort benthic survey data related to previous dredge campaigns.

11.2.3.2 FIELD SURVEYS

As detailed in EIAR Technical Appendix 11 and described below, field surveys were conducted to inform the benthic ecology baseline.

A walkover survey of the intertidal area was carried out on 10th of October 2023. A resurvey was carried out on 27th of May 2024 (low water height 0.7 m) to check for seasonal species that may have been absent during the October survey. The results of both surveys were combined.

The walk over surveys were carried out one hour before to one hour after low water. A meandering route through the intertidal area was taken. The physical features of the habitat (dominant shore type and sub habitats) were recorded. All macroalgae present were then recorded as present/absent and an abundance score on a SACFOR (Super abundant, Abundant, Common, Frequent, Occasional, Rare) scale was assigned. All faunal species noted were also recorded on a SACFOR scale and biotopes assigned.

A total of 40 stations were selected throughout the Benthic Study Site for grab sampling to inform macrofaunal, particle size and organic content analysis. The stations were selected to provide a suitable spatial spread across the entire site while avoiding obvious areas of hard substrate as identified by the multibeam data. All grab sampling was carried out between 13th and 15th of February 2024, and all sample analyses were completed by 30th of March 2024. Four grab samples were collected from each station suitable for grab sampling using a 0.1 m2 Day (for soft sediment

habitats) and 0.1 m2 mini Hamon (for coarse sediments) as appropriate. Three of the samples were analysed for macrofauna and one for particle size and total organic carbon.

Surface water samples were collected at 15 of the grab sampling stations sampled between 13th and 15th of February 2024. Simultaneous with water sampling, *in-situ* readings of water temperature, conductivity, salinity and dissolved oxygen saturation were collected using a CTD meter just off the bottom of the seabed. All samples were stored in cool boxes and transported to the laboratory for analysis on the day following collection.

Video surveys were conducted on 18th and 19th of May 2024. A drop down video camera, separate stills camera and associated lighting system integrated into a steel frame were utilised to obtain video and stills imagery of the seabed at 29 stations across the site. The length of the video transect varied at each station depending on the uniformity of the seabed but ranged between 5.6 and 149 m in total length. Vessel speed during transect was less than 0.3 knots. Field notes were made during recording from the live feed. All video captured and associated stills images are available on request.

Following a review of the video quality and the determination of its suitability for interpretation, each video segment was viewed at slow speed and start/stop. All species identified were recorded in a MS Excel proforma and each video segment was spatially encoded in the field, relative to the vessel position, allowing GIS shapefiles associated with each transect segment to be produced. Following the guidance of Parry (2019), biotopes were assigned to each segment analysed based on the depth, geomorphology and dominant characterising species recorded along the transect. Biotopes were assigned according to the Marine Habitat Classification for Britain and Ireland (Connor et al, 2004).

As all grab sample stations and video transect lines were fully spatially referenced, subtidal biotopes maps were prepared by plotting the corresponding biotopes as an overlay on the multibeam data.

Vibrocoring (a marine sediment sampling technique) was conducted as part of the geotechnical site investigation sampling undertaken for the Proposed Development, as described in EIAR Technical Appendix 7: Ground Investigation Report. Sediment subsamples from 31 of the vibrocore samples underwent contaminants analysis. Please see Figure 11.1 for locations of vibrocore sampling stations.

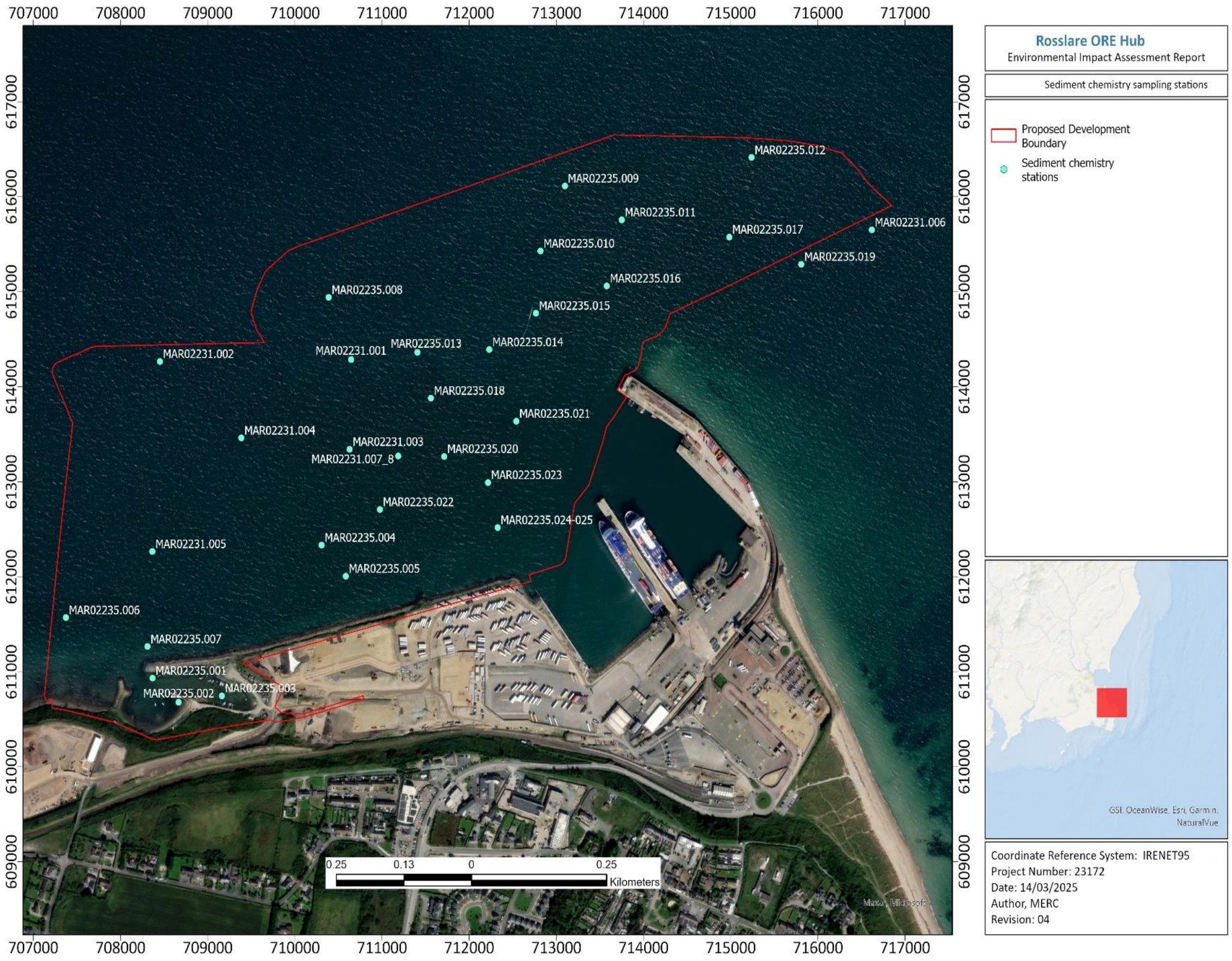

Figure 11.1: Sediment chemistry sampling stations in and adjacent to Proposed Development Boundary

11.2.4 ASSESSMENT OF EFFECTS

The assessment of effects was conducted by analysing the magnitude of potential development-related impacts on the sensitivity of the benthic receptors identified within the ZoI of the Proposed Development.

11.2.4.1 MAGNITUDE OF IMPACT

The various stages of the Proposed Development were examined to determine all relevant development-related impacts that may result from the construction and operation phases and could lead to effects on benthic ecology receptors (see Chapter 6: Project Description). Decommissioning of the Proposed Development, is not proposed and therefore not considered further (see Chapter 1: Introduction). The magnitude of each of the identified impacts was then assessed taking into consideration the scale and scope of the Proposed Development to include its potential spatial and temporal scale and the likely reversibility of any such impacts.

The definitions for the magnitude criteria used are given in Table 11.2.

Table 11.2: Magnitude criteria for Benthic (subtidal and intertidal) Ecology

Magnitude	Definition
High	Complete change and/or loss of the baseline biotope with the potential to negatively impact the conservation status of the local ecosystem and with very low chance of recovery.
Moderate	Change in the structure and function of the baseline biotope but which would be unlikely to negatively impact the conservation status of the local ecosystem.
Low	Minor or temporary change in the structure and function of the baseline biotope in a localised area.
Negligible	No perceptible change to the characterising species of the baseline biotope or to its structure and function

11.2.4.2 SENSITIVITY CRITERIA

Sensitivity was based on the Marine Evidence–Based Sensitivity Assessment (MarESA) (Tyler-Walters *et al*, 2018b). The MarESA sensitivity assessment uses a systematic process to compile and assess, using the best available scientific evidence, the sensitivity of biotopes to 'pressures', and was the one applied to each biotope identified within the ZoI of the Proposed Development.

Pressures are defined as 'the mechanism by which a human activity or natural event affects the ecosystem'. The pressures used in the MarESA approach are based on the pressure definitions developed by the OSPAR Intercessional Correspondence Group on Cumulative Effects (ICG-C) – Amended 25th March 2011 (OSPAR, 2011). The pressure benchmarks were based on Tillin *et al.* (2010) and subsequently revised by Tillin & Tyler-Walters (2015; 2014a&b) in liaison with the SNCBs (Statutory Nature Conservation Bodies).

Using this approach, the overall sensitivity of a receptor is assessed on a four-point scale which combines the resistance (intolerance of a species or habitat to damage from an external factor) and the resilience (time taken for its subsequent recovery) as shown in Table 11.3.

Table 11.3: Overall sensitivity score (after MarESA, 2018)

		Resistance			
		None	Low	Medium	High
Resilience	Very Low	High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	Low	High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	Medium	Medium sensitivity	Medium sensitivity	Medium sensitivity	Low sensitivity
	High	Medium sensitivity	Low sensitivity	Low sensitivity	Not sensitive

11.2.4.3 SIGNIFICANCE OF EFFECT

The matrix used to determine the significance of the effect upon benthic (Subtidal and Intertidal) ecology is given in Table 11.4. The significance of the effect was determined by correlating the **magnitude** of the impact and the **sensitivity** of the receptor. The significance of the effect can be assessed as having insignificant, minor, moderate or major significance. Impacts which result in moderate, minor, or insignificant effects within the assessment of the receptor, are considered to be 'not significant', with regards to the EIA regulations (EPA, 2022).

Table 11.4: Matrix of significance of effects used for benthic (subtidal and intertidal) ecology

Sensitivity		Magnitude			
		High	Moderate	Low	Negligible
	High	Major effect (significant)	Major effect (significant	Moderate effect (not significant)	Insignificant effect
	Medium	Major effect (significant	Moderate effect (not significant)	Minor effect (not significant)	Insignificant effect
	Low	Moderate effect (not significant)	Minor effect (not significant)	Insignificant effect	Insignificant effect
	Negligible	Insignificant effect	Insignificant effect	Insignificant effect	Insignificant effect

11.2.5 MITIGATION

As discussed in Chapter 1: Introduction and Methodology, three types of mitigation measures are considered in this chapter.

- Primary mitigation
- Secondary mitigation
- Tertiary mitigation

11.2.6 DIFFICULTIES AND UNCERTAINTIES

The benthic grab samples and dropdown video data covered a comprehensive set of point samples across the study site. Grab sampling was undertaken during February 2024, which is considered an optimal time for benthic sampling (ISO 16665:2014).

The resulting biotope maps are derived from the interpolation of these data combined with the geophysical data collected for this project (EIAR Technical Appendix 11: Benthic Ecology). Minor variations to the boundaries of the biotopes are considered likely, based on the interpolated data, and are likely to represent a gradient or transition between biotopes. However, such variations are considered insignificant due the comprehensive scale of the sampling conducted. In small sections of the survey area (as represented by the area covered by the Foreshore Licence) overarching habitat complexes were applied when the available data was too weak to support a biotope classification. This occurred only in 0.7% of the survey area and is considered insignificant, as the habitat complexes involved were comprised of exposed sand habitats, which are highly unlikely to support sensitive biotopes or experience significant effects.

Benthic surveys were not possible in a small area (approx. 9 ha) adjacent to the existing quay walls of the harbour due to port traffic.

Outside of the study area, within the Irish Sea, available benthic ecology data are limited to broadscale habitat classification maps (EMODnet Seabed Habitats, 2021). These maps do not provide detailed biotope data. However, an assessment of the likelihood for potential effects, taken together with the dispersion modelling analysis, was conducted using this information.

11.3 BASELINE: BENTHIC ECOLOGY IN RECEIVING ENVIRONMENT

11.3.1 STUDY AREA

The study area includes the benthic habitats within the area defined by the Foreshore Licence Area (220.2 ha) with the exception of a small area (approx. 9 ha) adjacent to the existing quay walls of the harbour, where benthic surveys were not possible due to port traffic. The study area therefore includes the Proposed Development Boundary and a surrounding buffer zone as shown in Figure 11.2.

Figure 11.2: Benthic Study Area

The predominant habitat within the study area is described as a mosaic of infralittoral (shallow subtidal zone) and circalittoral (deeper shallow subtidal zone) coarse sediment (EMODnet, 2021). As described in Section 11.2.3.2o, , grab sampling, drop down video surveys and walkover surveys were conducted in 2023 and 2024 to obtain detailed information on the benthic ecology of the area. These surveys provided the data required to fully characterise the study area. EIAR Technical Appendix 11: Benthic Ecology of Volume 3 of this EIAR includes the technical reports associated with these surveys.

11.3.1.1 SUBTIDAL HABITATS

A total of 40 stations were sampled for sediment macrofaunal, particle size and organic carbon analysis, see EIAR Technical Appendix 11: Benthic Ecology for details of sampling and sample processing methodologies employed. The results of the analysis indicate that the sediments within the sampling area are dominated by sands (between 63 µm – 2 mm particle diameter) with stations spilt into two broad groups, one being coarser and classified as 'gravelly sand', 'sandy gravel' or 'gravel' and the second group classified as 'muddy sand' or 'sand' under the simplified Folk classification system. Total organic carbon ranged from 0.86% to 7.39% across all samples, indicating no organic enrichment was present.

The number of species ranged from 19 taxa per 0.1 m^2 to 77 taxa per 0.1 m^2 and the average for the whole survey area was 40 taxa per 0.1 m^2. Abundance was extremely high (in excess of 1,000 individuals with a maximum of 2,342) at some stations where the bivalve *Abra alba* heavily dominated the communities present. This was compared to a median abundance value across the survey area of 164.5 individuals per 0.1 m^2. At many stations evenness and diversity were low due to the numerical dominance of a few taxa.

Biotopes (i.e. communities or assemblages of species which occur within a particular habitat type) were assigned according to the Marine Habitat Classification of Britain and Ireland (JNCC, 2022) to each station based on the sediment and biological data. Many of the coarser 'gravel' stations contained difficult to define biotopes. The composition of these communities may have resulted from sporadic high currents due to maneuvering ships, which may have led to the creation of an 'artificial' habitat, i.e., not one which would be positioned there in less disturbed conditions.

Based on grab sampling, three (3) sublittoral sediment biotopes were recorded as follows:

- *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc).
- *Mediomastus fragilis* and cirratulids in infralittoral mixed sediment (SS.SMx.IMx.MedCirr)
- *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment (SS.SMu.SMuVS.CapTubi).

The biotope SS.SSa.CMuSa.AalbNuc was the most dominant biotope recorded, accounting for 160 ha (75%) of the total survey area. This biotope is characterised by non-cohesive muddy sands or slightly shelly/gravelly muddy sand characterised by the bivalves *Abra alba* and *Nucula nitidosa*.

Other important taxa may include *Nephtys* spp., *Chaetozone setosa* and *Spiophanes bombyx* with *Fabulina fabula* also common in many areas. The echinoderms *Ophiura albida* and *Asterias rubens* may also be present (Connor *et al*, 2004)

The biotope SS.SMx.IMx.MedCirr was the second most abundant biotope recorded, accounting for 24 ha (11%) of the total survey area. This biotope is characterised by circalittoral gravelly muddy sand and muddy sandy gravels. The most characterising species include *Mediomastus fragilis* and cirratulid genera, i.e., Chaetozone, Aphelochaeta, Caulleriella and Cirrfiromia often with nuculid bivalves *Nucula nucleus* and *Melinna palmata* (JNCC, 2022).

The biotope SS.SMu.SMuVS.CapTubi was only recorded within the small boat harbour (Kilrane Harbour) and accounted for 1.2 ha (0.5%) of the total survey area. This biotope is found in reduced salinity, muddy sediment dominated by the polychaete *Capitella capitata* with a very low species richness. The biotope is generally found in the muddier sediments, usually with a high organic content, away from tidal channels in estuaries. On occasion, relatively large numbers of *Capitella capitata* can be found in sandier sediments within a more mobile habitat although these are thought largely to be imported by tidal streams from nearby populations (Connor *et al,* 2004).

A sublittoral biotope complex, sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles) (SS.SCS.ICS.SSh), accounting for 5 ha (2.5%) of the survey area, was also recorded during the grab sampling campaign. This biotope is characterised by clean shingle and pebble habitats with a lack of conspicuous fauna. Unstable, rounded pebbles and stones that are strongly affected by tidal streams and/or wave action can support few animals and are consequently faunally impoverished. The species composition of this biotope may be highly variable seasonally and is likely to comprise low numbers of robust polychaetes or bivalves with occasional epibiota including echinoderms and crustacea (Connor *et al,* 2004).

The dropdown video surveys, conducted at the locations of the grab samples and throughout the survey area, assisted in confirming the sediment type recorded by the grab sampling.

Video transects indicated that the survey area was characterised by a relatively level sediment seabed, with frequent areas of *Lanice conchilega* or its associated tube debris on the surface. An area of rippled sand was also present, likely associated with the vessel manoeuvring area, a feature also evident from the multibeam and grab sampling data. Areas of cobble reef are present within the site. These can be clearly seen from the multibeam data gathered in addition to the dropdown video.

All reef recorded was characterised by the biotope IR.HIR.KSed.ProtAhn: *Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock.

This biotope, which accounted for 19 ha (9%) of the survey area, was present on cobble within the depth range of 3.2 – 7.3 meters in mosaic with sediment biotopes, including mixed sediments. Where present, it was generally covered by a veneer of sand supporting species tolerant of sand scour.

Ahnfeltia plicata, *Polyoides rotundus* and *Calliblepharis ciliata* were present at the majority of the video drops on cobble. *Halidrys siliquosa*, *Callophyllis laciniata* and *Fucellaria lumbricalis* were also

frequently recorded. Faunal biomass and diversity were poor, as is typical for this biotope. *Anemonia viridis* and *Cereus pedunculatus* were the most frequently recorded faunal species.

To the southwest of the survey area, pockets of sand (SS.SSA: Sublittoral sands and muddy sands) occur adjacent to the intertidal area.

Aggregations of the common spider crab (*Maja brachydactyla*) was a feature of the reef biotope within the survey area. This species was also recorded on soft sediments, but aggregated at reef habitats, and was also recorded in association with discarded fishing gear.

The distribution of the reef biotope within the survey area, prepared through interpolation of the results of the dropdown video survey and multibeam analysis, is shown in Figure 11.3. See Table 11.5 for biotope code descriptions.

Where data were absent for the shallow sublittoral southwest section of the site, the overarching Habitat Complex was applied (e.g., Sublittoral sands and muddy sands).

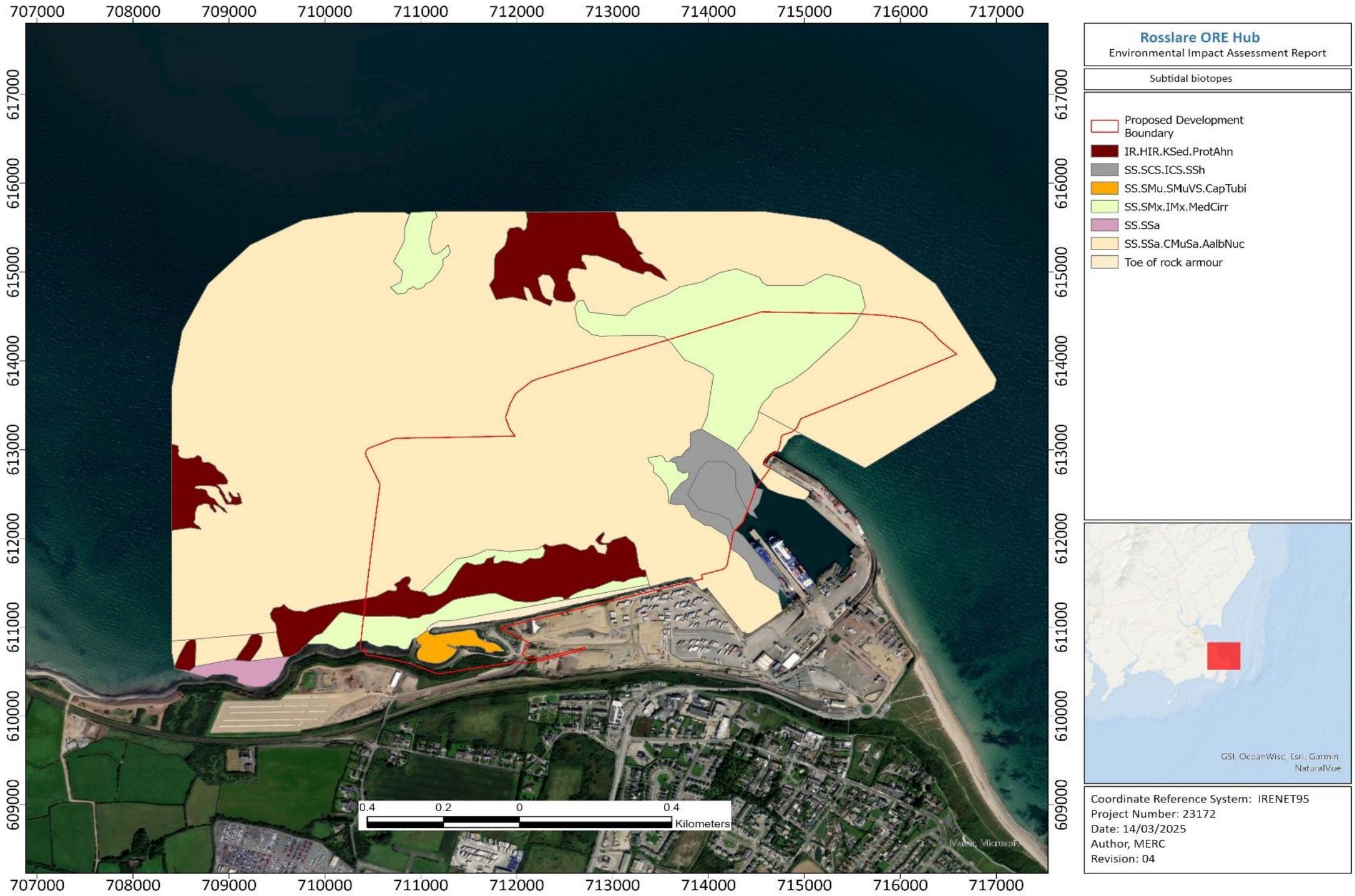

Figure 11.3: Subtidal biotopes in Proposed Development Boundary and Study Area

Table 11.5: Mapped biotope code descriptions (see Figure 11.3)

Biotope code	Biotope Description
IR.HIR.KSed.ProtAhn	Polyides rotundus, Ahnfeltia plicata and Chondrus crispus on sand-covered infralittoral rock
SS.SCS.ICS.SSh	Sparse fauna on highly mobile sublittoral shingle
SS.SMu.SMuVS.CapTubi	*Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment
SS.SMx.IMx.MedCirr	*Mediomastus fragilis* and cirratulids in infralittoral mixed sediment
SS.SSa	Sublittoral sands and muddy sands
SS.SSa.CMuSa.AalbNuc	*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment

11.3.1.2 INTERTIDAL HABITATS

The small boat harbour lies within a small, enclosed bay protected from the east by rock armour. Here, the intertidal area is dominated by cobble and small boulders. It lacks significant physical features such as rockpools, crevices or overhangs that can add diversity to the habitat. The inner section of the harbour, east of the main slip and pontoon, is sheltered and dominated by fucoids with areas of *Ascophyllum nodosum* also present. The brown algae, *Fucus ceranoides*, was abundant in the most easterly section of the inner harbour, indicating low salinity. This species is generally associated with freshwater input. However, there is no obvious source of freshwater (streams) entering the harbour.

The area has been heavily impacted by the presence of the rock armour and ancillary facilities for access to small boats. Litter and fishing gear debris is frequent throughout the area.

West of the spit, the area is more exposed, and the intertidal area is characterised by a mosaic of habitats including areas of mixed sediment, sand and cobble. There is less evidence of impacts in the more exposed outer section of the site.

Four intertidal biotopes and two biotope complexes are present within the PDB:

- *Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock (LR.LLR.F.Fves).
- *Fucus ceranoides* on reduced salinity eulittoral rock (LR.LLR.FVS.Fcer)
- *Fucus spiralis* on exposed to moderately exposed upper eulittoral rock (LR.MLR.BF.FspiB)
- *Fucus serratus* on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser)

- Shingle (pebble) and gravel shores (LS.LCS.Sh)
- Littoral Sand (LS.LSa)

Within the small boat harbour, LR.LLR.FVS.Fcer is generally confined to the most easterly section of the area, while the remainder of the site is characterised by LR.LLR.F.Fves. The outer section of the site, west of the spit, is more exposed and, depending on the shore height, characterised by a mosaic of the biotopes LR.MLR.BF.FspiB and LR.MLR.BF.Fser. Pockets of exposed LS.LCS.Sh and LS.LSa were also recorded. Species diversity was low, and no rare or unusual species were recorded. A biotope map, showing the characterising intertidal habitats is shown in Figure 11.4. See Table 11.6 for biotope code descriptions.

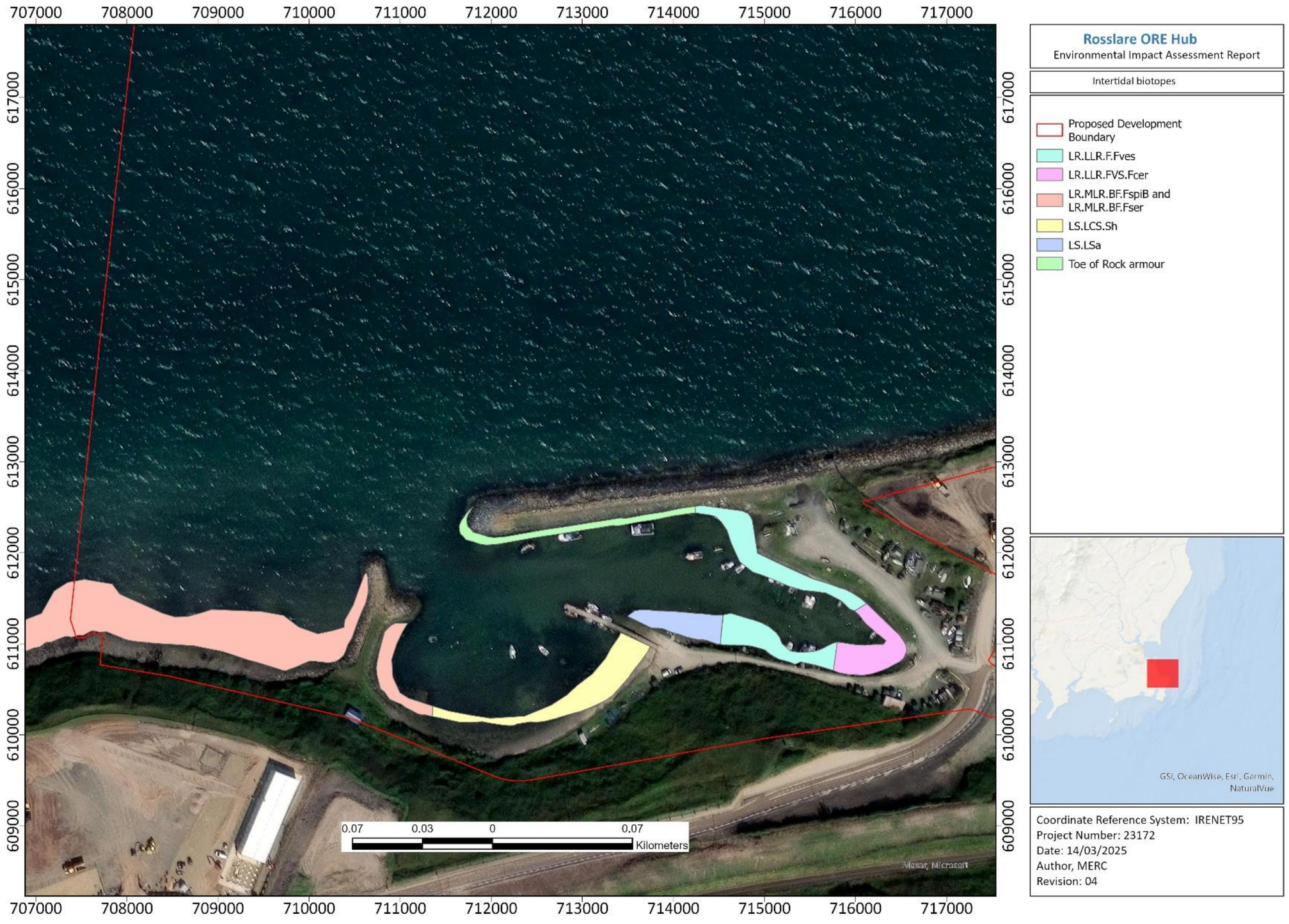

Figure 11.4: Intertidal biotopes in Proposed Development Boundary and Study Area

Table 11.6: Mapped intertidal biotope code descriptions (see Figure 11.4)

Biotope code	Biotope Description
LR.LLR.F.Fves	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock
LR.LLR.FVS.Fcer	*Fucus ceranoides* on reduced salinity eulittoral rock
LR.MLR.BF.FspiB	*Fucus spiralis* on exposed to moderately exposed upper eulittoral rock
LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock
LS.LCS.Sh	Shingle (pebble) and gravel shores
LS.LSa	Littoral Sand

11.3.1.3 CURRENT MODELLING

Modelling of potential changes to currents resulting from the construction of the Proposed Development (EIAR Technical Appendix 8) indicated that there would be no significant change to existing currents. The maximum change modelled was 0.8m/s in the area of the ORE berths and 0.4m/s at the proposed new small boat harbour.

11.3.1.4 WATER CHEMISTRY

The results of the analysis (EIAR Technical Appendix 11: Benthic Ecology) were unremarkable with all stations indicating an almost fully saline waterbody. All parameters measured were within the normal range for good water quality with no significant differences across the stations.

11.3.1.5 SEDIMENT CHEMISTRY

Results of contaminants analysis of vibrocore samples, summarised in Table 11.7, indicate all parameters were no higher than the upper levels under the proposed guidelines for sediment quality for the disposal of dredge spoil in Irish waters (Cronin *et al*, 2006).

Table 11.7: Sediment chemistry results

Parameter	Units	Range
Arsenic	mg kg^{-1}	4.8-19.3
Cadmium	mg kg^{-1}	<0.03-0.39
Chromium	mg kg^{-1}	17.9-109
Copper	mg kg^{-1}	5.3-53.9
Lead	mg kg^{-1}	7.3-54.4
Mercury	mg kg^{-1}	<0.01-0.06
Nickel	mg kg^{-1}	6.3-47.3
Zinc	mg kg^{-1}	19.1-106
TBT	µg kg^{-1}	<1-<5

Parameter	Units	Range
DBT	µg kg^{-1}	<1-<5
y-HCH (Lindane)	µg kg^{-1}	<0.1-0.12
HCB	µg kg^{-1}	<0.1
PCB (individual congeners of ICES 7)	µg kg^{-1}	<0.8-0.41
PCB (SICES 7)	µg kg^{-1}	0.56-1.84
PAH (S16)	µg kg^{-1}	<16-359.65
Total extractable Hydrocarbons	µg kg^{-1}	8,250-6,900,000

11.3.2 DESIGNATED SITES

The designated sites relevant to benthic ecology, within the ZoI of the Proposed Development, are Special Areas of Conservation (SACs) designated under the EU Habitats Directive to protect benthic habitat Qualifying Interests, as listed in Table 11.8. SACs designated for mobile species only and Special Protection Areas designated for birds are not designated for the protection of benthic ecology receptors and are therefore considered in other relevant chapters of the EIAR including Chapter 10: Terrestrial Ecology, Chapter 12: Fish, Shellfish and Turtle Ecology, Chapter 13: Marine Mammals and Chapter 14: Ornithology.

Table 11.8: Designated sites

Site	Nearest distance from development area (Dredge site and Reclamation area) (km)	Relevant Qualifying Interests
Long Bank SAC (002161)	1.5	Sandbanks which are slightly covered by sea water all the time [1110]
Carnsore Point SAC (002269)	1.3	Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170]

Long Bank SAC is designated for the EU Annex I Habitat Sandbanks which are slightly covered by sea water all the time [Habitat code: 1110].

Within Long Bank SAC a single community type is recorded; namely Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex. The sediment is largely that of medium to fine sand with an area of mixed sediment in the northern reaches of the site. Distinguishing species of Sand with *Nephtys cirrosa* and *Bathyporeia elega*ns community complex include *Bathyporeia elegans, Spio filicornis, Nephtys cirrose*, *Gastrosaccus spinifer* and *Urothoe brevicornis*. For the most part, this complex is that of a low species number and densities community. However, in the northern reaches of the site where the sediment is more mixed, a small area of increased numbers of species and individuals occurs.

Carnsore Point SAC is designated for two Annex I Habitats; Mudflats and sandflats not covered by seawater at low tide [1140] and Reefs [1170].

Habitat 1140 contains a single community complex, namely, Intertidal sand dominated by polychaetes and crustacea community complex. This complex is dominated by the spionid

polychaetes *Scolelepis squamata* and *Malacoceros fuliginosus*, the polychaete *Capitella* spp. and the intertidal amphipod *Haustorius arenarius*. Faunal distributions within this community complex are patchy, high abundances of *Malacoceros fuliginosus* and *Capitella* spp. are found at St. Helens Harbour and the western boundary of the SAC whilst on the beach between Carnsore Point and Crossfintan Point there are increased incidences of the amphipod *Bathyporeia pilosa*. The fauna recorded here are typical of intertidal clean sands.

Habitat 1170 includes three community complexes, namely Sheltered to moderately exposed intertidal reef community complex, Exposed subtidal reef dominated by a faunal community complex and *Laminaria*-dominated community complex.

The Sheltered to moderately exposed intertidal reef community complex occurs as boulders and sloping bedrock. The reef biota is largely composed of a variety of lichen species on the upper shore and combinations of fucoids elsewhere on the shore. In sheltered areas, the red algae *Porphyra purpurea* and the freshwater tolerant genus *Ulva* sp. occur, while on moderately exposed reef, encrusting barnacles are found.

The exposed subtidal reef dominated by a faunal community complex is dominated by faunal communities with the most conspicuous species generally consisting of sponges, echinoderms, anemones and erect bryozoans. In depths of between 11 m to 30 m, the reef is occasionally dominated by ascidians.

The *Laminaria* dominated community complex is recorded from south of Carnsore Point between the lower shore and approximately 10 m depth. Two species of kelp have been identified from this habitat, *Laminaria digitata* and *Laminaria hyperborea*. Other algal species associated with the community complex includes *Saccharina latissima*, *Chorda filum*, *Halidrys siliquosa*, *Dilsea carnosa* and the INIS *Sargassum muticum*. The fauna generally associated with this reef type include hydroids, sponges and bryozoans as well as the anemone *Anemonia viridis*, the crab *Necora puber* and the Ballan Wrasse *Labrus bergytta.*

All of the aforementioned community complexes are common in Ireland and no rare or unusual species are recorded from either of these SACs.

11.3.3 ADDITIONAL IMPORTANT ECOLOGICAL FEATURES

Important ecological features are considered to be those features within the ZoI of the Proposed Development that might be affected (CIEEM, 2018). While surveys of the study area have provided a comprehensive description of the baseline ecology within it, an extended search to 3 km was carried out to ascertain if additional features, which may be ecologically important, are likely to occur within the ZoI of the Proposed Development. This wider buffer zone has been based on the assessment of impacts and determination of the ZoI described in section 11.2. For this purpose, the EMODnet mapping (2019) was reviewed, which provided additional information on the surrounding geographical area.

The EMODnet broadscale habitat mapping, out to 3 km from the PDB, is given in Table 11.9. Multibeam echosounder data and seabed sampling data acquired during the INFOMAR and INSS national seabed mapping programmes are the primary sources of data used in the generation of this

collated seabed classification map. Areas where there is no multibeam data have either been filled by EUSeaMap (predictive broadscale habitat map) or have been left as unclassified.

Table 11.9: Broadscale habitats out to 3 km from the PDB (EMODnet, 2019)

EUNIS Habitat Code	Broadscale habitat
A5.14	Circalittoral coarse sediment
A5.13	Infralittoral coarse sediment
A3.1	Atlantic and Mediterranean high energy infralittoral rock
A4.1	Atlantic and Mediterranean high energy circalittoral rock
A5.25 or A5.26	Circalittoral fine sand or Circalittoral muddy sand
A5.23 or A5.24	Infralittoral fine sand or Infralittoral muddy sand
A4	Circalittoral rock and other hard substrata
A5.33	Infralittoral sandy mud

11.4 ASSESSMENT OF EFFECTS

A review of the Proposed Development design (Chapter 6: Project Description) and dredging dispersion assessment (EIAR Technical Appendix 8: Coastal Processes) was conducted. This information was used to inform establishment of the ZoI and the assessment of likely significant effects that may arise from the Proposed Development. The ZoI associated with the construction phase of the project is given in Table 11.12, and that with the operational phase is shown in Table 11.13.

11.4.1 "DO-NOTHING SCENARIO"

Should the Proposed Development not proceed, the existing baseline ecology of the benthic habitats may exhibit some change through natural or anthropogenic change as described below.

Natural change: Some degree of natural change would be expected as the natural environment is, to varying degrees, dynamic in terms of species composition and abundance. The concept of a biotope is not static and revisions to the Marine Nature Conservation Review (MNCR) classification (Connor *et al*, 2004) are constantly made as new data becomes available. In Ireland, the concept of a community complex is often applied to describe an area which has similar abiotic features but records a number of biological communities that are not regarded as being sufficiently stable and/or distinct temporally or spatially to become the focus of conservation efforts. It is considered likely that, in the absence of the Proposed Development, the benthic biotopes within the study area and surrounding ZoI will change to varying degrees over time. However, such changes would be unlikely to significantly change the baseline biotopes.

Anthropogenic change (including human-induced climate change): The benthic habitat within the study area and associated ZoI is already altered from what would be considered a 'natural state'. The biotopes associated with the intertidal habitat of the small boat harbour are a result of the

construction of boulder defences at this location which has provided the sheltered conditions for the establishment of fucoid dominated biotopes in an otherwise exposed environment unsuitable for these biotopes.

Much of the shoreline west of the Proposed Development site is impacted by long-shore drift which is considered to be a result of either the construction of the existing quay walls at Rosslare Port, the reclamation of sections of Wexford Harbour or a combination of both (Orford, 1987 and Sistermans, 2004). In the absence of the Proposed Development, these conditions are likely to remain and continue to maintain the existing fucoid habitat within Kilrane Harbour and contribute to continued long-shore drift and the consequent erosion of Rosslare Strand.

Climate change is already impacting and will likely continue to impact benthic habitats and species within the ZoI of the Proposed Development Area and all areas of the coast of Ireland. Currently there is a paucity of datasets available to systematically measure the effects of climate change and ocean acidification on benthic habitats and species (OSPAR, 2023). However, OSPAR (2024) states that direct and indirect pressures driven by climatic change and ocean acidification factors can significantly alter the environmental conditions necessary for benthic ecosystem processes and functions, and therefore affect habitat suitability for sensitive benthic species, species distributions, community structures and diversity patterns, particularly along the coastline. Human-induced climate change is likely to be affecting, and will continue to affect, the benthic ecosystem of the PDB and the wider marine ecosystem in the absence of the Proposed Development.

11.4.2 PRIMARY MITIGATION

Primary mitigation measures are incorporated into design of the Proposed Development, including reclamation within a bunded lagoon and the use of the weirbox to control turbidity during the construction phase and the deployment of interceptors in the reclamation area drainage scheme during the operational phase (see Chapter 6: Project Description).

11.4.3 TERTIARY MITIGATION

The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/785), is an international marine environmental convention which aims to prevent both operational and accidental discharge into the marine from sea going vessels. Ireland ratified the various elements of the MARPOL Convention through the Sea Pollution Act 1991, the Sea Pollution (Amendment) Act 1999 and the Sea Pollution (Miscellaneous Provisions) Act 2006. MARPOL 73/78 was given further legal effect through Statutory Instruments introduced under these Acts. The Acts place a legal obligation upon operators of vessels to implement measures to prevent both operational and accidental discharges from ships of substances, which may damage the marine environment as well as human health.

The construction and operational activities will result in an increase in vessels and therefore a potential risk of accidental spills however an incidence of pollution whether from an accidental occurrence or operational activities is not considered likely considering the legal obligations to comply with MARPOL 73/78.

Additional tertiary mitigation measures relevant to benthic ecology receptors are set out to mitigate the potential for the accidental release of pollutants including hydrocarbons and cementitious material during the construction phase by Chapter 7: Soils, Geology, Hydrogeology and Contamination, Chapter 9: Water Quality and Flood Risk of this EIAR and the outline Construction Environmental Management Plan (oCEMP) which accompanies this application..

11.4.4 CONSTRUCTION PHASE

The main elements of the construction phase, with the potential of impacting benthic habitats, include dredging, reclamation and the construction of the new quays, hardstands and slipways, installation of rock armour and associated works within the reclamation area. Dredging will be required to provide navigable waters to approach and berth. The primary berth pocket will be dredged to a depth of -12 mCD (metres Chart Datum), and the approach channel dredged to a depth of -10 mCD. No dredging is required to provide access to the proposed new small boat harbour.

Reclamation will be required for the installation of a hardstand area, for the storage and assembly of ORE components, surrounded by quay walls and associated rock armour. The dredge area is comprised of a total of 47.9 ha of subtidal benthic habitat and the reclamation area is comprised of a total of 24.5 ha of combined subtidal and intertidal benthic habitat, as shown in in Table 11.10 and Figure 11.5.

Table 11.10: Dredge and reclamation areas

Section of development	Location	Area (ha)
Dredge area	Subtidal	47.9
Reclamation area	Subtidal	22.8
Reclamation area	Intertidal	1.7

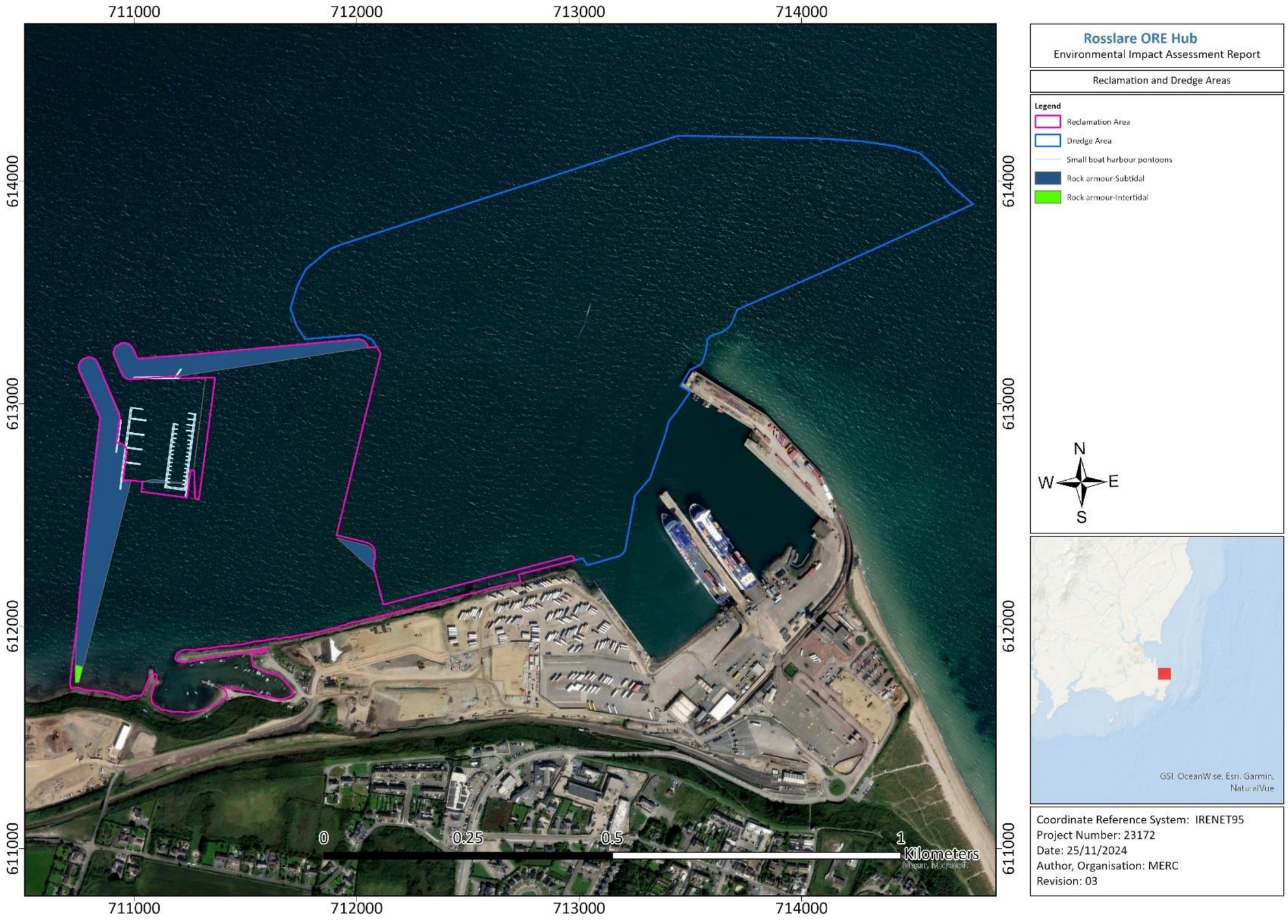

Figure 11.5: Reclamation, rock armour, pontoon and dredge areas

While direct effects within the footprint of the dredging and reclamation areas will occur, the spatial extent to which these effects will extend was informed by the dispersion modelling (EIAR Technical Appendix 8: Coastal Processes). The dispersion modelling used a worst-case scenario to calculate sediment dispersion and potential bed thickness change during three separate stages: Stage 1: construction of the reclamation area with imported rock-fill, Stage 2: dredging and disposal of the soft sediment overburden and Stage 3: dredging and disposal of the deeper till and bedrock, with all dredged material being disposed of into the reclamation area. The modelled results were extracted from several locations within the model mesh, including three points within 200 metres of Rosslare Europort which included the location of the weir-box which overlaps with the Seas Off Wexford cSPA (see Chapter 6: Project Description and Chapter 8: Coastal Processes), three locations located 2 km offshore and six locations nearby SPAs and SACs (including Wexford Harbour and Slobs SPA, The Raven SPA, Blackwater Bank SAC, Carnsore Point SAC and Long Bank SAC).

Table 11.11 provides a list of the results from the extracted points, while the location of these points can be seen in Figure 11.6.

Table 11.11: Point locations for the extracted sediment dispersion modelling results (from EIAR Technical Appendix 8: Coastal Processes)

Point Number	Name	Longitude (m)	Latitude (m)
Point 1	Nearshore West	679481	5793210
Point 2	Weir-box and Seas Off Wexford cSPA	680981	5793210
Point 3	Nearshore East	682481	5793210
Point 4	Offshore West	679481	5795010
Point 5	Offshore Centre	680981	5795010
Point 6	Offshore East	682481	5795010
Point 7	Carnsore Point SAC	683241	5791984
Point 8	Wexford Harbour and Slobs SPA	678383	5799453
Point 9	The Raven SPA	680168	5802163
Point 10	Blackwater Bank SAC	687009	5792050
Point 11	Long Bank SAC	683043	5794430

In summary, the modelling demonstrated that SSC and bed thickness would result in the following level changes within the port area and at adjacent reference locations as shown in Figure 11.6.

Stage 1: The maximum total increased SSC predicted during the 4-month disposal period in Stage 1 is approximately 0.23 mg/L at the nearshore eastern point of Rosslare harbour. The highest SSC is observed at the weirbox on the outer boundary of the reclamation area (see Chapter 6: Project Description), reaching 7 mg/L. Both the maximum and average SSC values are concentrated directly to the west and east of Rosslare Harbour, indicating that the sediment remains confined within the

port's area of influence. The SSC values are negligible south of Greenore Point and similarly low in areas to the west, beyond Rosehill Bay Beach.

Apart from the higher values near the port, the points representing the SAC areas are predicted to have maximum SSC results below 1.45 mg/L (observed at Carnsore Point SAC).

Bed thickness changes indicated a maximum change of 0.0026 cm near the disposal site. At the points representing the SAC areas, the maximum bed thickness change was 0.0082 cm at Carnsore Point SAC (Location 7), which is negligible.

Stage 2: Maximum SSC observed during the two-month dredging and disposal period at the location in front of the PDB (Location 2) was 2.43 mg/L. The peak SSC was modelled for the weir box, located on the outer boundary of the reclamation zone, with concentrations reaching 15 mg/L.

The highest SSC values were concentrated near Rosslare Harbour, with increased SSC levels extending 1.5 km west to Rosehill Bay Beach (beyond which, levels were negligible) and 2.5 km southeast to Greenore Point (beyond which levels were negligible).

Apart from the higher values near the port, the points representing the SAC and SPA areas have maximum SSC results below (5.16 mg/L), which was observed at Carnsore Point SAC.

The largest bed thickness change (0.027 cm) was observed at the weirbox . At the locations representing the SAC boundaries, the largest bed thickness change was at Carnsore Point SAC, where a change of 0.030 cm was modelled, which is considered negligible.

Stage 3: Maximum SSC observed during the eight-month dredging and disposal period at the location in front of the project site (Location 2) was 1.73 mg/L. The peak SSC modelled was at the weirbox located on the outer boundary of the reclamation zone, with concentrations reaching 20 mg/L.

As for stage 1 and 2, the maximum and average SSC are concentrated near Rosslare Harbour, 1.5 km to the west (Rosehill Bay Beach) and 2.5 km southeast (Greenore Point), beyond which SSC values were negligible.

The points representing the SACs indicated a maximum SSC of below 9.96 mg/L, as observed at Carnsore Point SAC.

The largest bed thickness change was modelled near Rosslare Harbour. For the SAC reference points the largest bed thickness change was 0.037 cm at Carnsore Point SAC which is considered negligible.

Based on the above SSC and bed thickness changes the ZoI of the Proposed Development has been extended to a radius of 3 km relative to sediment dispersion resulting from dredging and reclamation operations.

A summary of the potential impacts (pressures) and their potential effects is given in Table 11.12. Table 11.12 summarises and describes the MarESA pressures and pressure benchmarks associated with Proposed Development construction activities and describes the associated Zones of Influence considered in the impact assessment.

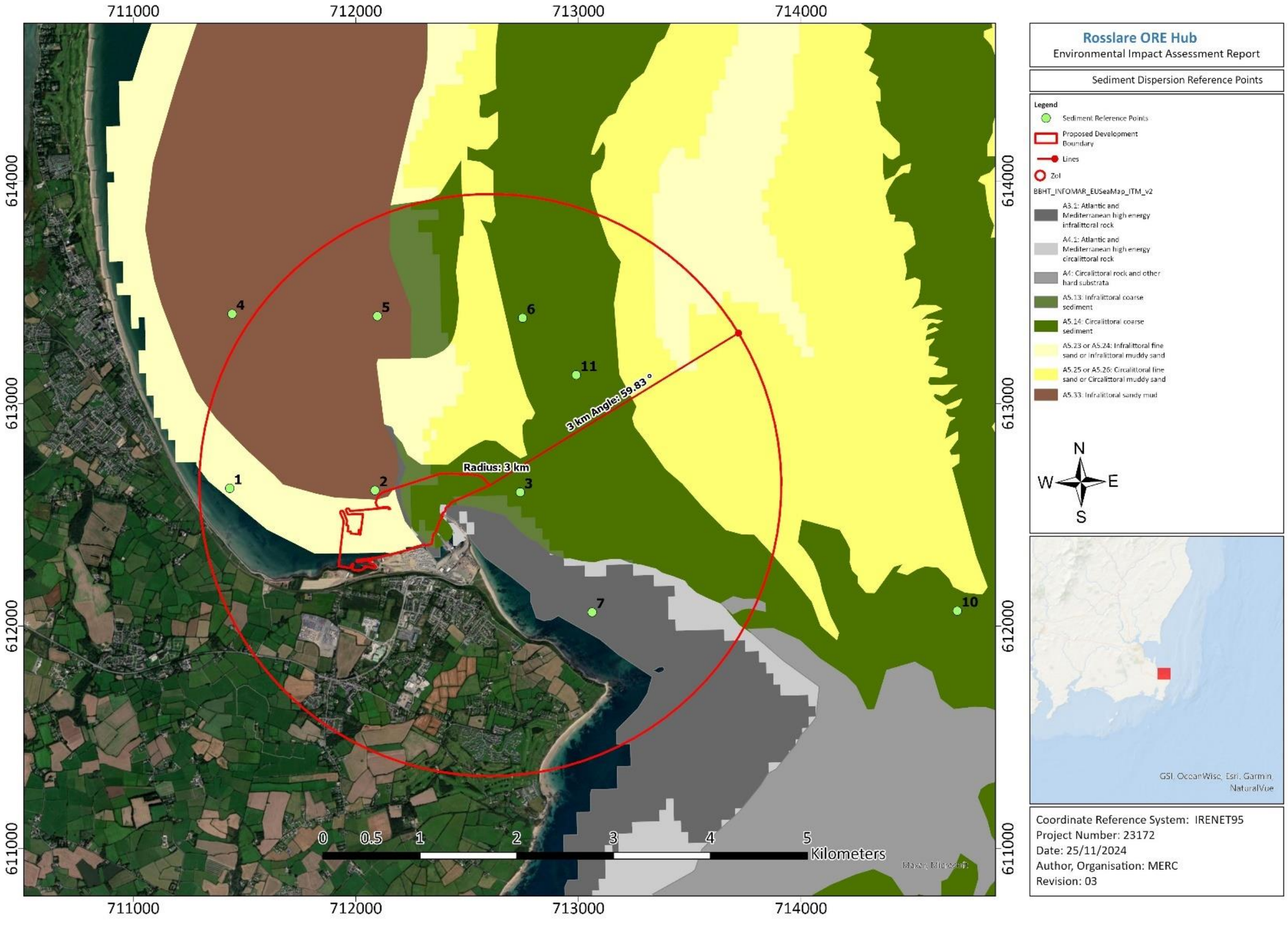

Figure 11.6: Sediment dispersion reference points and associated ZoI from Proposed Development Area

Table 11.12: Potential construction impacts and effects and their ZoI

MarESA Pressure*	MarESA Pressure Benchmark*	Relevant Proposed Activity	ZoI for Impact Assessment
Construction phase: Dredging and reclamation			
Physical loss (to land or freshwater habitat).	A permanent loss of existing saline habitat within the site	Habitat loss will occur within the reclamation area due to reclamation.	Footprint of reclamation area (27.7 ha)
Habitat structure changes - removal of substratum (extraction).	The extraction of substratum to 30 cm (where substratum includes sediments and soft rock but excludes hard bedrock).	Structural changes to benthic habitats to a depth of -12 mCD within the berth area and -10 mCD within the approach channel will occur due to dredging.	Up to 3 km. Based on dispersion model.
Changes in suspended solids (water clarity).	A change in one rank on the WFD (Water Framework Directive) scale e.g. from clear to intermediate for one year.	Dredging and reclamation activities will result in temporary (days) changes to water clarity.	Up to 3 km. Based on dispersion model.
Smothering and siltation rate changes (light).	Light deposition of up to 5 cm of fine material added to the seabed in a single discrete event.	Dredging and reclamation activities will result in sediment deposition within the ZoI of the development but primarily within the harbour area.	Up to 1 km. Based on dispersion model.
Smothering and siltation rate changes (Heavy).	Heavy deposition of up to 30 cm of fine material added to the seabed in a single discrete event.	Dredging and reclamation activities will result in sediment deposition within the ZoI of the development but primarily within the harbour area.	Up to 1 km. Based on dispersion model.
Underwater noise changes	MSFD indicator levels (SEL or peak SPL) exceeded for 20% of days in a calendar year.	Species known to be affected by underwater noise are marine mammals and fish and are the species relevant to the benchmark defined for this pressure. No impacts on benthic species are indicated. Underwater	N/A

MarESA Pressure*	MarESA Pressure Benchmark*	Relevant Proposed Activity	ZoI for Impact Assessment
		noise relative to marine mammals and fish are discussed in Chapters 12 and 13 of this EIAR.	
Introduction of invasive non-indigenous species (INIS)	The introduction of one or more invasive non-indigenous species (INIS)	The introduction of INIS may result from vessels working during the construction phase of the project.	It is not possible to provide a ZoI for INIS as there are too many global factors associated with their spread
Construction Phase: Building of the new quay walls and hardstand areas			
Changes in suspended solids (water clarity).	A change in one rank on the WFD (Water Framework Directive) scale e.g. from clear to intermediate for one year.	Temporary changes (days)in water clarity may occur in the area at and surrounding the new quay walls and slipways during their construction and during the placement of rock armour.	Up to 1 km. considered appropriate relative to the scale and likely magnitude of this impact.
Underwater noise changes.	MSFD indicator levels (SEL or peak SPL) exceeded for 20% of days in a calendar year.	Species known to be affected by underwater noise are marine mammals and fish and are the species relevant to the benchmark defined for this pressure. No impacts on benthic species are indicated. Underwater noise relative to marine mammals and fish are discussed in Chapters 12 and 13 of this EIAR.	N/A
Introduction of invasive non-indigenous species	The introduction of one or more invasive non-indigenous species (INIS)	The introduction of INIS may result from vessels working during the construction phase of the project.	It is not possible to provide a ZoI for INIS as there are too many global factors associated with their spread

* Pressures are defined as 'the mechanism by which a human activity or natural event affects the ecosystem'. The pressures used in the MarESA approach are based on the pressure definitions developed by the OSPAR Intercessional Correspondence Group on Cumulative Effects (ICG-C) – Amended 25th March 2011 (OSPAR, 2011). The pressure benchmarks were based on Tillin *et al.* (2010) and subsequently revised by Tillin & Tyler-Walters (2015; 2014a&b) in liaison with the SNCBs (Statutory Nature Conservation Bodies). The pressure and benchmark list are subject to change but full details of their interpretation and application to MarESA sensitivity assessments are given in the MarESA guidance document (Tyler-Walters et al., 2023).

11.4.5 OPERATIONAL PHASE IMPACTS

Operational phase impacts include the day-to day activities that will be associated with the operation of the Rosslare Europort ORE Hub (i.e., the windfarm operations which the hub is designed to support) and the relocated small boat harbour and those associated with the presence of new physical infrastructure at the location as described in Chapter 6: Project Description.

The primary effects are likely to result from shading and fouling associated with the new pontoons and the potential for increased vulnerability to the introduction of invasive non-indigenous species (INIS) associated with increased vessel traffic.

Impacts arising from pollution/waste discharges and the accidental spillage of hydrocarbons have been scoped out as they have been considered in chapters 7 and 9 and form part of the embedded mitigation associated with the Proposed Development.

Table 11.13 summarises and describes the MarESA pressures and pressure benchmarks associated with Proposed Development operational phase activities and describes the associated Zones of Influence considered in the impact assessment.

Table 11.13: Potential operational impacts and effects and their ZoI

MarESA Pressure	MarESA Pressure Benchmark	discussed in Chapters 12 and	ZoI for Impact Assessment
Operational phase			
Introduction of invasive non-indigenous species	The introduction of one or more invasive non-indigenous species	The introduction of INIS may result from vessels using the new quays and small boat harbour	It is not possible to provide a ZoI for INIS as there are too many global factors associated with their spread
Introduction of shading and light	Shading (e.g. due to overgrowth, construction of jetties or other artificial structures) could adversely affect shallow sublittoral macroalgae, seagrass, and pondweeds.	Shading from pontoons could lead to a reduction or loss of algal species associated with reef habitats adjacent to jetties/quay walls.	Within 25 m of Quay walls.

11.4.6 CUMULATIVE EFFECTS AND OTHER INTERACTIONS

11.4.6.1 METHODOLOGY

While a single development may not in itself cause a significant impact on the local ecosystem, a combination of projects within a localised area may cause a negative impact. Therefore, the cumulative impacts of a project or plan in association with other projects and plans must be taken into consideration when assessing the possible impacts of a development.

Transboundary effects refer to significant effects that a proposed development in one country may have on the environment of another. The United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context, (referred to as the 'Espoo Convention') adopted in 1991 documents the requirement to consider transboundary impacts. The Espoo Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

Chapter 25: Interactions of this EIAR has considered and assessed cumulative and transboundary effects that may occur as a result of the Proposed Development. Potential impacts identified that are relevant to benthic ecology receptors are documented in Table 11.12 and Table 11.13. Additional projects identified as having potential to act in-combination with the Proposed Development are considered to be those projects most likely to contribute to these pressures and generate the same or similar pressures to those identified.

The following approach to the identification of cumulative impacts has been taken:

- The geographic boundaries of the Proposed Development were reviewed.
- As the proposed project is solely marine based, a search for projects with a marine component or the ability to impact the marine environment through a SPR model were considered relative to the potential for cumulative effects. In this regard all additional projects within 5 km of the PDB were considered in this review. This is considered to be reasonable and appropriate relative to the scale and scope of the proposed project.
- The search was focused on projects and applications listed through the following sources:
    - Local Authority Planning applications
    - Wexford County Council Development Plan
    - An Bord Pleanála
    - Maritime Area Regulatory Authority (MARA) for applications submitted after 17th July 2023
    - Foreshore Unit of the Department of Housing Local Government and Heritage for applications prior to 17th July 2023
    - Environmental Protection Agency (EPA) Dumping at Sea register
- A review was undertaken to ascertain if any potential impacts on sensitive benthic receptors, resulting from the identified projects was likely

11.4.6.2 ASSESSMENT OF CUMULATIVE IMPACTS

A full list of all projects sourced for consideration in this EIAR are given in Chapter 25: Interactions. Those projects considered relevant to the Proposed Development are listed in Table 11.14. An assessment of these projects, with regard to potential cumulative effects, at the construction and operational phase of the Proposed Development was carried out and the rational for the assessment is provided in Table 11.14. No projects were identified with the potential to lead to cumulative impacts with the Proposed Development during either the construction or operational phases.

11.4.6.3 ASSESSMENT OF TRANSBOUNDARY IMPACTS

The magnitude of all identified construction and operational phase impacts of the Proposed Development are documented in section 11.4.4 and 11.4.5. The ZoI of these potential impacts is limited to a maximum of 3 km. No further additional projects have been identified that could lead to any cumulative impacts. As such, transboundary impacts are not considered possible.

Table 11.14: Projects considered relative to cumulative impacts

Planning reference	Applicant	Date	Description	Assessment of potential for cumulative effect
20211672	Iarnród Eireann	10/12/2021	Permission for an extension to the existing Berth 3. Replacement of the existing linkspan with a new linkspan and support structures. Demolition and removal of the existing Berth 4 linkspan to include re-surfacing works to provide new quayside working areas. Associated site works and ancillary development including dismantling and demolition of existing structures including linkspans, wingwall, elevated walkway, and bank seat.	This project was subject to Screening for Appropriate Assessment and no project related impacts on benthic receptors were recorded. As such no potential for impact with the Proposed Development is considered possible
20200725	Iarnród Eireann	28/8/2020	Permission for a new main access road, roundabout, internal road and freight entrance plaza. To include demolition and removal of existing port sheds, construction of a new main access road, construction of a new western roundabout to provide access to the small boating marina, the proposed freight entrance plaza; and new internal road, construction of a new internal road, erection of a freight entrance plaza, administration building and associated foul water holding tank; and all associated site works and ancillary development including drainage works, a temporary construction compound.	This project was subject to Screening for Appropriate Assessment and no project related impacts on benthic receptors were recorded. As such no potential for impact with the Proposed Development is considered possible
20211322	The Commissioners of Public Works in Ireland	07/10/2021	Permission for the construction of a new Border Control Post (BCP) at Rosslare Europort. Consisting of land side demolition and construction of new buildings to include truck and car parking spaces, hard and soft landscaping, new internal roads, footpaths, street lighting, new foul and storm	This project was subject to EIAR and no project related impacts on benthic receptors were recorded. As such no potential for impact with the Proposed Development is considered possible.

Planning reference	Applicant	Date	Description	Assessment of potential for cumulative effect
			water drainage systems, water connection, site services and all other associated and ancillary works.	
20211971	The Commissioners of Public Works in Ireland	28/1/2022	Permission for the relocation of the existing pet-check portacabin, the creation of a new lay-by, pedestrian path and additional parking spaces, together with all associated site works.	This project was subject to Screening for Appropriate Assessment and no project related impacts on benthic receptors were recorded. As such no potential for impact with the Proposed Development is considered possible
314015	Wexford County Council	3/1/2023	Development of the N25 Rosslare Europort Access Road.	This project was subject to EIAR and no project related impacts on benthic receptors were recorded. As such no potential for impact with the Proposed Development is considered possible.

11.5 IMPACT ASSESSMENT

The impact assessment for each of the biotopes recorded within the Project Development Boundary and ZoI is documented below and summarised in Table 11.16.

11.5.1 CONSTRUCTION PHASE

11.5.1.1 PHYSICAL LOSS (TO LAND OR FRESHWATER HABITATS)

Reclamation will involve the infill of approximately 24.5 ha of a combination of subtidal and intertidal benthic habitat (see Table 11.10). The reclamation area will include the areas to be occupied by quay walls and associated rock armour, ramps and slipways. A full description of the reclamation methods is provided in Chapter 6: Project Description.

Magnitude of impact

Reclamation will lead to permanent loss of 22.8 ha of subtidal habitat comprised of three separate biotopes and 1.7 ha of intertidal habitat comprised of a fourth biotope. The complete loss of the baseline biotope with the potential to negatively impact the conservation status of the local ecosystem and with very low/no chance of recovery would result in a magnitude score of High. However, it must be taken into account that the proposed loss of habitat is in an area dominated by SS.SSa.CMuSa.AalbNuc, which accounted for 75.1% of the study area. This habitat, which is characterised by non-cohesive muddy sands or slightly shelly/gravelly muddy sand, is also likely to be extensive in this area of the Irish coast as indicated by INFOMAR sediment profiles, which show shallow sublittoral coarse sediment and shallow sublittoral sand and muddy sand across most of the southeast of Ireland. Other biotopes which would be lost, as documented in Table 11.15, represent only 4.2% of the total Study Area and is comprised of a mosaic of biotopes common to the southeast coast of Ireland. **Therefore, the magnitude of the impact is considered to be "Low"** as the magnitude would be unlikely to affect the conservation status of the local ecosystem.

Sensitivity of receptor

The biotopes within the footprint of the reclamation area are given in Table 11.15.

Sensitivity assessment to Physical loss (to land or freshwater habitat)

All marine habitats and benthic species are considered to have a resistance of None to this pressure and to be unable to recover from a permanent loss of habitat (resilience is Very Low). Sensitivity within the direct spatial footprint of this pressure is therefore **High.**

Table 11.15: Biotopes within the reclamation and dredge areas

	Reclamation area		Dredge area	
Biotope	**Area (ha)**	**%**	**Area (ha)**	**%**
SS.SSa.CMuSa.AalbNuc	17.34	70.77	31.64	66.05
SS.SMx.IMx.MedCirr	4.66	19.02	9.40	19.62
SS.SCS.ICS.SSh	N/A	N/A	4.34	9.06
IR.HIR.KSed.ProtAhn	4.48	18.29	2.61	5.39
LR.MLR.BF.FspiB & LR.MLR.BF.Fser	0.29	1.18	N/A	N/A

	Reclamation area		Dredge area	
Biotope	**Area (ha)**	**%**	**Area (ha)**	**%**
LS.LCS.Sh	0.08	0.32	N/A	N/A
LS.Lsa	0.04	0.18	N/A	N/A
LR.LLR.F.Fves	0.12	0.50	N/A	N/A
LR.LLR.FVS.Fcer	0.05	0.23	N/A	N/A
SS.SMu.SMuVS.CapTubi	1.21	4.9	N/A	N/A

Note: Biotopes do not add up to 100% due to presence of slip ways and rock armour with the dredge and reclamation areas. In addition, the Chief Surveyor boundary for the High-Water Mark (HWM) does not reflect the present day HWM for the small boat harbour. Therefore, intertidal biotopes were "Pulled back" from the HWM where this would have led to them to appear as if they were in the terrestrial sections of the existing small boat harbour.

11.5.1.2 HABITAT STRUCTURE CHANGES – REMOVAL OF SUBSTRATUM (EXTRACTION)

Dredging will result in benthic habitat change within the footprint of the dredge area during the construction phase of the development. Change to benthic habitats to a depth of -12 mCD within the berth area -10 mCD within the approach channel will result. Dredging activities may also result in benthic habitat disturbance as a consequence of sediment mobilisation to a wider buffer zone outside of the direct dredge area.

Magnitude of impact

Dredging operations will require the removal of 1,400,000 m³ of material (sediments and hard strata) within an area of 48.4 ha. A full description of the dredging operations and the estimated type and quantities of dredge material is provided in Chapter 6: Project Description and Technical Appendix 7: Geotechnical Investigation Report.

A Trailing Suction Hopper Dredging (TSHD) or Cutter Suction Dredging (CSD) technique will be used to remove 550,000 m³ of soft marine deposits. A total duration of 12 weeks has been allowed for this stage. Dredging will begin in the outermost area, handling 100,000 m³, after which the dredger will proceed with the remaining 450,000 m³ in the innermost area. During stage 3, The remaining 850,000 m³ of material, which will include stiffer clays and weathered rock, will be removed using a backhoe dredger or a Cutter Suction Dredging (CSD) technique. It is estimated that this phase will take 9 months to complete using Backhoe dredging or 3.5 months using CSD operations.

As described in Chapter 6: Project Description, within the bunded reclamation area, the displaced seawater and dredge material will be controlled via the weir-box system.

Table 11.15 gives the total area of each biotope within the dredge and reclamation area. It is considered that the dredging operations will lead to minor or temporary changes in the structure and function of the baseline biotope in a localised area i.e., within the dredge area, but this would be unlikely to negatively impact the conservation status of the local ecosystem as the species present within these biotopes can be broadly characterised as either opportunist species that rapidly colonise disturbed habitats or are species that are frequently encountered throughout the geographical area of the southeast coast of Ireland. No rare or unusual species or keystone species

were recorded in any of the biotopes within the proposed dredging area. **Therefore, the magnitude of the impact is considered to be "Low".**

Sensitivity of receptors

***Mediomastus fragilis* and cirratulids in infralittoral mixed sediment (SS.SMx.IMx.MedCirr)** was assigned to 20.5% of the dredge area. While this biotope is the best fit for the habitat and species recorded in this area, the species data did not perfectly align with the biotope description; this biotope is described in the literature (JNCC, 2022) as being composed of infralittoral shallow mixed sediment, characterised by a diverse number of cirratulid polychaetes, bivalves and amphipods. Dredging will result in a medium magnitude impact on this biotope as a result of habitat structural changes (removal of the substratum).

Sensitivity assessment (to habitat structural changes): Resistance is classified as None as the extraction of the sediment will remove the characterising and associated species present, within the affected area. Resilience is considered to be Medium as some species may require longer than two years to re-establish and sediments may need to recover (where exposed layers are different). Hence, sensitivity is assessed as **Medium.**

Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles) (SS.SCS.ICS.SSh) occupies 10.8% of the dredge area. This biotope is characterised by clean shingle and pebble habitats with a lack of conspicuous fauna as a result of strong tidal streams. substratum),

Sensitivity assessment (to habitat structural changes): The process of extraction will remove the abiotic habitat; therefore, a resistance of None is recorded. While the MarESA assessment considers that as the shingle is mobile, where small areas are impacted, infilling is likely to be rapid following sediment redistribution by wave action. Thus, resilience is assessed as High, and sensitivity as Medium. However, in the present case, it is considered unlikely that the seabed will infill and therefore physical change to another sediment type may be possible. Thus, the sensitivity assessment is assessed as **High**.

***Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock (IR.HIR.KSed.ProtAhn)** occupies 5.4% of the dredge area. This biotope is characterised by a hard rock substratum that is overlain or periodically exposed to, a layer of coarse sand. Removal of the bedrock would remove the attachment surface for the red algal turf that characterises this biotope, and the absence of sand may allow colonisation of less scour-tolerant species, significantly altering the character of the biotope.

Sensitivity assessment (to physical change to another seabed type). Based on the loss of suitable habitat, biotope resistance is assessed as None and recovery is assessed as Very Low as the change at the pressure benchmark is permanent. Sensitivity is therefore **High**.

***Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc).** This biotope covers the vast majority of the dredge area (62.44%) and was characterised by the bivalves *Abra alba* and *Nucula nitidosa*. Other important taxa included *Nephtys* spp., *Spiophanes bombyx* with *Fabulina fabula* as described for this biotope.

Most of the animals that occur in this biotope are shallowly buried and extraction of the sediment will remove the biological assemblage.

Sensitivity assessment (to physical change to another seabed type). Resistance is assessed as None as extraction of the sediments will remove the characterising and associated species present. Resilience is assessed as Medium as some species may require longer than two years to re-establish and sediments may need to recover (where exposed layers are different). Biotope sensitivity is therefore assessed as **Medium**.

11.5.1.3 CHANGES TO SUSPENDED SOLIDS (WATER CLARITY)

Dredging and the associated disposal of the dredge material into the reclamation area will lead to an increase in SSC for the 10-month duration of the three stages of the dredge campaign as described in section 11.4.4.

Magnitude of impact

All stages of the dredge campaign will result in an increase in SSC. Stage 3 of the proposed dredging operations will produce the highest SSC values with concentrations of 20mg/L predicted near the weir box location decreasing to 9.96 mg/L at location 6 (1.8 km southeast of the dredge area). Ensuring a precautionary approach, the ZoI for SSC was extended out to 3 km (see Figure 11.6). While the various stages of the dredge campaign will lead to a temporary increase in SSC none of the infaunal benthic receptors would be affected by this increase. Minor temporary effects may impact algal species, but this would be of a temporary duration and unlikely to lead to effects other than minor or temporary change in the structure and function of the baseline biotope in a localised area. **Therefore, the magnitude of the impact is considered to be "Low".**

Sensitivity of receptors

The benthic receptors within the footprint of the dredge area (Figure 11.3) and the predominant broadscale habitats and marine community types (for SACs) extending out to 3km from the dredge area, with the potential for effects, are described below**.** Intertidal habitats are not considered as those recorded will be lost to reclamation within the foreshore licence area and no additional significant intertidal habitats occur within the ZoI of dispersion.

***Mediomastus fragilis* and cirratulids in infralittoral mixed sediment (SS.SMx.IMx.MedCirr)**

Sensitivity assessment (to changes in water clarity): Changes in turbidity and seston are not predicted to directly affect burrowing polychaetes that live within sediments. The biotope is dominated by deposit-feeding species that are unlikely to be directly affected by increases or decreases in suspended sediments. Therefore, biotope resistance is assessed as High, resilience as High, and sensitivity is assessed as **Not sensitive** albeit with Low confidence.

***Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc)**

Sensitivity assessment (to changes in water clarity): The characterising, suspension feeding bivalves are not predicted to be sensitive to and tolerant of, short-term increases in turbidity following sediment mobilisation by storms and other events. An increase in suspended solids, at the pressure benchmark may have negative impacts on growth and fecundity by reducing filter feeding efficiency and imposing costs on clearing. Biotope resistance is assessed as Medium as there may be some

shift in the structure of the biological assemblage and resilience is assessed as High (following restoration of typical conditions). Biotope sensitivity is assessed as **Low**.

Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles) (SS.SCS.ICS.SSh)

Sensitivity assessment (to changes in water clarity): This biotope occurs in scoured habitats, and it is likely, depending on local sediment supply, that the biotope is exposed to chronic or intermittent episodes of high levels of suspended solids as local sediments are re-mobilised and transported by wave action. This biotope is characterised by the absence of species through sediment mobility (JNCC, 2015), rather than the presence of typical species: changes in suspended solids will therefore not alter the biotope. Resistance to an increase or decrease in suspended solids is therefore assessed as High and resilience as High (by default) and this biotope is considered to be **Not sensitive**.

***Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock (IR.HIR.KSed.ProtAhn).** Increases in suspended solids may lead to greater scour causing damage to plants and reduce light availability impacting growth if exposure is frequently repeated. However, in the present case only temporary exposure is possible and the species present are tolerant of scour.

Sensitivity assessment (to changes in water clarity): As the species present are tolerant of scour and turbidity, biotope resistance is assessed as Medium and resilience as High sensitivity is therefore assessed as **Low**.

***Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment SS.SMu.SMuVS.CapTubi**

The biological assemblage characterising this biotope is infaunal and consists of sub-surface deposit feeders. Increased suspended solids are unlikely to have an impact. A reduction in suspended solids may reduce deposition and supply of organic matter.

Sensitivity assessment (to changes in water clarity): Increased suspended solids are unlikely to have an impact, so the biotope is considered to be **Not sensitive**.

Broadscale habitat types:

Sediment biotopes: Circalittoral coarse sediment, Infralittoral coarse sediment, Circalittoral fine sand or Circalittoral muddy sand, Infralittoral fine sand or Infralittoral muddy sand, Infralittoral muddy sand.

Reef biotopes: Atlantic and Mediterranean high energy infralittoral rock, Atlantic and Mediterranean high energy circalittoral rock, Circalittoral rock and other hard substrata.

Sensitivity assessment (to changes in water clarity): As detailed biotope sensitivity data for these broadscale habitats have not been published, it is considered that the five sediment biotopes would have, as a worst case, a resistance of Medium and resilience of High (following restoration of typical conditions) with biotope sensitivity being assessed as Low, similar to the sediment biotopes within the Study Area, while the reef biotopes would, as a worst case, have the same sensitivity assessment as IR.HIR.KSed.ProtAhn, i.e., resistance assessed as Medium and resilience as High and sensitivity assessed as **Low**.

Marine community types associated with SACs

Sensitivity assessment (to changes in water clarity):

- Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex, a feature of the Annex I habitat 1110 is, at its nearest distance, 1.5 km from the PDB.

  This community complex is considered to be equal to the MNCR biotope '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' (SS.SSa.IFiSa.NcirBat). The characterising species live within the sand and are unlikely to be directly affected by an increased concentration of suspended matter in the water column. Within the mobile sands habitat storm events or spring tides may re-suspend or transport large amounts of material and therefore species are considered to be adapted to varying levels of suspended solids. The Sensitivity of the biotope is classified as **Low**

- Intertidal sand dominated by polychaetes and crustacea community complex a feature of the Annex I habitat 1140 is, at its nearest distance, 1.3 km from the PDB.

  This community complex is considered to be similar to the MNCR biotope '*Scolelepis* spp. In littoral mobile sand' (LS.LSa.MoSa.AmSco.Sco). Exposed and moderately exposed shores of fully marine mobile clean sand, with particle sizes ranging from coarse to very fine. The sediment is not always well sorted, and may contain a subsurface layer of gravel or shell debris. Usually, no anoxic layer is present. The mobility of the sediment leads to a species-poor community, dominated by the polychaetes *Scolelepis squamata* and *Scolelepis foliosa.* The Sensitivity of the biotope is classified as **Low**

- Sheltered to moderately exposed intertidal reef community complex, a feature of the Annex I habitat 1170 is, at its nearest distance, 1.7 km from the PDB. This community complex is considered to be similar to the MNCR biotope '*Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on *sand-covered infralittoral rock'* (IR.HIR.KSed.ProtAhn). As the species present are tolerant of scour and turbidity, biotope resistance is assessed as Medium and resilience as High sensitivity is therefore assessed as **Low**.

- Exposed subtidal reef dominated by a faunal community complex, a feature of the Annex I habitat 1170 is, at its nearest distance, 3 km from the PDB. This community complex is considered to have similar characteristics to the MNCR biotope 'Mixed turf of bryozoans and erect sponges with *Cylista elegans* on tide-swept circalittoral rock'. The CR.HCR.XFa.ByErSp complex tends to occur in areas of high energy, therefore an increase in suspended sediment will result in an increase in scour. While some sponges and *Flustra* are probably resistant of scour, other fragile sponges, and bryozoans will be removed. The biotope will probably come to resemble *Flustra* dominated or grazed faunal turf communities in the short-term, and the biotope will be lost. Therefore, a resistance of Low is suggested, with resilience of Medium and sensitivity of **Medium**.

- *Laminaria* dominated community complex, a feature of the Annex I habitat 1170 is, at its nearest distance, 1.3 km from the PDB. This community complex is considered to be similar to the MNCR biotope *Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock (IR.MIR.KR.LhypT.Ft). Changes in water clarity are likely to affect photosynthetic rates and enable *Saccharina latissima* to compete more successfully with *Laminaria hyperborea*. A decrease in turbidity is likely to support enhanced growth (and possible habitat expansion) and

is therefore not considered in this assessment. Resistance to this pressure is defined as **Low** and resilience to this pressure is defined as **Medium** at the benchmark level due to the scale of the impact. Hence, this biotope is regarded as having a sensitivity of **Medium** to this pressure.

11.5.1.4 SMOTHERING AND SILTATION RATE CHANGE

Dredging will result in bed thickness changes which may result in smothering of sensitive benthic receptors.

Magnitude of impact

All stages of the dredge campaign will result in an increase in bed thickness. Stage 1 of the proposed dredging operations is predicted to produce a bed thickness change, with level changes of a maximum change of 8 cm near the disposal site and negligible changes (below 0.01 cm) at distances beyond 1km from the port. While stage 3 will produce a level thickness change of 6 cm near the disposal site, this will increase to 0.03 cm at location 2. Stage 3 changes are considered negligible. As such, the ZoI for bed thickness change is limited in its extent to 1 km from the disposal area, as both light (5cm) and heavy (30 cm) smothering may occur to varying degrees within this area. Smothering to the reclamation area is not considered as this area will be lost (see section 11.5.1.1). **Therefore, the magnitude of the impact is considered to be "Low"** as only minor or temporary change in the structure and function of the baseline biotope in a localised area.

Sensitivity of receptors

***Mediomastus fragilis* and cirratulids in infralittoral mixed sediment (SS.SMx.IMx.MedCirr)**

Sensitivity assessment (to smothering and siltation rate changes-Light): This biotope is exposed to strong to weak tidal streams in moderately wave exposed to sheltered conditions, so that fine sediments may be removed quickly. The biotope is dominated by infaunal deposit-feeding polychaetes and bivalves that are likely to survive short periods under 5 cm of rapidly deposited sediment. Therefore, resistance is assessed as High, resilience as High and sensitivity assessed as **Not sensitive**.

Sensitivity assessment (to smothering and siltation rate changes-Heavy): The deposition of 30 cm of fine sediment may take several tidal cycles to be removed and some of the more sensitive species may be reduced in abundance within the affected area. Therefore, resistance is assessed as Medium, resilience as High and sensitivity assessed as **Low**.

***Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc)**

Sensitivity assessment (to smothering and siltation rate changes-Light): Bivalves and polychaetes and other species are likely to be able to survive short periods under sediments and to reposition. However, as the pressure benchmark refers to fine material, this may be cohesive and species characteristic of sandy habitats may be less adapted to move through this than sands. Biotope resistance is classed as Medium as some mortality of characterising and associated species may occur. Biotope resilience is classed as High and biotope sensitivity is classed as **Low**.

Sensitivity assessment (to smothering and siltation rate changes-Heavy): The character of the overburden is an important factor determining the degree of vertical migration of buried bivalves.

Individuals are more likely to escape from a covering similar to the sediments in which the species is found than a different type. Sensitivity is therefore assessed as **Medium**.

Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles) (SS.SCS.ICS.SSh)

Sensitivity assessment (to smothering and siltation rate changes-Light): This biotope is characterised by the absence of species through sediment mobility (JNCC, 2015), rather than the presence of typical species. The addition of a single deposit of fine sediments which will be removed by wave action or currents will therefore not alter the biotope. Resistance to this pressure is therefore assessed as High and resilience as High (by default) and this biotope is considered to be **Not sensitive.**

Sensitivity assessment (to smothering and siltation rate changes-Heavy): As above for "Light". Resistance to this pressure is assessed as High and resilience as High (by default) and this biotope is considered to be **Not sensitive**.

***Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock (IR.HIR.KSed.ProtAhn).**

This biotope is characterised by species such as *Chondrus crispus, Polyides rotunda* and *Ahnfeltia plicata* are erect and grow to over 20 cm, therefore mature plants are unlikely to be affected by smothering with 5 cm of sediment. However, recently settled propagules, regenerating holdfasts and small developing plants would be buried by 5 cm of sediment and be unable to photosynthesize.

Sensitivity assessment (to smothering and siltation rate changes-Light): Based on the growth form of the characterising red algae and the presence of these algae and *Urticina felina* in biotopes subject to sand covering (including the assessed biotope one), resistance to this pressure, at the benchmark, is assessed as High, resilience is assessed as High (by default) and the biotope is considered to be **Not sensitive.**

Sensitivity assessment (to smothering and siltation rate changes-Heavy): Resistance is assessed as Low as the impact on the characterising and associated species could be significant but may be mitigated by rapid removal. Resilience is assessed as High based on vegetative re-growth from the scour-tolerant surviving bases of the characterising species. Sensitivity is therefore assessed as **Low**.

11.5.1.5 UNDERWATER NOISE

The MarESA sensitivity assessments do not consider noise pressures are relevant to benthic species. While some literature suggests that low frequency noise may affect the behaviour of burrowing fauna in controlled laboratory experiments (Wang *et al* 2022), there is limited evidence on the effects of underwater noise on marine benthic species within the marine environment. The majority of benthic invertebrates (and, hence, their communities) have limited or no known response to noise, although vibrations in the water column, at close proximity, may result in an avoidance response. Therefore, this pressure is considered to be Not relevant to benthic species and habitats, unless specific evidence to the contrary is found. If evidence on any effect of noise (or vibration) on the component species is found, then it is documented in the MarESA sensitivity assessment, and the potential for the pressure to result in mortality is assessed (Tyler-Walters *et al.,* 2018). A review of the most current MarESA sensitivity assessments (MarESA, 2024) has not recorded any change to this pressure.

11.5.1.6 INTRODUCTION OF INVASIVE NON-INDIGENOUS SPECIES

Magnitude of impact

The magnitude of the impact relative to invasive non-indigenous species (INIS) is considered to be confined to the local area, particularly the new quay walls and jetties which may provide additional substrate for the establishment of INIS. While such additional artificial substrates may provide a settlement location for INIS, the extent of any further spread from there would be limited by the lack of suitable additional substrate. As such it is considered to be the harbour area including the existing quays of the original harbour. The magnitude of the impact is therefore considered to be **Low**.

***Mediomastus fragilis* and cirratulids in infralittoral mixed sediment (SS.SMx.IMx.MedCirr)**

The sediments characterising this biotope are likely to be too mobile and unsuitable for most of the INIS currently recorded in Ireland. Some evidence suggests that *Crepidula* and *Didemnum* sp. may emerge as a threat to this biotope and there are many additional INIS that are currently unrecorded which may in the future pose a threat.

Sensitivity assessment (to Introduction or spread of INIS). Resistance is assessed as Medium in examples where wave action is high and subject to storms but Low in wave sheltered areas dominated by tidal flow. Resilience is assessed as Very low as it would require the removal of possible introductions of selected species. Hence, sensitivity is assessed as **High** based on the worst-case scenario. *Crepidula*, *Didemnum sp* and others have not yet been reported to occur in this biotope so the confidence in the assessment is **Low** as, according to MarESA, further evidence is required.

***Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc)**

The American slipper limpet *Crepidula fornicata* has been recorded from a number of bays in Ireland (e.g., Dungarvan Harbour, Carlingford Lough, Kenmare River and Clew Bay). The colonial ascidian *Didemnum vexillum* is present in many parts of Ireland where it has been recorded attached to pontoons, quay walls and oyster bags on trestle installations on both the east and west coasts of Ireland. These species and others may present a threat to this habitat as it provides suitable substrate for attachment of these and potentially additional INIS.

Sensitivity assessment (to Introduction or spread of INIS). The sediments characterising this biotope are likely to be too mobile or otherwise unsuitable for most of the invasive non-indigenous species currently recorded in Ireland. However, evidence suggests that *Crepidula* could colonise fine muddy sands, typical of this biotope. Additional INIS may also emerge as a threat to this biotope.

Therefore, sensitivity is assessed based on *Crepidula fornicata*, where resistance is assessed as Medium based on the assumption that the substratum may be too muddy for colonisation at high densities. Resilience is assessed as Very low, as it would require the removal of *Crepidula*. Hence, sensitivity is assessed as **Medium** based on the worst-case scenario. *Crepidula* has not yet been reported to occur in this biotope so the confidence in the assessment is Low and further evidence is required.

Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles) (SS.SCS.ICS.SSh)

The high levels of abrasion resulting from the movement of shingle and the subsequent sediment instability will limit the establishment of all but the most highly scour-resistant INIS and there is no direct evidence for the effects of INIS on this biotope. As this biotope is characterised by unstable, mobile, cobbles and pebbles whose scour due to wave action and in winter storms removes most of the resident fauna on a seasonal basis the establishment of INIS is unlikely.

Sensitivity assessment (to Introduction or spread of INIS). Overall, there is no evidence of this biotope being adversely affected by non-native species. As scouring of this biotope by mobile coarse sediments limits the establishment of all but robust species, resistance to INIS is assessed as High and resilience as High (by default) so that the biotope is assessed as **Not sensitive**.

***Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock (IR.HIR.KSed.ProtAhn).**

The high levels of scour in this biotope will limit the establishment of all but scour resistant INIS from this biotope and no direct evidence was found for the effects of INIS on this biotope. A number of invasive red algae have been recorded in the UK, from reported habitat preferences *Bonnemaisonia hamifera* does not appear to be present in scoured environments although the harpoon weed, *Asparagopsis armata* is found in sandy pools (Guiry & Guiry, 2015). In North America *Grateloupia turuturu* is a major competitor of *Chondrus crispus*, although *Grateloupia turuturu* is present in the UK, this large foliose species may not be able to colonise this scoured biotope due to the effects of drag and abrasion. *Undaria pinnatifida* has the potential to out-compete *Saccharina latissima* in suitable habitats. However, it is unlikely to do so in this wave exposed and sand scoured biotope.

Sensitivity assessment (to Introduction or spread of INIS). As sand scouring of this biotope limits establishment of all but robust species, resistance to INIS is assessed as High and resilience as High (by default) so that the biotope is considered to be **Not sensitive**.

11.5.2 OPERATIONAL PHASE IMPACTS

The main elements of the operational phase, with the potential for impact on benthic habitats, include the potential for habitat change (scour, fouling, shading and effects resulting from a change in water flow/local wave exposure) adjacent to the new quay walls and associated rock armour. Habitat change at the proposed location of the pontoons resulting from fouling and shading and the introduction of INIS are also considered possible.

11.5.2.1 INTRODUCTION OF LIGHT OR SHADING

Magnitude of impact

The magnitude of the impact relative to light and shading would be limited to the immediate area, out to 25 m. Shading could lead to a reduction or loss of algal species associated with reef habitats adjacent to jetties/quay walls. As such this impact would only be relevant to the IR.HIR.KSed.ProtAhn as this is the only biotope present that supports algal species. The magnitude of any impacts on this biotope would be extremely limited and confined to a linear length 100 m where quay walls will be constructed adjacent to existing locations of this biotope (see Figure 11.3 and Figure 11.5). The magnitude of the impact is therefore considered to be **Low**.

***Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock (IR.HIR.KSed.ProtAhn).**

Shading (e.g., due to overgrowth, construction of jetties or other artificial structures) could adversely affect shallow sublittoral macroalgae. In general, subtidal red algae, such as those which characterise this biotope, are able to exist at relatively low light levels. *Ahnfeltia plicata* frequently occurs as an understory of kelp canopies where light levels are low, while experimental data has demonstrated that *Polyides rotunda* and *Furcellaria lumbricalis* can both tolerate low light levels.

Sensitivity assessment (to Introduction light or shading). As the key structuring and characterising species colonise a broad range of light environments from intertidal to deeper sub tidal and shaded understorey habitats the biotope is considered to have High resistance and, by default, High resilience and therefore is **Not sensitive** to this pressure.

11.5.2.2 INTRODUCTION OF INIS

The introduction of INIS relative to the magnitude of the impact and the sensitivity of receptors is documented in section 11.5.1.6. The same criteria apply to the operation phase of the project. The MarESA sensitivity assessment for all recorded biotopes are recorded in Table 11.16.

Table 11.16: MarESA sensitivity assessment for all recorded biotopes

Identified pressure	Magnitude	SS.SMx.IMx.MedCirr	SS.SSa.CMuSa.AalbNuc	SS.SMu.SMuVS.CapTubi	IR.HIR.KSed.ProtAhn	SS.SCS.ICS.SSh	SS.SSa	LR.MLR.BF.FspiB	LR.MLR.BF.Fser	LR.LLR.F.Fves	LR.LLR.FVS.Fcer	SS.SSa.IFiSa.NcirBat	LS.LSa.MoSa.AmSco.Sco	CR.HCR.XFa.ByErSp	IR.MIR.KR.LhypT.Ft
Physical loss (to land or freshwater habitat).	Low	High	High	High	High	NR	NR	High	High	High	High	NR	NR	NR	NR
Habitat structure changes – removal of substratum (Extraction)	Low	Med	Med	NA	High	High	NR	NR	NR	NR	NR	NR	NR	NR	NR
Changes to suspended solids (Water Clarity)	Low	NS	Low	NS	Low	NS	NR	NR	NR	NR	NR	Low	Low	Med	Med
Smothering and siltation rate changes (High)	Low	Low	Med	NR	Low	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR
Smothering and siltation rate changes (Low)	Low	NS	Low	NR	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR
Underwater noise	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Introduction of INIS	Low	Low	Medium	NR	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR
Introduction of light and shading	Low	NR	NR	NR	NS	NS	NR	NR	NR	NR	NR	NR	NR	NR	NR

11.6 SIGNIFICANCE OF EFFECTS

The significance of effects during the construction and operational phases of the Proposed Development is assessed below, based on the magnitude of the likely effect and sensitivities of receptors within the ZoI, and summarised in Table 11.17.

11.6.1 CONSTRUCTION PHASE: RECLAMATION

***Mediomastus fragilis* and cirratulids in infralittoral mixed sediment (SS.SMx.IMx.MedCirr)**

The impact of construction phase (reclamation) is considered to be of low magnitude for SS.SMx.IMx.MedCirr and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore is not significant in EIA terms.

***Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock (IR.HIR.KSed.ProtAhn)**

The impact of construction phase (reclamation) is considered to be of low magnitude for the receptor IR.HIR.KSed.ProtAhn and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore is not significant in EIA terms.

***Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc)**

The impact of construction phase (reclamation) is considered to be of low magnitude for the receptor SS.SSa.CMuSa.AalbNuc and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore is not significant in EIA terms.

***Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment (SS.SMu.SMuVS.CapTubi)**

The impact of construction phase (reclamation) is considered to be of low magnitude for the receptor SS.SMu.SMuVS.CapTubi and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore is not significant in EIA terms.

***Fucus spiralis* on exposed to moderately exposed upper eulittoral rock (LR.MLR.BF.FspiB)**

The impact of construction phase (reclamation); physical loss is considered to be of low magnitude for the receptor LR.MLR.BF.FspiB and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore not significant in EIA terms.

***Fucus serratus* on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser)**

The impact of construction phase (reclamation) is considered to be of low magnitude for the receptor LR.MLR.BF.Fser and these receptors are considered to be of high sensitivity to this impact,

therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore not significant in EIA terms.

***Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock (LR.LLR.F.Fves)**

The impact of construction phase (reclamation) is considered to be of low magnitude for the receptor LR.LLR.F.Fves and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore not significant in EIA terms.

***Fucus ceranoides* on reduced salinity eulittoral rock (LR.LLR.FVS.Fcer)**

The impact of construction phase (reclamation) is considered to be of low magnitude for the receptor LR.LLR.FVS.Fcer and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore not significant in EIA terms.

Littoral Sand (LS.LSa)

The impact of construction phase (reclamation) is considered to be of low magnitude for the receptor LS.LSa and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore not significant in EIA terms.

Shingle (pebble) and gravel shores (LS.LCS.Sh)

The impact of construction phase (reclamation) is considered to be of low magnitude for the receptor LS.LCS.Sh and these receptors are considered to be of high sensitivity to this impact, therefore, the construction phase reclamation impact is expected to be of moderate significance and therefore not significant in EIA terms.

11.6.2 CONSTRUCTION PHASE: DREDGING

***Mediomastus fragilis* and cirratulids in infralittoral mixed sediment (SS.SMx.IMx.MedCirr)** The impact of construction phase (dredging) is considered to be of low to moderate magnitude for the receptor SS.SMx.IMx.MedCirr and these receptors are considered to be of not sensitive to medium sensitivity to this impact, therefore the construction phase (dredging) impact is expected to be of minor significance and therefore not significant in EIA terms.

The impact of construction phase (dredging): habitat structure changes is considered to be of low magnitude for SS.SMx.IMx.MedCirr and these receptors are considered to be of medium sensitivity to this impact, therefore, the habitat structure changes impact is expected to be of moderate significance and therefore is not significant in EIA terms.

The impact of construction phase (dredging): changes to suspended solids

Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles) (SS.SCS.ICS.SSh)

The impact of construction phase (dredging) is considered to be of low to moderate magnitude for the receptor SS.SCS.ICS.SSh and these receptors are considered to be of not sensitive to high

sensitivity to this impact, therefore the construction phase (dredging) impact is expected to be of minor significance and therefore not significant in EIA terms.

***Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock (IR.HIR.KSed.ProtAhn)**The impact of construction phase (dredging) is considered to be of low to moderate magnitude for the receptor IR.HIR.KSed.ProtAhn and these receptors are considered to be of not sensitive to high sensitivity to this impact, therefore the construction phase (dredging) impact is expected to be of minor significance and therefore not significant in EIA terms.

***Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc)**

The impact of construction phase (dredging) is considered to be of low to moderate magnitude for the receptor SS.SSa.CMuSa.AalbNuc and these receptors are considered to be of low to medium sensitivity to this impact, therefore the construction phase (dredging) impact is expected to be of moderate significance and therefore not significant in EIA terms.

***Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (SS.SSa.IFiSa.NcirBat)**The impact of construction phase (dredging) is considered to be of low magnitude for the receptor SS.SSa.IFiSa.NcirBat and these receptors are considered to be of low sensitivity to this impact, therefore the construction phase (dredging) impact is considered to be insignificant and therefore not significant in EIA terms.

***Scolelepis* spp. In littoral mobile sand (LS.LSa.MoSa.AmSco.Sco)**

The impact of construction phase (dredging) is considered to be of low magnitude for the receptor LS.LSa.MoSa.AmSco.Sco and these receptors are considered to be of low sensitivity to this impact, therefore the construction phase (dredging) impact is considered to be insignificant and therefore not significant in EIA terms.

Mixed turf of bryozoans and erect sponges with *Cylista elegans* on tide-swept circalittoral rock (CR.HCR.XFa.ByErSp)

The impact of construction phase (dredging) is considered to be of low magnitude for the receptor CR.HCR.XFa.ByErSp and these receptors are considered to be of medium sensitivity to this impact, therefore the construction phase (dredging) impact is considered to be minor and therefore not significant in EIA terms.

***Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock (IR.MIR.KR.LhypT.Ft)**

The impact of construction phase (dredging) is considered to be of low magnitude for the receptor IR.MIR.KR.LhypT.Ft and these receptors are considered to be of medium sensitivity to this impact, therefore the construction phase (dredging) impact is considered to be minor and therefore not significant in EIA terms.

11.6.3 OPERATIONAL PHASE

***Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock (IR.HIR.KSed.ProtAhn)**

The impact of operational phase introduction of INIS, and light and shading, is considered to be of low magnitude for the receptor IR.HIR.KSed.ProtAhn and these receptors are considered to be of low sensitivity to this impact, therefore the operation phase introduction of INIS, and light and shading is considered insignificant and therefore not significant in EIA terms.

Table 11.17: Significance of effects

Biotope	Sensitivity	Magnitude	Significance of effect	Mitigation required
Construction phase: Reclamation				
SS.SMx.IMx.MedCirr	High	Low	Moderate (not significant)	No
IR.HIR.KSed.ProtAhn	High	Low	Moderate (not significant)	No
SS.SSa.CMuSa.AalbNuc	High	Low	Moderate (not significant)	No
SS.SMu.SMuVS.CapTubi	High	Low	Moderate (not significant)	No
LR.MLR.BF.FspiB	High	Low	Moderate (not significant)	No
LR.MLR.BF.Fser	High	Low	Moderate (not significant)	No
LR.LLR.F.Fves	High	Low	Moderate (not significant)	No
LR.LLR.FVS.Fcer	High	Low	Moderate (not significant)	No
LS.LSa	High	Low	Moderate (not significant)	No
LS.LCS.Sh	High	Low	Moderate (not significant)	No
Construction phase: Dredging				
SS.SMx.IMx.MedCirr	NS to Med	Low to moderate	Minor (not significant)	No
SS.SCS.ICS.SSh	NS to High	Low to moderate	Minor (not significant	No
IR.HIR.KSed.ProtAhn	NS to High	Low to moderate	Minor (not significant)	No
SS.SSa.CMuSa.AalbNuc	Low to Med	Low to moderate	Moderate (not significant)	Yes
SS.SSa.IFiSa.NcirBat	Low	Low	Insignificant	No

Biotope	Sensitivity	Magnitude	Significance of effect	Mitigation required
LS.LSa.MoSa.AmSco.Sco	Low	Low	Insignificant	No
CR.HCR.XFa.ByErSp	Med	Low	Minor (not significant	No
IR.MIR.KR.LhypT.Ft	Med	Low	Minor (not significant	No
Operational phase				
IR.HIR.KSed.ProtAhn	Low	Low	Insignificant	No

11.7 MITIGATION MEASURES FOR BENTHIC ECOLOGY

This section describes secondary construction and operational phase mitigation measures.

11.7.1 CONSTRUCTION PHASE MITIGATION MEASURES

Modelling indicates that SSC and bed thickness changes will be below levels with the potential for significant effects during construction. However, with due regard to the precautionary principle, turbidity monitors will be employed to ensure SSC levels (and thereby the potential for increased bed thickness changes) do not exceed the predicted values.

Monitoring of turbidity in real-time will be achieved using turbidity monitors within Rosslare Europort harbour bounds to identify any increased Suspended Sediment Concentration that arises and will implement controls if the SSC limit of 300mg/l above background is breached at the monitored locations.

Monitoring will comprise one offshore buoy in a typically up-current location and another buoy in a typically down-current location corresponding to locations to the east of the dredged boundary and the north-west of the dredged boundary. The tide tends to flow east to north-west and vice-versa between flood to ebb. The buoys will be positioned approximately 300m outside the boundary of dredging and outside of regular navigation routes for RoRo vessels and construction plant. The background reading will be read from the up-current monitoring buoy and the assessment of turbidity will be read from the down-current monitoring buoy. Up-current and down-current positions must be swapped between flood and ebb tidal cycles.

This limiting control value of SSC will be correlated with Notional Turbidity Units (NTU) for samples of sediment initially recovered from the site prior to commencement. This allows instantaneous readings to be taken with real-time NTU meters on the monitoring buoys which are matched to suspended sediment values. The buoys will be set to relay real-time events (including trigger values) and warn the contractor of high values of suspended sediment.

11.7.2 OPERATIONAL PHASE MITIGATION MEASURES

The biotope SS.SSa.CMuSa.AalbNuc, which is the dominant biotope within the Development Area and surrounding study site, is vulnerable to the potential introduction of INIS as a result of increased vessel traffic and the creation of new structures. An INIS management plan will be put in place by

the successful contractor as part of their detailed Construction Environmental Management Plan (CEMP) prior to commencement of construction of the Proposed Development to mitigate the potential for effects on this biotope.

11.8 RESIDUAL EFFECTS

Following the implementation of the mitigation proposed residual effects are as detailed in Table 11.18. Note no residual cumulative effects have been identified.

Table 11.18: Assessment of residual effects

Pressure	Residual effects	Assessment of Significance
Construction phase		
Physical loss (to land or freshwater habitat).	Loss of an area of 22.8 ha of subtidal habitat and 1.7 ha of intertidal habitat, corresponding the reclamation area, will occur.	Moderate (not significant)
Habitat structure changes - removal of substratum (extraction).	Extraction of the substratum would remove 10% of the SS.SCS.ICS.SSh biotope within the dredge area which would be unlikely to return to the baseline. However, this biotope is represented by mobile cobble and shingle with very low species richness and diversity.	Not significant
Changes in suspended solids (water clarity).	Suspended solids concentrations would return to baseline levels following completion of sediment disturbance operations on completion of the project	Not significant
Smothering and siltation rate changes (light).	Very slight bed level changes may occur; however, the magnitude of these changes would not impact the affected biotopes or habitat.	Not significant
Smothering and siltation rate changes (Heavy).	Minor (< 8 cm) bed level changes may occur; however, the magnitude of these changes would not impact the affected biotopes or habitat.	Not significant
Underwater noise changes	N/A	N/A
Introduction of invasive non-indigenous species (INIS)	With mitigation the potential for the introduction of INIS is considered low.	Not significant

Pressure	Residual effects	Assessment of Significance
Operational phase		
Introduction of invasive non-indigenous species	With mitigation the potential for the introduction of INIS is considered low.	Not significant
Introduction of shading and light	No biotopes or species susceptible to shading or light.	Not significant

11.9 SUMMARY

The assessment of impacts and their potential effects on the benthic environment have been fully documented above. With consideration of measures to avoid impacts on the benthic ecology of the Proposed Development Area and its surrounding ZoI embedded in the development design as primary mitigation, no residual significant effects on benthic receptors have been identified.

Additional secondary mitigation measures will be implemented to further avoid or reduce impacts on benthic ecology during the construction and operation of the Proposed Development.

Table 11.19 summarises the impact assessment findings.

Table 11.19: Assessment Summary

Potential Effect	Construction/ Operation	Beneficial / Adverse/ Neutral	Extent (Site/Local/National / Transboundary)	Short term/ Long term	Direct/ Indirect	Permanent / Temporary	Reversible / Irreversible	Significance of Effect (according to defined criteria)	Proposed mitigation	Residual Effects (according to defined criteria)
Physical loss (to land or freshwater habitat).	Construction and Operation	Adverse	Site	Long term	Direct	Permanent	Reversible	Moderate (Not significant in EIAR terms)	None	Moderate (Not significant in EIAR terms)
Habitat structure changes - removal of substratum (extraction).	Construction	Adverse	Site	Short-long term	Direct	Permanent	Reversible	Minor to moderate (Not significant in EIAR terms)	None	Not significant
Changes in suspended solids (water clarity).	Construction	Adverse	Local	Short term	Direct and indirect	Temporary	Reversible	Minor (Not significant in EIAR terms)	None	Not significant
Smothering and siltation rate changes (light).	Construction	Adverse	Local	Short term	Direct and indirect	Temporary	Reversible	Minor (Not significant in EIAR terms)	None	Not significant
Smothering and siltation rate changes (Heavy).	Construction	Adverse	Local	Short term	Direct and indirect	Temporary	Reversible	Minor (Not significant in EIAR terms)	None	Not significant
Introduction of invasive non-indigenous species (INIS)	Operation	Adverse	National	Long term	Direct and indirect	Permanent	Irreversible	Moderate (Not significant in EIAR terms)	Implementation of INIS management plan	Not significant
Introduction of shading and light	Operation	Adverse	Site	Long Term	Direct	Permanent	Reversible	Insignificant (Not significant in EIAR terms)	None	Not significant

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